IEEE

2016 International Conference on Industrial Engineering and Engineering Management

IEEM2016

4-7 DECEMBER 2016
BALI, INDONESIA

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IEEE 2017 International Conference on Industrial Engineering and Engineering Management

IEEM2017

10-13 Dec, Singapore

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Paper Submission

Closes 01 JUN

Contents

Conference Venue
Bali Nusa Dua Convention Center (BNDCC)
Kawasan Terpadu ITDC Block NW/1
Nusa Dua 80363 Bali Indonesia
Tel: +62 361 773000
web: www.baliconventioncenter.com

IEEM2016 Program Overview

SUN - 4 DEC

- AM Tour "Nature Program"
- Conference Registration
- Welcome Reception
- Eve Tour "Culture Program"

MON - 5 DEC

- Conference Registration
- Welcome & Opening
- Keynote Presentations
- "Meet-the-Editors" Panel Session
- Technical Sessions
- Conference Dinner: Pasar Senggol

TUE - 6 DEC

- Conference Registration
- Technical Sessions
- Poster Session
- Best Paper Awards Presentation

WED - 7 DEC

- Day Tour "Subak"

Welcome Message

"Selamat Datang"

We are delighted to extend a warm welcome to you at the 2016 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM2016) to be held from 4th to 7th December 2016 in Bali, Indonesia.

This year, IEEM is jointly organized by IEEE Indonesia Section, IEEE TEMS Singapore Chapter and IEEE TEMS Hong Kong Chapter. The conference is also supported by Institute of Technology Bandung and Gadjah Mada University.

As a high standard conference, IEEM has always brought together the community's most innovative thinkers and dynamic researchers from around the world to share the latest best practices and information in industrial engineering and engineering management. To ensure an exceptional quality of papers, each paper is subjected to rigorous review process.

IEEM2016 received almost 500 submissions and each paper was sent to at least 3 reviewers. The acceptance decisions were then 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 three distinguished speakers to deliver the keynote presentations:

Professor James M. Tien, Member of US National Academy of Engineering and Former Dean of the College of Engineering, University of Miami, United States, will present on "The Sputnik of Servgoods: Autonomous Vehicles".

Professor Arnoud De Meyer, President, Singapore Management University, Singapore will discuss on "Manufacturing and Engineering Networks in a Globalised and Data-rich World".

Ibu Marina Kacaribu, Vice President, Enterprise Digital Services, Telkomsel, Indonesia will highlight on "Embracing the Future by Growing the Digital Ecosystem in Indonesia and Deliver Value to Customers".

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.

We hope you have a fruitful conference and a culturally engaging experience in Bali!

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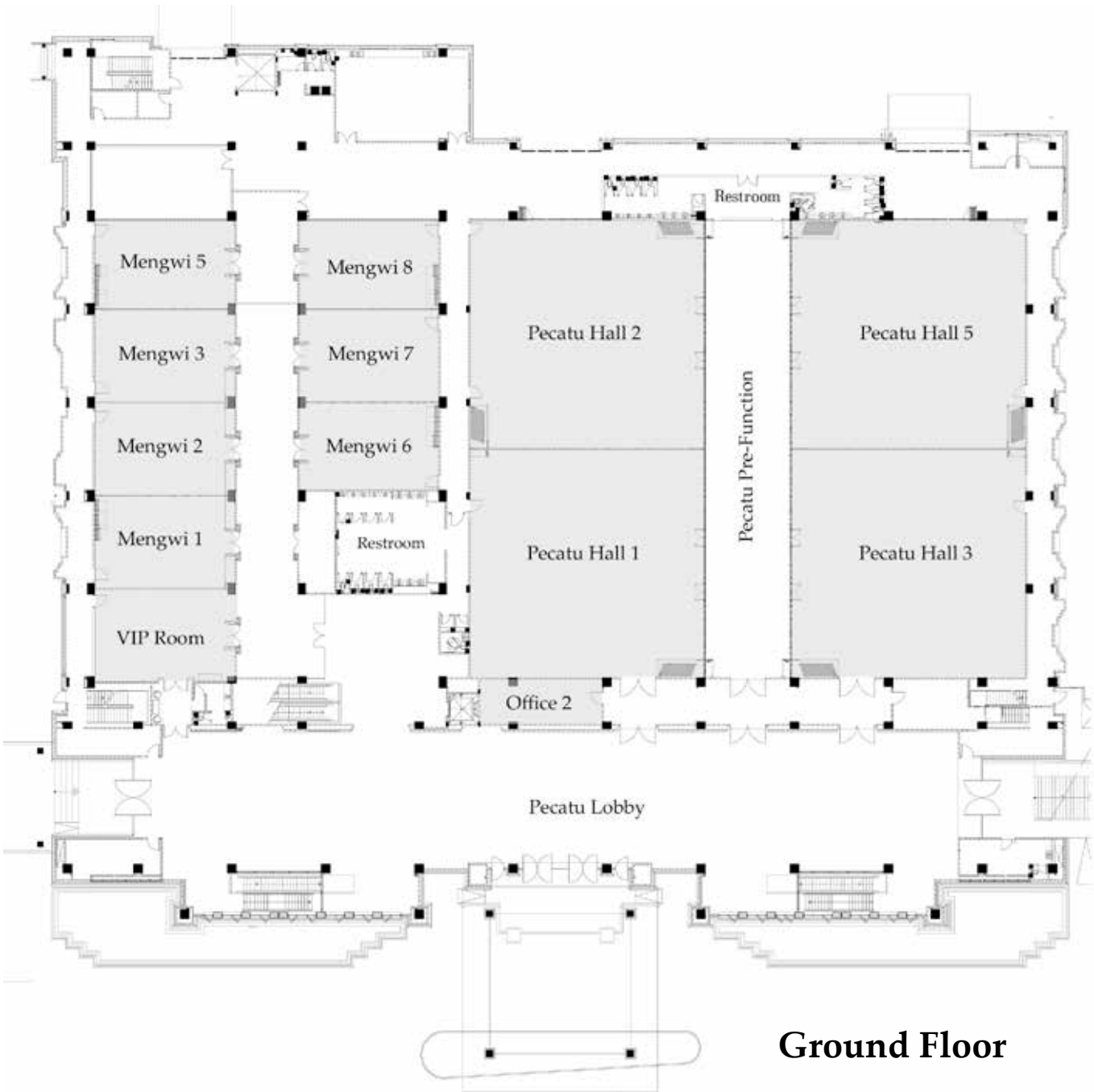
Meeting Room Locations



Ground Floor

Sunday, 04 December 2016 Bali Nusa Dua Convention Center, Ground Floor					
Venue	**Pecatu Lobby**				
09:30 - 14.30	Optional AM Tour "Nature Program" (Ticketed Event - Advance Booking Required) Collect Tickets between 08:30 - 09:15 from Office 2 (Secretariat Office)				
14:30 - 16:00	Welcome Reception				
14:30 - 17:00	Registration				
16:00 - 21:30	Optional Eve Tour "Culture Program" (Ticketed Event - Advance Booking Required)				
Monday, 05 December 2016 **Bali Nusa Dua Convention Center, Ground Floor**					
Venue	**Pecatu 1, 2**				
08:30 - 17:00	Registration				
09:30 - 09:45	Welcome & Opening				
09:45 - 10:30	**Keynote 1** "The Sputnik of Servgoods: Autonomous Vehicles" **James M. TIEN** - *Member, US National Academy of Engineering &* *Former Dean of the College of Engineering, University of Miami, United States*				
10:30 - 11:00	AM Coffee/Tea				
11:00 - 11:45	**Keynote 2** "Manufacturing and Engineering Networks in a Globalised and Data-rich World" **Arnoud DE MEYER** - *President, Singapore Management University, Singapore*				
11:45 - 12:30	**Keynote 3** "Embracing the Future by Growing the Digital Ecosystem in Indonesia and Deliver Value to Customers" **Marina KACARIBU** - *Vice President, Enterprise Digital Services, Telkomsel, Indonesia*				
Venue	**Pecatu 3, 5**				
12:30 - 13:30	Lunch Buffet				
13:30 - 15:00	**Mengwi 1**	**Mengwi 2**	**Mengwi 3**	**Mengwi 5**	**Mengwi 6**
	"Meet-the-Editors" Panel Session *(see also p10)*	Operations Research 1 *(see also p44)*	Supply Chain Management 1 *(see also p45)*	Engineering Education and Training *(see also p46)*	Human Factors 1 *(see also p48)*
	Mengwi 7	**Mengwi 8**	**VIP Room**	**Pecatu 1**	**Pecatu 2**
	Healthcare Systems and Management *(see also p49)*	Systems Modeling and Simulation 1 *(see also p50)*	Intelligent Systems *(see also p51)*	Reliability and Maintenance Engineering 1 *(see also p52)*	Service Innovation and Management *(see also p53)*
Venue	**Pecatu Lobby**				
15:00 - 15:30	PM Coffee/Tea				
15:30 - 17:00	**Mengwi 1**	**Mengwi 2**	**Mengwi 3**	**Mengwi 5**	**Mengwi 6**
	Technology and Knowledge Management 1 *(see also p55)*	Operations Research 2 *(see also p57)*	Supply Chain Management 2 *(see also p58)*	Quality Control and Management 1 *(see also p59)*	Human Factors 2 *(see also p60)*
	Mengwi 7	**Mengwi 8**	**VIP Room**	**Pecatu 1**	**Pecatu 2**
	Decision Analysis and Methods 1 *(see also p61)*	Systems Modeling and Simulation 2 *(see also p62)*	Safety, Security and Risk Management *(see also p63)*	Reliability and Maintenance Engineering 2 *(see also p64)*	E-Business and E-Commerce *(see also p65)*
Venue	**Grand Hyatt Hotel - Add: Kawasan Wisata Nusa Dua BTDC**				
18:30 - 22:00	Conference Dinner at Pasar Senggol *(see also p13)*				

Tuesday, 06 December 2016 Bali Nusa Dua Convention Center, Ground Floor					
Venue	**Pecatu Lobby**				
08:30 - 17:00	Registration				
09:00 - 10:30	**Mengwi 1**	**Mengwi 2**	**Mengwi 3**	**Mengwi 5**	**Mengwi 6**
	Technology and Knowledge Management 2 *(see also p66)*	Operations Research 3 *(see also p67)*	Supply Chain Management 3 *(see also p68)*	Quality Control and Management 2 *(see also p69)*	Manufacturing Systems 1 *(see also p70)*
	Mengwi 7	**Mengwi 8**	**VIP Room**	**Pecatu 1**	**Pecatu 2**
	Decision Analysis and Methods 2 *(see also p71)*	Project Management 1 *(see also p72)*	Facilities Planning and Management *(see also p73)*	Reliability and Maintenance Engineering 3 *(see also p74)*	Information Processing and Engineering *(see also p75)*
Venue	**Pecatu Lobby**				
10:30 - 11:00	AM Coffee/Tea				
11:00 - 12:30	**Mengwi 1**	**Mengwi 2**	**Mengwi 3**	**Mengwi 5**	**Mengwi 6**
	Technology and Knowledge Management 3 *(see also p76)*	Operations Research 4 *(see also p77)*	Supply Chain Management 4 *(see also p78)*	Production Planning and Control 1 *(see also p79)*	Manufacturing Systems 2 *(see also p80)*
	Mengwi 7	**Mengwi 8**	**VIP Room**	**Pecatu 1**	
	Decision Analysis and Methods 3 *(see also p81)*	Project Management 2 *(see also p82)*	Big Data and Analytics *(see also p83)*	Reliability and Maintenance Engineering 4 *(see also p84)*	
Venue	**Pecatu 3, 5**				
12:30 - 13:30	Lunch Buffet				
Venue	**Pecatu 2**				
13:30 - 15:00	Authors/Presenters Poster Set-up				
13:30 - 15:00	**Mengwi 1**	**Mengwi 2**	**Mengwi 3**	**Mengwi 5**	**Mengwi 6**
	Technology and Knowledge Management 4 *(see also p86)*	Operations Research 5 *(see also p87)*	Supply Chain Management 5 *(see also p88)*	Production Planning and Control 2 *(see also p89)*	Manufacturing Systems 3 *(see also p90)*
	Mengwi 7	**Mengwi 8**	**VIP Room**	**Pecatu 1**	**Pecatu 2**
	Decision Analysis and Methods 4 *(see also p91)*	Project Management 3 *(see also p92)*	Engineering Economy and Cost Analysis *(see also p93)*	Reliability and Maintenance Engineering 5 *(see also p94)*	Poster Display *(see also p95)*
Venue	**Pecatu 1**				
15:00 - 15:30	Best Paper Awards Presentation				
Venue	**Pecatu 2**				
15:30 - 17:00	Poster Session & Coffee/Tea Reception				
17:00 - 17:30	Authors/Presenters Poster Tear-down				
Wednesday, 07 December 2016 **Bali Nusa Dua Convention Center, Ground Floor**					
08:00 - 15:00	Optional Day Tour "Subak" (*Ticketed Event - Advance Booking Required)*				

Keynote Speaker

Mon - 5 Dec | 09:45 - 10:30 | Pecatu 1 & 2

"The Sputnik of Servgoods: Autonomous Vehicles"

James M. TIEN
Member, US National Academy of Engineering
Former Dean,College of Engineering
University of Miami, United States

Abstract

In an earlier paper [Tien 2015], the author defined the concept of a servgood, which can be thought of as a physical good or product enveloped by a services-oriented layer that makes the good smarter or more adaptable and customizable for a particular use. Adding another layer of physical sensors could then enhance its smartness and intelligence, especially if it were to be connected with each other or with other servgoods through the Internet of Things. Such sensed servgoods are becoming the products of the future. Indeed, autonomous vehicles can be considered the exemplar servgoods of the future; it is about decision informatics and embraces the advanced technologies of sensing (i.e., Big Data), processing (i.e., real-time analytics), reacting (i.e., real-time decision-making), and learning (i.e., deep learning). Since autonomous vehicles constitute a huge quality-of-life disruption, it is also critical to consider its policy impact on privacy and security, regulations and standards, and liability and insurance. Finally, just as the Soviet Union inaugurated the space age on October 4, 1957, with the launch of Sputnik, the first man-made object to orbit the Earth, the U. S. has inaugurated an age of automata or autonomous vehicles that can be considered to be the U. S. Sputnik of servgoods, with the full support of the U. S. government, the U. S. auto industry, the U. S. electronic industry, and the U.S. higher educational enterprise.

About the Speaker

After 8 years as Dean of the College of Engineering at the University of Miami, Coral Gables, Florida, Dr. James M. Tien stepped down in 2015; he remains a Distinguished Professor. He received the BEE from Rensselaer Polytechnic Institute (RPI) and the SM, EE and PhD from the Massachusetts Institute of Technology (MIT). He has held leadership positions at Bell Telephone Laboratories, at the Rand Corporation, and at Structured Decisions Corporation (which he co-founded). He joined the Department of Electrical, Computer and Systems Engineering at RPI in 1977, became Acting Chair of the department, joined a unique interdisciplinary Department of Decision Sciences and Engineering Systems as its founding Chair, and twice served as RPI's Acting Dean of Engineering. Dr. Tien has published extensively, been invited to present dozens of plenary lectures, and been honored with both teaching and research awards, including being elected a Fellow in IEEE, INFORMS and AAAS and being a recipient of the IEEE Joseph G. Wohl Outstanding Career Award, the IEEE Major Educational Innovation Award, the IEEE Norbert Wiener Award, the IEEE Richard M. Emberson Award, and the IBM Faculty Award. He received a Doctor of Engineering (honoris causa) from Canada's University of Waterloo and is also an Honorary Professor at over a dozen non-U.S. universities. Dr. Tien is also an elected member of the U. S. National Academy of Engineering.

Mon - 5 Dec | 11:00 - 11:45 | Pacatu 1 & 2

"Manufacturing and Engineering Networks in a Globalised and Data-rich World"

Arnoud DE MEYER
President
Singapore Management University, Singapore

Abstract

It has become almost a cliché that the way we organize manufacturing and engineering, is changing because of two main reasons: globalization and the degree of data-intensity in products and services. Many sectors and markets are dominated by a small group of large producers, who have an international network of factories and design facilities. And the concept of a physical product or an intangible service has gotten blurred, because in most cases the value created for the customer now often consists of physical products and information and network based services.

This has obviously a major impact on how we think about global engineering and manufacturing networks. I will address three issues. First a lot more innovation and engineering is carried out in global ecosystems, or loose partnerships of companies and research institutes who together create value. This the way ARM, the British risc processor designer that was recently bought by Softbank, or Alibaba have organized their innovation systems. Such ecosystems have become possible thanks to the lower transaction costs between partners, as a result of better information and networking technology. I will propose under which circumstances such ecosystems are appropriate for engineering and manufacturing, and how they can be managed.

Secondly I have developed with my co-authors Ann Vereecke and Kasra Ferdows a model for the organization of global production networks, based on the degree of uniqueness of products and processes, which may help to delayer such networks. This empirically supported model helps us to spot anomalies in engineering and manufacturing networks and provides an excellent tool for the audit and management of such global networks.

Thirdly we have also explored what the implication is of the current hypes in manufacturing, e.g. re-shoring, 4.0 manufacturing and Internet of Things, the rise of e-commerce and digital manufacturing may imply for global engineering and manufacturing networks. Based on a number of case studies of companies like Johnson and Johnson, SAB Miller, Rolls Royce, BASF or Luxottica we hypothesize that the information density and interconnectedness of products and processes play a key role in the influence of these hypes on the organization of engineering and manufacturing networks.

How global networks can or need to be organized is still a very new are of research and practice. It is an area where modelling and empirical research can make a big difference. I will propose a number of hypotheses for interesting research projects.

About the Speaker

Professor De Meyer is the fourth President of Singapore Management University. Previously, he was Director of Judge Business School at the University of Cambridge where he was Professor of Management Studies and Fellow of Jesus College. He was associated for 23 years with INSEAD where he held various senior academic and administrative positions, including founding Dean of INSEAD's Asia Campus in Singapore.

Professor De Meyer has a Master of Science in Electrical Engineering, MBA and PhD in Management from the University of Ghent in Belgium. He also pursued his studies as a visiting scholar at the Sloan School of Management, Massachusetts Institute of Technology (USA). His research interests are in manufacturing and technology strategy; the implementation of new manufacturing technologies; the management of R&D; how innovation can be managed more effectively; project management under conditions of high uncertainty; management and innovation in Asia; the globalisation of Asian firms; the management of novel projects; and e-readiness in Europe. His work is published widely in academic journals and he has written several books.

Professor De Meyer serves on several boards including the Human Capital Leadership Institute, National Research Foundation, Singapore International Chamber of Commerce, Singapore Symphonia Company Limited and Temasek Management Services. He is an external director of Dassault Systèmes SA (France) and also Chair of the Strategic Advisory Committee of VITO, the Flemish Institute for Technological Research (Belgium).

Keynote Speaker

Mon - 5 Dec | 11:45 - 12:30 | Pecatu 1 & 2

"Embracing the Future by Growing the Digital Ecosystem in Indonesia and Deliver Value to Customers"

Marina KACARIBU
Vice President, Enterprise Digital Services
Telkomsel, Indonesia

Abstract

The rapid growing of cellular network and smartphone adoption in Indonesia has brought new digital behavior and brought many opportunities for the digital ecosystem players, as more people become connected to the Internet through their mobile phone.

As the largest mobile operator that deliver connectivity and digital services to our customers, we have seen how the new services has grown very fast in consumer areas such as social media, games, and entertainment.

Telkomsel has worked with many content partners, publishers, both global and local in driving the new services and distribute it to the right segment, leveraging on our asset and capabilities not only in network coverage and quality but also billing enablement, distribution, marketing and reaching out to the youth and community in various on the ground activities.

We learn that the innovation needs to happen not only in the product itself, but also in the business model, pricing, and how it is communicated and distributed to the relevant segment in the market. End to end user experience is critical and it needs dedicated effort to test and get market feedback continuously.

With the continue expansion of 3G and now 4G, the new landscape of Internet of everything has also been started to rise. Now, there are more applications and ways to connect not only people but also many types of devices and sensors, brings new potential use cases for new value creations to both consumer and enterprises.

In embracing the future growth in this area, Telkomsel has been launched key initiatives and products, focusing in mobile financial services, digital entertainment, IoT based services and digital advertising. It has challenges but the opportunities of value creation are huge, so collaboration with multiple parties along the value chain is imperative.

With more than 150 million customers and growing, Telkomsel continues to work with many of new stakeholders in the adjacent industries, find ways to stimulate the innovation and deliver more values to our customers.

About the Speaker

Almost 20 years engagement with the Telco industry, Marina has been involved in various works including new product development, corporate strategy, and setting new business development for Telkomsel, as the biggest mobile operator in Indonesia. For the last 3 years as VP Digital Lifestyle, she has been handling the digital consumer services, including content, VAS, and the growing space of apps marketplace, music, games, and video.

Now developing a new digital business stream as Vice President Enterprise Digital Services in Telkomsel, the largest mobile operator in Indonesia. Responsible for developing business solution in B2B and B2B2C, in particular to drive the adoption of Internet of Things in improving the productivity and deliver value creation to enterprise.

Very enthusiastic for innovation and the growth of technology for advancing business and enhancing life.

"Meet-the-Editors" Panel Session

Mon - 5 Dec | 13:30 - 15:00 | Mengwi 1

Chair:
Peter Ed LOVE
Department Editor, IEEE Transactions on Engineering Management

Panelists:
Tolga BEKTAS
Area Editor, Computers & Operations Research

Roel LEUS
Associate Editor, OR Spectrum

Hsiao-Fan WANG
Regional Editor, Fuzzy Optimization and Decision Making

Min XIE
Editor, Reliability Engineering and System Safety
Department Editor, IIE Transactions
Area Editor, Computers & Industrial Engineering

About the Panelists:

Tolga BEKTAS
Area Editor, Computers & Operations Research

Professor Tolga Bektas is Chair of Logistics Management at the Southampton Business School at the University of Southampton. He holds a PhD degree in Industrial Engineering from Bilkent University awarded in 2005, and has research interests in mathematical modelling and optimisation of a variety of problems in distribution logistics, including network design, intermodal transportation, road and rail transportation, and vehicle routing. He has undertaken various editorial roles, such as an Area Editor for Computers & Operations Research, as a co-editor of OR Insight, and as guest editor of several special issues. His papers appeared in journals such as Transportation Research Part B, Transportation Science, European Journal of Operational Research, Omega, Naval Research Logistics, Networks and the Journal of the Operational Research Society. He has given keynote talks in international conferences, and has been part of the programme committee of various conferences, including the recently held EURO 2016 in Poznan.

Roel LEUS
Associate Editor, OR Spectrum

Roel Leus holds a Master's degree (1998) in Business Engineering and a PhD (2003) in Applied Economics, both from KU Leuven (Belgium). He is currently Full Professor of Operations Research at the Faculty of Economics and Business of KU Leuven, and he is also head of the Research Center for Operations Research and Business Statistics at the same university. He has been a visiting researcher at London Business School (UK, 2004) and at LAAS-CNRS Toulouse (France, 2008). His main research interests are sequencing and scheduling, project planning, and planning under uncertainty. Roel Leus has published more than 40 papers in various international journals, and he currently also serves as an associate editor of OR Spectrum and special-issue editor of Journal of Scheduling.

"Meet-the-Editors" Panel Session

Mon - 5 Dec | 13:30 - 15:00 | Mengwi 1

Hsiao-Fan WANG
Regional Editor, Fuzzy Optimization and Decision Making

Hsiao-Fan Wang is the Distinguished Chair Professor of National Tsing Hua University (NTHU), Taiwan, Republic of China; Fellow of Chinese Institute of Industrial Engineering and Erskine Fellow of Canterbury University, NZ. She is also taking charge of both the Research Center of Advanced Manufacture & Service Management; and the Arts Center of the university. She has been teaching at the Department of Industrial Engineering and Engineering Management at the same university, NTHU after she graduated from Cambridge University, UK in 1981. She used to be the Vice Dean of the College of Engineering, the Head of the Department of IEEM, in NTHU, President of Chinese Fuzzy Systems Association, Vice President of International Fuzzy Systems Association. Also, she has been awarded the Distinguished Research Award from National Science Council of Taiwan, ROC; Distinguished Contracted Research Fellow of NSC and Distinguished Teaching Award of Engineering College, NTHU. She is the area editors of several international journals and has published more than 120 journal papers; as well as is the (co)author of 15 books. Her research interests are in Multicriteria Decision Making, Fuzzy Set Theory and Green Value Chain Management.

Min XIE
Editor, Reliability Engineering and System Safety
Department Editor, IIE Transactions
Area Editor, Computers & Industrial Engineering

Min Xie is currently a Chair Professor of Industrial Engineering at City University of Hong Kong and serves as Associate Dean at College of Science and Engineering. He did his undergraduate study at Royal Inst of Technology in Sweden and completed his PhD from Linkoping University, Sweden in 1987. Dr Xie joined the National University of Singapore in 1991 as one of the first recipients of the prestigious LKY research fellowship. Prof Xie has published nearly 300 SCI-index journal papers and 8 books. Prof Xie was elected fellow of IEEE in 2005 for his contribution in software and systems reliability. He served as Chief Editor of Quality Technology and Quantitative Management and Associate Editor of IEEE Transactions on Reliability, and currently as an Editor of Reliability Engineering and System Safety, Department Editor of IIE Transactions, Area Editor of Computers & Industrial Engineering, and on the editorial board of more than 10 other international journals.

Chaired by:

Peter Ed LOVE
Department Editor, IEEE Transactions on Engineering Management

Peter Love is a John Curtin Distinguished Professor at Curtin University. Professor Love's leadership in research and active engagement with the construction and resources industry was acknowledged in 2010 when he was awarded the inaugural Scopus Young Australian Researcher of the Year Award in 2010 and later in 2012 was a nominee for Australian of the Year. In 2013 he was awarded a Higher Doctorate of Science (Sc.D) for his significant contributions to the field construction engineering and management.

Professor Love currently acts as the Department Editor for People and Organization for IEEE Transactions on Engineering Management. He is a Visiting Professor to Universities in Australia, China, Korea, United Kingdom and South Africa. Professor Love has been a recipient of almost $5 million from the Australian Research Council's Discovery and Linkage schemes. In addition, he has secured funding from the Engineering and Physical Sciences Research Council (EPSRC) and Research Grants Council (RGC) in Hong Kong. He regularly reviews research proposals submitted to the ARC, EPSRC, RGC, South African National Research Foundation (NRF), National Science Foundation (NSF) in the USA, the Georgian National Science Foundation and the Danish Council for Independent Research. As a result of Professor Love's contribution to the field of Operations Management he was appointed as an Honorary Professor at Burnel University in 2016.

Professor Love has a multi-disciplinary background and has varied research interests, which include safety and reliability engineering, project management, risk management, infrastructure engineering, operations and production management, and modelling and optimisation in complex projects. He serves as an editorial advisory board member for several leading international journals. He currently has co-authored/edited six books and has authored/co-authored over 600 internationally refereed research papers.

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 – 6 Dec 2016 in Pecatu 2 (Ground Floor). 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 – 6 December 2016	
Poster Set-up	13:30 - 15:00
Poster Session (Presenter Attendance Required)	15:30 - 17:00
Poster Tear-down	17:00 - 17:30

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 17:30 latest.
   b. After this time, posters remaining on the boards will be removed and discarded. IEEM2016 will not be responsible for posters and materials left on poster boards after the stated hours.

Conference Dinner

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

Date :	5th December 2016 (Monday)
Time:	6:30pm - 10:00pm
Venue:	Pasar Senggol *(Located adjacent to the Lobby of Grand Hyatt Bali)*
Address:	Grand Hyatt Hotel Kawasan Wisata Nusa Dua BTDC Nusa Dua Bali, Indonesia, 80363
Bus Transfer from BNDCC:	3 Buses Depart at 6:00pm 3 Buses Depart at 6:20pm ***(Gather at BNDCC entrance 10mins before bus departure time)***

Join us as we immerse into a culturally invigorating and exciting evening at our IEEM2016 Conference Dinner this year!

Dine underneath the stars at Pasar Senggol, designed as a contemporary Balinese night market, lingering among an array of stalls offering authentic Indonesian and Balinese dishes. Situated at the heart of the resort, the open Amphitheatre allows guests to dine while being entertained by the live legendary Balinese cultural performances.

We look forward to spending an eventful evening with each and every one of our esteemed guests at IEEM2016 Conference Dinner!

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Sessions

Operations Research 1

5/12/2016 13:30 - 15:00
Room: Mengwi 2

Chairs: Norbert TRAUTMANN, *University of Bern*
Egon MUELLER, *Chemnitz University of Technology*

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An Implementation of the Parallel Schedule-Generation Scheme for Applying Microsoft Excel's Evolutionary Solver to the Resource-Constrained Project Scheduling Problem RCPSP
Norbert TRAUTMANN, Mario GNÄGI
University of Bern, Switzerland

IEEM16-P-0300
Agile Energy Modelling: A Business Centric Approach
Megashnee MUNSAMY[1], Arnesh TELUKDARIE[2]
[1]*Mangosuthu University of Technology, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM16-P-0163
Elevator Performance Estimation Model Based on Square Lattices
Yoichi SHIMAKAWA[1], Yuki SATO[1], Hiroyuki GOTO[2]
[1]*Salesian Polytechnic, Japan*
[2]*Hosei University, Japan*

IEEM16-P-0165
Multi-Objective Constraint Optimization in Mail-Order Pharmacy Automated Distribution System
Toshiyuki MIYAMOTO[1], Natsuhito UENO[1], Debiao LI[2], Sang Won YOON[3]
[1]*Osaka University, Japan*
[2]*Fuzhou University, China*
[3]*State University of New York at Binghamton, United States*

IEEM16-P-0504
Measuring Organizations' Operations Competitive Priorities
Andre VERMEULEN, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

IEEM16-P-0551
Single Machine Scheduling for Multi-Assembly Jobs with Preemption
Luksamon BOONMA, Ronnachai SIROVETNUKUL, Thana SARTTRA
Mahidol University, Thailand

IEEM16-P-0153
The Evaluation of Green Manufacturing: A DEA-Based Approach
Mei-Niang FAN[1], Jun-Der LEU[1], André KRISCHKE[2]
[1]*National Central University, Taiwan*
[2]*Munich University of Applied Sciences, Germany*

Supply Chain Management 1

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Chairs: Aries SUSANTY, *Diponegoro University*
Yong LIN, *University of Greenwich*

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Aries SUSANTY, Arfan BAKHTIAR, Hery SULIANTORO, Christoper MANALU
University of Diponegoro, Indonesia

IEEM16-P-0645
Supply Chain Collaboration: A Triadic View
Lin HUANG, Yong LIN, Li ZHOU, Petros IEROMONACHOU
University of Greenwich, United Kingdom

IEEM16-P-0147
Designing a Recycling Supply Chain Network for a Bottle Manufacturing Factory
Parichehr PAAM, Regina BERRETTA, Mojtaba HEYDAR
The University of Newcastle, Australia

IEEM16-P-0474
Effect of Manufacturing Machines Upgrading on Green Supply Chain Planning
Elnaz MOAYYERI, Farzad DEHGHANIAN, Mahla BABAGOLZADEH
Ferdowsi University of Mashhad, Iran

IEEM16-P-0619
Evaluation of Supply Chain Resilience Enhancement with Multi-Tier Supplier Selection Policy Using Agent-Based Modeling
Shijian CHEN[1], Kang TAI[1], ZhengPing LI[2]
[1]*Nanyang Technological University, Singapore*
[2]*Singapore Institute of Manufacturing Technology, Singapore*

IEEM16-P-0389
Commodity Price Volatility Mitigation in Supply Chain Risk Management: Real Options to Assess the Value of Flexibility-Driven Strategies
Nicola COSTANTINO[1], Roberta PELLEGRINO[1], Danilo TAURO[1]
[1]*Politecnico di Bari, Italy*

Engineering Education and Training

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Chairs: Rui SOUSA, *University of Minho*
Jan Harm PRETORIUS, *University of Johannesburg*

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Rui SOUSA[1], Dorota STADNICKA[2], Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[3], J. Ville ISOHERRANEN[4]
[1]*University of Minho, Portugal*
[2]*Rzeszow University of Technology, Poland*
[3]*University of Stavanger, Norway*
[4]*University of Oulu, Finland*

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Trends Preventing Engineers from Obtaining Professional Registration with ECSA in the Required Time
Nishaal ROOPLALL, Annlize MARNEWICK, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

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Attraction, Education and Retention of Technical Women in South Africa
Hannelie NEL, Johan MEYER
University of Johannesburg, South Africa

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A Comparison Study of Methods to Solve the Mental Health Problem Between the Engineering and Non-Engineering Students
Ming Foong LEE, W. M. H. WAN ADAM
Universiti Tun Hussein Onn Malaysia, Malaysia

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Competencies Model for Entrepreneur Development in Software Industries
Atya AISHA[1], Joko SISWANTO[2], Iman SUDIRMAN[2]
[1]*Telkom University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

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Broadening Access to Problem-Based Learning: Design of the Shell Eco-Marathon Car-In-A-Box Concept
Sune VON SOLMS, Johan MEYER, Warren HURTER
University of Johannesburg, South Africa

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A Study on Information System Quality Management on Productivity Monitoring Model in a Governmental Organization with Multi-Performance Objectives - A Case Study in National Iranian Gas Company
Ali MASSAELI
National Iranian Gas Company (NIGC), Iran

Human Factors 1

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Chairs: Seng Fat WONG, *University of Macau*
Titis WIJAYANTO, *Universitas Gadjah Mada*

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

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Criteria Based Ergonomic Assessment in a Manufacturing Industry
V. KAMALA, Malliga POOSANDARAM, G. M. PRIYANKA
Anna University, India

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Pothole- and Patch Repair Failure Recurrence in Gauteng: The Human Influence
Joanne MULLER [1], Annlize MARNEWICK[2]
[1]*Much Asphalt (Pty) Ltd, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM16-P-0353
Investigating the RGB-D Camera Tracking Accuracy in Different Carrying Tasks
Pin-Ling LIU, Chien-Chi CHANG, Chih-Ting CHEN
National Tsing Hua University, Taiwan

IEEM16-P-0479
The Relation Between Performance of Lean Manufacturing and Employee' Mental Workload
Ari WIDYANTI, Wiku LARUTAMA
Bandung Institute of Technology, Indonesia

IEEM16-P-0630
Adoption of Near Field Communication in Hotel Industry Based on Risk Perspectives and Individual Characteristics
Kin Meng SAM[1], Chris CHATWIN[2]
[1]*University of Macau, China*
[2]*University of Sussex, United Kingdom*

Healthcare Systems and Management

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Chairs: Juha PUUSTJÄRVI, *University of Helsinki*
Manuel CRISOSTOMO, *Institute of Systems and Robotics*

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Paulo FERREIRA[1], João FERREIRA[2], Manuel CRISÓSTOMO[1], Antonio COIMBRA[1]
[1]*University of Coimbra, Portugal*
[2]*Superior Institute of Engineering of Coimbra, Portugal*

IEEM16-P-0002
Practicing Information Therapy in Self-Care: A Solution to the Rise in Health Care Costs
Juha PUUSTJÄRVI[1], Leena PUUSTJÄRVI[2]
[1]*University of Helsinki, Finland*
[2]*The Pharmacy of Kaivopuisto, Finland*

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Benchmarking Lean Practices and Performance Measures of a Hospital
Gopalakrishnan NARAYANAMURTHY, Anand GURUMURTHY
Indian Institute of Management Kozhikode, India

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Comparison of 3D Scanning and 3D Modelling of a Workplace from Various Aspects
Marek BURES, Jiri POLCAR
University of West Bohemia, Czech Republic

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A Regression-Based Approach to Identifying Factors Affecting Operational Efficiency in Surgical Rooms
Jun-Der LEU, Larry Jung-Hsing LEE, Yi-Wei HUNAG
National Central University, Taiwan

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Hierarchical Status and Job Idiosyncrasy in Formalized Organizations: A Field Study on Hospital Physicians
Severin HORNUNG[1], Juergen GLASER[2], Matthias WEIGL[1]
[1]*Uinversity of Munich, Germany*
[2]*University of Innsbruck, Austria*

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Simulation Study of Patient Arrivals and Doctors Scheduling in a Children's Emergency Department
Leslie CHIA[1], Weidong LIN[2]
[1]*KK Women's and Children's Hospital, Singapore*
[2]*Temasek Polytechnic, Singapore*

Systems Modeling and Simulation 1

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Chairs: Jayendran VENKATESWARAN, *Indian Institute of Technology Bombay*
Sirichai TORSAKUL, *Rajamangala University of Technology Thanyaburi*

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Pooja KULKARNI, Jayendran VENKATESWARAN
Indian Institute of Technology Bombay, India

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Using Animation to Develop a MOOC on Information Security
Cheuk Hang AU[1], Kyle Chun Sing LAM[2], Walter S. L. FUNG[2], Xin XU[2]
[1]*The Chinese University of Hong Kong, Hong Kong SAR*
[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

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Simulation Approach for Practical Testing Improvement of Logistics Professional Qualification System Level 1 in Thailand
Chawalit MANISRI, Tharinee MANISRI, Jenjai LITTLE
Sripatum University, Thailand

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Integrating Usage Data into the Planning of Product-Service Systems
Daniel KAMMERL, Gabriel NOVAK, Christoph HOLLAUER, Markus MÖRTL
Technical University of Munich, Germany

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An Investigation of Chloride Penetration and Maintenance Strategies for Concrete Structures by a Modeling Approach
Tharana YOSPRAKOB, Chaiwoot BOONYASIRIWAT, Farida CHAMCHOD
Mahidol University, Thailand

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Finite Element Modeling for Stress Analysis of a Buried Pipeline Under Soil and Traffic Loads
Natapol MEESAWASD[1], Supachara KONGNUAN[2], Chaiwoot BOONYASIRIWAT[1], Farida CHAMCHOD[1]
[1]*Mahidol University, Thailand*
[2]*Thammasat University, Thailand*

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Quality Improvement by Variance Reduction of Component Using Learning Investment Allocation Model
Cucuk Nur ROSYIDI[1], Aris Wahyu NUGROHO[1], Wakhid Ahmad JAUHARI[1], Bambang SUHARDI[1], Kunihiro HAMADA[2]
[1]*Sebelas Maret University, Indonesia*
[2]*Hiroshima University, Japan*

Intelligent Systems

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Chairs: Fumiaki SAITOH, *Aoyama Gakuin University*
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Fumiaki SAITOH
Aoyama Gakuin University, Japan

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Nattapon JAISUMROUM, Pholchai CHOTIPRAYANAKUL, Sunpasit LIMNARARAT
King Mongkut's Institute of Technology Ladkrabang, Thailand

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Qunjie FU, Tsui-Ping CHUNG
Jilin University, China

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Heng SUN, Tsui-Ping CHUNG
Jilin University, China

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Genetic Algorithm for Scheduling Double Different Size Crane System with Different Truck Ready Times
XiaoMeng GAO, Yang YANG, ZhenHui WU
Shanghai Maritime University, China

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Financial and Strategic Impact of VCs on Start-up Development: Silicon Valley Decacorns vs. Northern-European Experience
Mait RUNGI, Egon SAKS, Kristiina TUISK
Tallinn University of Technology, Estonia

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Jingjing HE, Jinsong YANG, Yi YANG, Yunxia CHEN
Beihang University, China

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Kuan Eng CHONG, *Universiti Teknikal Malaysia Melaka*

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David VALIS[1], Libor ZAK[2], Zdenek VINTR[1], Kamila HASILOVA[1]
[1]*University of Defence, Czech Republic*
[2]*Brno University of Technology, Czech Republic*

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Jonathan ROSS, Johannes KNUST, Arne JAGODZINSKI, Malte STONIS, Bernd-Arno BEHRENS
Institut für Integrierte Produktion Hannover gGmbH, Germany

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Jiawen HU, Zuhua JIANG
Shanghai Jiao Tong University, China

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Yonas Zewdu AYELE, Abbas BARABADI
University of Tromsø - The Arctic University of Norway, Norway

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Economic Life Prediction of Repairable Multi-Component Systems Based on Extension Theory
Wenjun GONG, Yunxia CHEN, Yi YANG, Rui KANG
Beihang University, China

IEEM16-P-0677
A Conditional Test for the Exponential Distribution in Load-Sharing Systems
Kong YAONAN[1], Zhisheng YE[2]
[1]*Nation University of Singapore, Singapore*
[2]*National University of Singapore, Singapore*

IEEM16-P-0729
Two Dimensional Maintenance Contract with Coordination Between Owner and Agent
Hennie HUSNIAH[1], Udjianna S. PASARIBU[2], Bermawi ISKANDAR[2]
[1]*Langlangbuana University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

Service Innovation and Management

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Chairs: Nur Aini MASRUROH, *Gadjah Mada University*
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Nur Aini MASRUROH, Hafizha NABILA ABSARI, Yun PRIHANTINA MULYANI
Gadjah Mada University, Indonesia

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Measuring Service Productivity and Complexity in Medical Rescue Services
Markus HARLACHER, Andreas PETZ, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER, Christopher M. SCHLICK
RWTH Aachen University, Germany

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Electricity-Saving Behavior Antecedents: Electricity-Saving Motivations, Constraints, Knowledge and Beliefs
Hung Chih LAI, Yao Cheng YU, Yi-Min TUAN
National Taiwan University, Taiwan

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Characterization and Empirical Analysis of Variety-Induced Costs in Integrated Product-Service Systems (PSS)
Guenther SCHUH, Michael RIESENER, Jan KOCH, Stefan BREUNIG, Jan KUNTZ
RWTH Aachen University, Germany

IEEM16-P-0467
An Integration of Function- and Affordance-Based Methods for Product-Service System Utilizing Finite State Automata
Hyunwoong KO[1], Seung Ki MOON[1], Kristin L. WOOD[2], Hyung Sool OH[3]
[1]*Nanyang Technological University, Singapore*
[2]*Singapore University of Technology and Design, Singapore*
[3]*Kangwon National University, South Korea*

IEEM16-P-0523
Identification of Variant-Creating Factors in Product Service Systems
Guenther SCHUH, Jan KUNTZ, Katharina HEEG, Philipp JUSSEN, Jan KOCH, Stefan BREUNIG
RWTH Aachen University, Germany

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Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

Technology and Knowledge Management 1

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Chairs: Weng Marc LIM, *Swinburne University of Technology*
TMA ARISAMADHI, *Bandung Institute of Technology*

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Weng Marc LIM[1], Pei-Lee TEH[2], Pervaiz Khalid AHMED[2], Alan H.S. CHAN[3], Soon-Nyean CHEONG[4], Wen-Jiun YAP[4]
[1]*Swinburne University of Technology, Malaysia*
[2]*Monash University, Malaysia*
[3]*City University of Hong Kong, Hong Kong SAR*
[4]*Multimedia University, Malaysia*

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Relationship Among Individual Factors, Knowledge Sharing, and Work Performance: A Model from Baby Boomers, Generation X, and Generation Y Perspective
Amelia KURNIAWATI[1], T. M. A. ARISAMADHI[2], Iwan Inrawan WIRATMADJA[2]
[1]*Telkom University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

IEEM16-P-0022
Impact of Tacit and Explicit Knowledge on Knowledge Sharing at Indonesian Small and Medium Enterprise
Augustina Asih RUMANTI, T. M. A. ARISAMADHI, Iwan Inrawan WIRATMADJA
Bandung Institute of Technology, Indonesia

IEEM16-P-0454
Web Usability and Self-Efficacy in Promoting Individual Knowledge Sharing
Ceicalia TESAVRITA[1], Kadarsah SURYADI[2], Iwan Inrawan WIRATMADJA[2]
[1]*Universitas Katolik Parahyangan, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

IEEM16-P-0521
The Effects of R&D Engineers' Work Engagement and Workplace Climate on Positive Attitude to Knowledge Sharing Within Japanese R&D Workplace
Hideki SHIMIZU-TANAKA
Aomori Public University, Japan

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Applying Balanced Scorecard for Quality Assurance in Educational Management: A Case Study of a Research Group in a University
Soontarin NUPAP
Mae Fah Luang University, Thailand

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Made ANDRIANI, Kadarsah SURYADI, T. M. A. ARISAMADHI, Joko SISWANTO
Bandung Institute of Technology, Indonesia

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Chairs: Juergen ZIMMERMANN, *Clausthal University of Technology*
Zhe ZHANG, *Nanjing University of Science and Technology*

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Alexander FRANZ, Juergen ZIMMERMANN
Clausthal University of Technology, Germany

IEEM16-P-0181
Relationship between Overall Equipment Effectiveness, Throughput and Production Part Cost in Semiconductor Manufacturing Industry
Chong KUAN ENG[1], Kam-Choi NG[2]
[1]*Technical University Malaysia, Malaysia*
[2]*Infineon Technologies, Malaysia*

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Formulation of Service Network Design with Time Requirements to Schedule Heterogeneous Fleet
Zujian WANG, Mingyao QI
Tsinghua University, China

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A Heuristic Algorithm for Maximizing the Total Weight of Just-In-Time Jobs Under Multi-Slot Conditions
Ryo SAITO, Eishi CHIBA
Hosei University, Japan

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A New Solution Representation for the Rectilinear Block Packing Problem
Ken MATSUSHITA[1], Yannan HU[1], Hideki HASHIMOTO[2], Shinji IMAHORI[3], Mutsunori YAGIURA[1]
[1]*Nagoya University, Japan*
[2]*Tokyo University of Marine Science and Technology, Japan*
[3]*Chuo University, Japan*

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Facility Location and Routing Decisions for a Food Delivery Network
Niraj Ramesh DAYAMA, Mohan KRISHNAMOORTHY
Monash University, Australia

IEEM16-P-0065
Improving Column Generation Methods or Sheduling Problems Using ZDD and Stabilization
Roel LEUS, Daniel KOWALCZYK
KU Leuven, Belgium

Supply Chain Management 2

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Chairs: Yi-Hui LIANG, *I-Shou University*
Sobhan ASIAN, *RMIT University*

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Yi-Hui LIANG
I-Shou University, Taiwan

IEEM16-P-0156
Capacity Investments and Technology Decisions Under Regulatory Uncertainty
Tarun JAIN, Jishnu HAZRA
Indian Institute of Management, India

IEEM16-P-0204
Correlation of Barriers to Reverse Logistics Performance Using Structural Equation Modeling
Pornwasin SIRISAWAT, Tossapol KIATCHAROENPOL
King Mongkut's Institute of Technology Ladkrabang, Thailand

IEEM16-P-0718
A Review of Supply Network Configuration Literature and Decision Support Tools
Subodha DHARMAPRIYA, Senevi KIRIDENA, Nagesh SHUKLA
University of Wollongong, Australia

IEEM16-P-0010
Modeling Disruption Propagation in a Complex Supply Chain
Puay Siew TAN[1], Siang Guan LEE[2], Chin Sheng TAN[3]
[1]*Singapore Institute of Manufacturing Technology, Singapore*
[2]*Nanyang Technological University, Singapore*
[3]*Agency for Science, Technology and Research (A*STAR), Singapore*

IEEM16-P-0366
Self-Assembly of Supplier Selection Strategies
Gabriel YEE[1], Yew Soon ONG[2], Puay Siew TAN[1]
[1]*Singapore Institute of Manufacturing Technology, Singapore*
[2]*Nanyang Technological University, Singapore*

Quality Control and Management 1

5/12/2016 15:30 - 17:00
Room: Mengwi 5

Chairs: Ville ISOHERRANEN, *University of Oulu*
R.M. Chandima RATNAYAKE, *University of Stavanger*

Abstracts: see page 59

IEEM16-P-0058
Operational Excellence Evaluation Model for SMEs and Regional Findings
Ville ISOHERRANEN[1], Eija-Riitta NIINIKOSKI[1], Tapio MALINEN[2], Martti JOKINEN[2], Pekka KESS[1], Minna Katariina KARKKAINEN[1]
[1]*University of Oulu, Finland*
[2]*Centria University of Applied Sciences, Finland*

IEEM16-P-0609
Software Test Estimation Tool: Comparable with COCOMOII Model
Shaiful ISLAM[1], Bishwajit Banik PATHIK[1], Manzur H. KHAN[2], Md. Mamun HABIB[3]
[1]*American International University-Bangladesh, Bangladesh*
[2]*Universiti Utara Malaysia, Bangladesh*
[3]*BRAC University, Bangladesh*

IEEM16-P-0047
A Self-Starting Control Chart for Simultaneous Monitoring of Mean and Variance of Autocorrelated Simple Linear Profile
Amirhossein AMIRI, Reza GHASHGHAEI, Peyman KHOSRAVI
Shahed University, Iran

IEEM16-P-0169
The Effects of Violations of Assumptions in Multivariate Shewhart Control Charts
Sudarat NIDSUNKID[1], John BORKOWSKI[2], Kamon BUDSABA[1]
[1]*Thammasat University, Thailand*
[2]*Montana State University, United States*

IEEM16-P-0439
Design of Gamma Control Charts Based on the Narrowest Confidence Interval
Songhua HAO[1], Shuo HUANG[2], Jun YANG[1]
[1]*Beihang University, China*
[2]*City University of HongKong, Hong Kong SAR*

IEEM16-P-0524
Monitoring Categorical Processes by Integrating Ordinal Information
Junjie WANG[1], Jian LI[2], Qin SU[2]
[1]*City University of Hong Kong, China*
[2]*Xi'an Jiaotong University, China*

IEEM16-P-0646
Assessing the Raters Agreement in the Diagnostic Catheter Tube Connector Production Process Using Novel Fuzzy Similarity Coefficient
Magdalena DIERING[1], Krzysztof DYCZKOWSKI[2]
[1]*Poznan University of Technology, Poland*
[2]*Adam Mickiewicz University, Poland*

Human Factors 2

5/12/2016 15:30 - 17:00
Room: Mengwi 6

Chairs: Markus HARTONO, *University of Surabaya*
Titis WIJAYANTO, *Universitas Gadjah Mada*

Abstracts: see page 60

IEEM16-P-0423
Indonesian Anthropometry Update Through Drillis & Contini Revisited and Structural Equation Modeling Incorporating Children, Adult and Elderly Populations
Markus HARTONO
University of Surabaya, Indonesia

IEEM16-P-0514
Effects of Morning-Night Differences and Sleep Deprivation on Situation Awareness and Driving Performance
Titis WIJAYANTO, Sunu WIBIRAMA, Zakian Zakaria MARYOTO, Mumtaz Naufal WINADI, M. BAHIT
Universitas Gadjah Mada, Indonesia

IEEM16-P-0378
Identifying the Visual Interference by Design and Tactile Properties of Leathers Using Automobile Interior
Wonjoon KIM, Gee Won SHIN, Joong Hee LEE, Yushin LEE, Myung Hwan YUN
Seoul National University, South Korea

IEEM16-P-0486
Community Behavior During the Evacuation of Mount Merapi Eruption Disaster
Dwi HANDAYANI, Muhammad Kusumawan HERLIANSYAH, Budi HARTONO, Bertha Maya SOPHA
Gadjah Mada University, Indonesia

IEEM16-P-0601
How to Define the User's Tolerance of Response Time in Using Mobile Applications
Ronggang ZHOU[1], Shuang SHAO[1], Wen LI[2], Lei ZHOU[2]
[1]*Beihang University, China*
[2]*China Mobile Research Institute, China*

IEEM16-P-0636
Designing Meaningful User Experiences: Interactive Learning Experience Model
Simon KREMER, Tony SIES, Udo LINDEMANN
Technical University of Munich, Germany

Decision Analysis and Methods 1

5/12/2016 15:30 - 17:00
Room: Mengwi 7

Chairs: Yves DE SMET, *Université libre de Bruxelles*
Siana HALIM, *Petra Christian University*

Abstracts: see page 61

IEEM16-P-0081
On the Use of Reference Profiles to Compute Alternative PROMETHEE II Rankings: A Preliminary Study
Nguyen Anh Vu DOAN, Yves DE SMET
Université libre de Bruxelles, Belgium

IEEM16-P-0087
Group Decision Using Analytical Hierarchical Process: Surabaya's Universities Library in Digital Natives Perspective
Siana HALIM[1], Felecia FELECIA[1], Dian WULANDARI[2], Fransica Lucy SUSANTI[1]
[1]*Petra Christian University, Indonesia*
[2]2*Petra Christian University Library, Indonesia*

IEEM16-P-0235
A Ranking Method for Large Scale Competitions Based on Sample Grouping
Hsiang-Ching WANG[1], Yi-Feng HUNG[1], Hsiang-Hui HUNG[2]
[1]*National Tsing Hua University, Taiwan*
[2]*Chien-Kung Senior High School, Taiwan*

IEEM16-P-0052
A Cloud-Based Approach to Specifying New Components in Open Configuration
Linda ZHANG
IESEG School of Management, France

IEEM16-P-0030
A Method to Group Reliability Data by Hierarchical Clustering
Sheng KANG, Wei-Ting Kary CHIEN
Semiconductor Manufacturing International (Shanghai) Corporation, China

IEEM16-P-0734
Sustainable Maintenance Performance Evaluation Model for Cement Industry
Elita AMRINA, Dhova ARIDHARMA
Andalas University, Indonesia

IEEM16-P-0692
Human Capital, Social Capital and Innovation Outcome: A Systematic Review and Research Agenda
Arie Restu WARDHANI[1], N. ACUR[2], K. MENDIBIL[2]
[1]*University of Strathclyde, United Kingdom*
[2]*University of Stirling, United Kingdom*

Systems Modeling and Simulation 2

5/12/2016 15:30 - 17:00
Room: Mengwi 8

Chairs: Tatsushi NISHI, *Osaka University*
Stefano FAZI, *University of Groningen*

Abstracts: see page 62

IEEM16-P-0563
General Conversion of Integer Programming Problems into Optimal Firing Sequence Problem of Petri Nets
Akito KODAMA, Tatsushi NISHI
Osaka University, Japan

IEEM16-P-0338
Routing Containers in a Dry Port Transport System
Stefano FAZI
University of Groningen, Netherlands

IEEM16-P-0430
Signal Loss of RFID Technology with Short Distance and High Frequency
Seng Fat WONG, Weng Ian HO, K. C. SUN
University of Macau, Macau

IEEM16-P-0438
Concept of System Architecture Database Analysis
Kristin GOEVERT[1], Robert CLOUTIER[2], Michael ROTH[1], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*University of South Alabama, United States*

IEEM16-P-0584
Modeling Indonesia's Rice Supply and Demand Using System Dynamics
Sinta SULISTYO, Bonitasari ALFA, Subagyo
Universitas Gadjah Mada, Indonesia

IEEM16-P-0593
Mapping the Construction Innovation System in the Russian Federation: Conceptual Model Development
Emiliya SUPRUN, Rodney STEWART, Oz SAHIN, Kriengsak PANUWATWANICH
Griffith University, Australia

IEEM16-P-0191
A Module Partition Method Base on Complex Network Theory
Na ZHANG, Yu YANG, Yujie ZHENG
Chongqing University, China

Safety, Security and Risk Management

5/12/2016 15:30 - 17:00
Room: VIP Room

Chairs: Anisur RAHMAN, *Griffith University*
Yoshinobu TAMURA, *Yamaguchi University*

Abstracts: see page 63

IEEM16-P-0408
A Training and Development Skills to Support Product - Service Design from Informatics Perspective
Anies Faziehan ZAKARIA, S.C. Johnson LIM
Universiti Tun Hussein Onn Malaysia, Malaysia

IEEM16-P-0213
A Prediction Model of Hard landing Based on RBF Neural Network with K-means Clustering Algorithm
Xiaoduo QIAO, Wenbing CHANG, Shenghan ZHOU, Xuefeng LU
Beihang University, China

IEEM16-P-0397
Risk Perception and Safety Compliance of Construction Workers
Nini XIA, Xueqing WANG, Wei NI, Xing LIU
Tianjin University, China

IEEM16-P-0531
Artificial Intelligence Improving Safety and Risk Analysis: A Comparative Analysis for Critical Infrastructure
Alexander GUZMAN, Shuichi ISHIDA, Eugene CHOI, Atsushi AOYAMA
Ritsumeikan University, Japan

IEEM16-P-0565
Risk-Based Decision Making in Complex Systems: The ALBA Method
Simone COLOMBO
Politecnico di Milano, Italy

IEEM16-P-0682
Developing Rail Safety Competencies Based on Accident and Incident Investigations: Using Root Cause Taxonomies to Learn from Accidents
Ibrahim Mujdat BASARAN, Sinan YILMAZ
Bulent Ecevit University, Turkey

IEEM16-P-0488
The Preemptive Stochastic Resource-constrained Project Scheduling Problem: An Efficient Optimal Solution Procedure
Stefan CREEMERS
IESEG School of Management, France

Reliability and Maintenance Engineering 2

5/12/2016 15:30 - 17:00
Room: Pecatu 1

Chairs: Zhiqiang CAI, *Northwestern Polytechnical University*
Gopinath CHATTOPADHYAY, *Federation University*

Abstracts: see page 64

IEEM16-P-0450
Issues and Challenges of Balancing Cost, Performance and Risk in Heavy-Haul Rail Asset Management
Gopinath CHATTOPADHYAY
Federation University, Australia

IEEM16-P-0170
Evaluation of Mission Success for Binary System with Repairable Spare Parts
Zhiqiang CAI, Peng GUO, Yang LI, Weitao SI
Northwestern Polytechnical University, China

IEEM16-P-0137
Reliability Improvement for Electrical Pneumatic Arm Loading System
Laith A. HADIDI, Abdullah F. ALKHALDI
King Fahd University of Petroleum and Minerals, Saudi Arabia

IEEM16-P-0061
Modelling of Influence of Various Operational Conditions on Li-ion Battery Capability
David VALIS, Kamila HASILOVA, Jan LEUCHTER
University of Defence, Czech Republic

IEEM16-P-0305
Bayesian Estimation for Failure Probability Through Bogey Test Data
Wanjiao WANG[1], Qingpei HU[2], Dan YU[2]
[1]*Beihang University, China*
[2]*Chinese Academy of Sciences, China*

IEEM16-P-0669
Investigating the Necessity of Acceleration in a Degradation Test
Lanqing HONG[1], Zhisheng YE[1], Xingqiu ZHAO[2]
[1]*National University of Singapore, Singapore*
[2]*Hong Kong Polytechnic University, China*

IEEM16-P-0670
Optimal Supply Planning for Two-Levels Assembly System with Stochastic Lead-Times and Maintenance Actions
Zouhour GUIRAS[1], Sadok TURKI[1], Nidhal REZG[1], Alexandre DOLGUI[2]
[1]*Université de Lorraine, France*
[2]*Ecole des Mines de Nantes, France*

E-Business and E-Commerce

5/12/2016 15:30 - 17:00
Room: Pecatu 2

Chairs: Michel ALDANONDO, *The University of Toulouse Mines Albi*
Yue WANG, *Hang Seng Management College*

Abstracts: see page 65

IEEM16-P-0101
Extending Configuration Techniques from ATO-MTO Towards ETO with Confidence Indicators Based on Readiness and Maturity
Abdourahim SYLLA[1], Elise VAREILLES[1], Michel ALDANONDO[2], Thierry COUDERT[1], Laurent GENESTE[1], Paul PITIOT[1]
[1]*University of Toulouse, France, Metropolitan*
[2]*The University of Toulouse Mines Albi, France*

IEEM16-P-0434
How Reference Options Affect Customer Decisions in Product Configuration
Yue WANG[1], Guohua TANG[2]
[1]*Hang Seng Management College, Hong Kong SAR*
[2]*Alibaba Group, China*

IEEM16-P-0380
A Continuous Toolchain for User-Driven Customization
Michael ROTH, Lisa MAYR, Maik PLOETNER, Udo LINDEMANN
Technical University of Munich, Germany

IEEM16-P-0363
An Evaluation of Customer Repurchase Behaviour in Mobile Telecommunication Services in Australia
Hassan Shakil BHATTI, Ahmad ABARESHI, Siddhi PITTAYACHAWAN
RMIT University, Australia

IEEM16-P-0631
Evaluation of Hospital Web Services Using Intuitionistic Fuzzy AHP and Intuitionistic Fuzzy VIKOR
Gülçin BÜYÜKÖZKAN, Orhan FEYZIOĞLU, Fethullah GOCER
Galatasaray University, Turkey

Technology and Knowledge Management 2

6/12/2016 09:00 - 10:30
Room: Mengwi 1

Chairs: Danping LIN, *Shanghai Maritime University*
Sune VON SOLMS, *University of Johannesburg*

Abstracts: see page 66

IEEM16-P-0277
Research on Effect Factors Evaluation of Internet of Things (IOT) Adoption in Chinese Agricultural Supply Chain
Danping LIN[1], Carman Ka Man LEE[2], Kangwei LIN[2]
[1]*Shanghai Maritime University, China*
[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

IEEM16-P-0136
Technology Acceptance Model of Internet Banking Service for Student's Tuition Fee Payment (Case Study: Public Government University)
Zulhans Ramadhan MAHAROESMAN, Iwan Inrawan WIRATMADJA
Bandung Institute of Technology, Indonesia

IEEM16-P-0316
Strategic Planning of Immature Technologies for Serial Application Using the Example of Selective Laser Melting
Robin KOPF, Gisela LANZA
Karlsruhe Institute of Technology, Germany

IEEM16-P-0347
One's Fault is Another's Lesson: What Motivates the Employees to Participate in the Learning Activity?
Sanetake NAGAYOSHI[1], Jun NAKAMURA[2]
[1]*Shizuoka University, Japan*
[2]*Shibaura Institute of Technology, Japan*

IEEM16-P-0520
Development of a Toolkit of Methods for Simulations in Product Development
Cristina CARRO SAAVEDRA[1], Nils Jorge MARAHRENS[1], Sebastian SCHWEIGERT[1], Philipp KESTEL[2], Simon KREMER[1], Sandro WARTZACK[2], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*Friedrich-Alexander University Erlangen, Germany*

IEEM16-P-0635
Evaluating the Regional Innovation Inputs Inequalities in China: Gini Coefficient Based on the Innovative Outputs
Yingying JIA, Peng GUO
Northwestern Polytechnical University, China

IEEM16-P-0746
Effect of Maintenance Resource Constraints on Flow-Shop Environment in a Joint production and Maintenance Context
Sandeep KUMAR, Bhupesh Kumar LAD
Indian Institute of Technology Indore, India

Operations Research 3

6/12/2016 09:00 - 10:30
Room: Mengwi 2

Chairs: Mingyao QI, *Tsinghua University*
Mojahid SAEED OSMAN, *American University of Sharjah*

Abstracts: see page 67

IEEM16-P-0151
The Electric Vehicle Routing Problem with Time Windows and Battery Swapping Stations
Jinbo CHEN, Mingyao QI, Lixin MIAO
Tsinghua University, China

IEEM16-P-0490
Maintenance Data Allocation Model for Repairable Items in Echelon Inventory System
Mojahid F. SAEED OSMAN
American University of Sharjah, United Arab Emirates

IEEM16-P-0566
An Exact Approach for the Identical Parallel Machine Scheduling Problem with Sequence-Dependent Setup Times and the Job Splitting Property
Taha ARBAOUI, Farouk YALAOUI
Universit´e de Technologie de Troyes, France

IEEM16-P-0572
An Iterated Dual Substitution Approach for the Min-Max Regret Multidimensional Knapsack Problem
Wei WU[1], Manuel IORI[2], Silvano MARTELLO[3], Mutsunori YAGIURA[1]
[1]*Nagoya University, Japan*
[2]*University of Modena and Reggio Emilia, Italy*
[3]*University of Bologna, Italy*

IEEM16-P-0613
Modeling Thailand Power Market: Mathematical Program with Equilibrium Constraints
Seksun MORYADEE
Chulachomklao Royal Military Academy, Thailand

IEEM16-P-0603
A Robust Approach for Newsvendor Problem with the Alternative Product Under Price and Ordering Quantity Competitions
Takashi HASUIKE
Waseda University, Japan

Supply Chain Management 3

6/12/2016 09:00 - 10:30
Room: Mengwi 3

Chairs: Sobhan ASIAN, *RMIT University*
Vipul JAIN, *Victoria University of Wellington*

Abstracts: see page 68

IEEM16-P-0319
Dynamic Priority Repair Policy for Service Parts Supply Chain
Aghil REZAEI SOMARIN[1], Sobhan ASIAN[2], Songlin CHEN[1]
[1]*Nanyang Technological University, Singapore*
[2]*RMIT University, Australia*

IEEM16-P-0651
Reverse Logistics Service Provider Selection: A TOPSIS-QFD Approach
Vipul JAIN[1], Sharfuddin Ahmed KHAN[2]
[1]*Victoria University of Wellington, New Zealand*
[2]*University of Sharjah, United Arab Emirates*

IEEM16-P-0280
Integrated Methodology for Supplier Selection in Supply Chain Management
Naveen JAIN[1], Amit Raj SINGH[1], Akhilesh CHOUDHARY[2]
[1]*National Institute of Technology, India*
[2]*Indian Institute of Information Technology, Design & Manufacturing Jabalpur, India*

IEEM16-P-0307
Supply Chain Management Framework Development for New Multiple Life Cycle Product Development
Mohamad Fariz MOHAMED NASIR, Abd Rahman ABDUL RAHIM, Halim Shah HAMZAH
Universiti Teknologi Malaysia, Malaysia

IEEM16-P-0498
Assessing the Effectiveness of Diesel and Petrol Supply Chain: A Case of Namibia
Tupomukumo IYAMBO[1], Michael MUTINGI[2], Charles MBOHWA[3]
[1]*Ministry of Mines and Energy, Namibia*
[2]*Namibia University of Science and Technology, Namibia*
[3]*University of Johannesburg, South Africa*

Quality Control and Management 2

6/12/2016 09:00 - 10:30
Room: Mengwi 5

Chairs: Ville ISOHERRANEN, *University of Oulu*
Zhiqiang CAI, *Northwestern Polytechnical University*

Abstracts: see page 69

IEEM16-P-0511
Application of Quality Function Deployment to Improve Smart Services Applications, Dubai Public Entity as a Case Study
O. A. L. ZAWATI, Fikri DWEIRI
University of Sharjah, United Arab Emirates

IEEM16-P-0515
Acceptance Sampling Plans Based on Truncated Life Test for the Generalized Weibull Model
Shovan CHOWDHURY
Indian Institute of Management, Kozhikode, India

IEEM16-P-0672
Heteroscedastic Linear Model Based Reliability Evaluation for Solar Cell Degradation Testing
Zhidong SHENG[1], Rui LIANG[2]
[1]*University of Science and Technology of China, China*
[2]*Chinese Academy of Sciences, China*

IEEM16-P-0649
Integrating Lean Six Sigma with ISO 9001:2015
Pedro Alexandre MARQUES[1], Paulo MEYRELLES[1], Pedro SARAIVA[2], Francisco FRAZÃO GUERREIRO[1]
[1]*ISQ – Institute for Technology and Quality, Portugal*
[2]*University of Coimbra, Portugal*

IEEM16-P-0546
Refining of Heat Treatment Process Parameters on Large Cup-Type SAE4140 Alloy
Pai-Chung TSENG, Y. C. TENG, P. SAWADOGO
National Chung Hsing University, Taiwan

Manufacturing Systems 1

6/12/2016 09:00 - 10:30
Room: Mengwi 6

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

Abstracts: see page 70

IEEM16-P-0628
A Method to Generate Lattice Structure for Additive Manufacturing
Dinh Son NGUYEN[1], Frederic VIGNAT[2]
[1]*The University of Danang, Viet Nam*
[2]*University of Grenoble Aples, France*

IEEM16-P-0464
Make or Buy Analysis Model in a Multi-Stage Manufacturing Processes
Cucuk Nur ROSYIDI[1], Mega Aria PRATAMA[1], Wakhid Ahmad JAUHARI[1], Bambang SUHARDI[1], Kunihiro HAMADA[2]
[1]*Sebelas Maret University, Indonesia*
[2]*Hiroshima University, Japan*

IEEM16-P-0481
aA Fuzzy Logic Expert System for the Automated Generation of Roadmaps for Automated Guided Vehicle Systems
Sarah UTTENDORF[1], Björn EILERT[1], Ludger OVERMEYER[2]
[1]*University of Hanover, Germany*
[2]*Leibniz University Hanover, Germany*

IEEM16-P-0045
Influencing Factors on Goal Achievement in Teamwork of Production Teams
Robert STRANZENBACH, Susanne MÜTZE-NIEWÖHNER, Philipp M. PRZYBYSZ, Christopher M. SCHLICK
RWTH Aachen University, Germany

IEEM16-P-0231
Heuristics for Minimizing the Total Tardiness in a Re-Entrant Hybrid Flow Shop With Non-Identical Machines in Parallel
Xiang Yi ZHANG, Lu CHEN
Shanghai Jiao Tong University, China

IEEM16-P-0629
Machine and Production Scheduling Under Electricity Time Varying Prices
MohammadMohsen AGHELINEJAD, Yassine OUAZENE, Alice YALAOUI
Universit´e de Technologie de Troyes, France

Decision Analysis and Methods 2

6/12/2016 *09:00 - 10:30*
Room: Mengwi 7

Chairs: *Charles MBOHWA, University of Johannesburg*
Egon MUELLER, *Chemnitz University of Technology*

Abstracts: see page 71

IEEM16-P-0265
The Choice of a Collaboration Form - A Special Insight in the Case of R&D Consortia
Xiao-Li CHEN, Christina HESSE, Ralph RIEDEL, Egon MÜLLER
Chemnitz University of Technology, Germany

IEEM16-P-0341
Biogas Use as Fuel in Spark Ignition Engines
Temitope KUKOYI[1], Edison MUZENDA[1], Esther AKINLABI[1], Able MASHAMBA[1], Charles MBOHWA[1], Thabo MAHLATSI[2]
[1]*University of Johannesburg, South Africa*
[2]*City of Johannesburg, South Africa*

IEEM16-P-0183
A Weighted Preference Graph Approach to Analyze Incomplete Customer Preference Information in QFD Product Planning
Pai ZHENG, Xun XU, Shane XIE
The University of Auckland, New Zealand

IEEM16-P-0432
Generating Decision Rules for Flexible Capacity Expansion to Achieve Better Lifecycle Performance
Junfei HU[1], Peng GUO[1], Kim Leng POH[2], Linbo LUO[3]
[1]*Northwestern Polytechnical University, China*
[2]*National University of Singapore, Singapore*
[3]*Xidian University, China*

IEEM16-P-0674
A Model of the N-Player Multiple Period Bargaining Game with Equal Discounting Rate
Pongsakorn NIMNUAL, Naraphorn PAOPRASERT
Kasetsart University, Thailand

IEEM16-P-0412
Performance Comparison of Two Truth Telling Incentive Mechanisms: An Experimental Method
Min YANG[1], Caijia JIA[1], Zhuwei WANG[2]
[1]*Beihang University, China*
[2]*University of Science and Technology, China*

IEEM16-P-0680
POLCA Simulation Game for Job Shop
Whee Ching HOW, Kuan Eng CHONG
University of Technical Malaysia Malacca, Malaysia

Project Management 1

6/12/2016 09:00 - 10:30
Room: Mengwi 8

Chairs: Budi HARTONO, *Universitas Gadjah Mada*
Mauro MANCINI, *Politecnico Di Milano*

Abstracts: see page 72

IEEM16-P-0263
Knowledge Management Maturity and Firm's Performance: Firm's Size as a Moderating Variable
Budi HARTONO[1], Nurul INDARTI[2], Kah-Hin CHAI[3], Sinta SULISTYO[2]
[1]*Gadjah Mada University, Indonesia*
[2]*Universitas Gadjah Mada, Indonesia*
[3]*National University of Singapore, Singapore*

IEEM16-P-0334
Guidelines for Building Information Modeling (BIM) Performance Improvement in the EPC industry
Andrea BOTTARI, Gabriele IOUDIOUX, Mauro MANCINI, Agnese TRAVAGLINI
Politecnico di Milano, Italy

IEEM16-P-0399
Predicting the Effect of Wastes on Project Cost Using Multiple Linear Regressions
Khanh HA DUY[1], Kim SOO YONG[2]
[1]*Ho Chi Minh City University of Technology and Education, Viet Nam*
[2]*Pukyong National University, South Korea*

IEEM16-P-0268
Structuring Highly Iterative Product Development Projects by Using HIP-Indicators
Günther SCHUH, Michael RIESENER, Frederic DIELS
RWTH Aachen University, Germany

IEEM16-P-0506
Project Success Factors: The Opinion of Facilities Managers
Edoghogho OGBEIFUN, Charles MBOHWA, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

IEEM16-P-0483
Performance Metrics in Engineering Change Management - Key Performance Indicators and Engineering Change Performance Levels
Niklas KATTNER, Tianyi WANG, Udo LINDEMANN
Technical University of Munich, Germany

Facilities Planning and Management

6/12/2016 09:00 - 10:30
Room: VIP Room

Chairs: Ali SIADAT, *Arts et Metiers ParisTech*
Shin-Guang CHEN, *Tungnan University*

Abstracts: see page 73

IEEM16-P-0281
Performance Enhancing in the Manufacturing Industry: An Improvement KATA Application
Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[2], Dorota STADNICKA[3], Rui SOUSA[1], J. Ville ISOHERRANEN[4], Maneesh KUMAR[5]
[1]*University of Minho, Portugal*
[2]*University of Stavanger, Norway*
[3]*Rzeszow University of Technology, Poland*
[4]*University of Oulu, Finland*
[5]*Cardiff University, United Kingdom*

IEEM16-P-0217
Optimal Re-Arrangement in Fast Enumeration for Integer Programming Problems
Shin-Guang CHEN
Tungnan University, Taiwan

IEEM16-P-0088
Assessing E-Waste Recycling Programs by Developing Preference Selection Index Under Interval Type-2 Fuzzy Uncertainty
V. MOHAGHEGHI[1], S. M. MOUSAVI[1], Ali SIADAT[2]
[1]*Shahed University, Iran*
[2]*Arts et Métiers ParisTech, France*

IEEM16-P-0492
Overall Reliability Index Development for Railway Infrastructure and Rolling Stock with Case Study
Fuqing YUAN
University of Tromsø, Norway

IEEM16-P-0547
Complementing a Delphi Exercise with a Focus Group Session
Edoghogho OGBEIFUN, Charles MBOHWA, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

IEEM16-P-0248
Research on Incentive Policies of Medical Information Sharing of Medical Consortium in China Based on the Principal-Agent Theory
Qiang ZHANG, Liya WANG, Jinze CHAI, Donghao PEI, Zhibin JIANG
Shanghai Jiao Tong University, China

Reliability and Maintenance Engineering 3

6/12/2016 09:00 - 10:30
Room: Pecatu 1

Chairs: Anisur RAHMAN, *Griffith University*
Yoshinobu TAMURA, *Yamaguchi University*

Abstracts: see page 74

IEEM16-P-0355
Evaluation of Customer's Risk to Lifetime Warranty
Anisur RAHMAN
Griffith University, Australia

IEEM16-P-0529
Comparison of Big Data Analyses for Reliable Open Source Software
Yoshinobu TAMURA[1], Shigeru YAMADA[2]
[1]*Yamaguchi University, Japan*
[2]*Tottori University, Japan*

IEEM16-P-0301
Kinetic Reliability Analysis of Space Four-Links Mechanism Considering Wear
Yu SHI, Bifeng SONG, Tianxiang YU, Yugang ZHANG
Northwestern Polytechnical University, China

IEEM16-P-0522
Decision-Support Approach for Selecting the Suitable Maintenance Policy
Nasser Youssouf MAHAMOUD[1], Pierre DEHOMBREUX[1], Marc PIRLOT[1], Hassan ELMI ROBLE[2]
[1]*University of Mons, Belgium*
[2]*Research Center of the University of Djibouti (CRUD), Djibouti*

IEEM16-P-0676
A Quantitative Study on the Impact of Opportunistic Maintenance in the Presence of Time-Varying Costs
Huy TRUONG BA, Michael E. CHOLETTE, Pietro BORGHESANI, Lin MA
Queensland University of Technology, Australia

IEEM16-P-0586
Time Series of Multivariate Zero-inflated Poisson Counts
Chen ZHANG[1], Nan CHEN[1], Linmiao ZHANG[2]
[1]*National University of Singapore, Singapore*
[2]*Micron Technology, Singapore*

IEEM16-P-0444
A Fuzzy Logic Based Approach for Deciding the Corrective Action to Minimize Vibration Induced Fatigue Damage on Offshore Pipework
Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Information Processing and Engineering

6/12/2016 09:00 - 10:30
Room: Pecatu 2

Chairs: Juergen ZIMMERMANN, *Clausthal University of Technology*
SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*

Abstracts: see page 75

IEEM16-P-0122
Hybrid Methods of Particle Swarm Optimization and Spatial Credibilistic Clustering with a Clustering Factor for Image Segmentation
Peihan WEN, Dongqun ZHOU, Meng Jie WU, Shuping YI
Chongqing University, China

IEEM16-P-0373
Information Processing and Knowledge Discovery Framework for Sustainable Building Environment Using Multiple Sensor Network
S.C. Johnson LIM, Safullizam PUTEH, Kai Chen GOH
Universiti Tun Hussein Onn Malaysia, Malaysia

IEEM16-P-0184
An Explorative Study on Management and Maintenance of Systems for Design and Manufacture of Customized Products
Morteza POORKIANY, Joel JOHANSSON, Fredrik ELGH
Jönköping University, Sweden

IEEM16-P-0349
Determining the Relationship Between Psychological and Physiological Measurements of Human Trust Using Rough Set Analysis
Wei Shiung LIEW[1], Halimahtun MOHD KHALID[2], Parham NOORALISHAHI[1], Zeeshan RASOOL[1], Chu Kiong LOO[1], Martin HELANDER[2]
[1]*University of Malaya, Malaysia*
[2]*Damai Sciences, Malaysia*

IEEM16-P-0463
SPSA-Based PID Parameters Optimization for a Dual-Tank Liquid-Level Control System
Xiangsong KONG, Lingwu QIAN, Ziyan WANG
Xiamen University of Technology, China

IEEM16-P-0189
A Disassmbly Complexity Assessment Method for Sustainable Product Design
Samyeon KIM[1], Seung Ki MOON[1], Su Min JEON[2], Hyung Sool OH[3]
[1]*Nanyang Technological University, Singapore*
[2]*Advanced Remanufacturing and Technology Centre, Singapore*
[3]*Kangwon National University, South Korea*

IEEM16-P-0310
Factors That Drive Purchasing Performance in Engineering Procurement and Construction Companies
Gitesh CHAVAN, Ranjan CHAUDHURI
National Institute of Industrial Engineering (NITIE), India

Technology and Knowledge Management 3

6/12/2016 11:00 - 12:30
Room: Mengwi 1

Chairs: Nurul INDARTI, *Universitas Gadjah Mada*
Weng Marc LIM, *Swinburne University of Technology*

Abstracts: see page 76

IEEM16-P-0276
Types of Knowledge Transferred in Family Business Succession
Nurul INDARTI[1], Gabriella Hanny KUSUMA[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Universitas Atma Jaya Yogyakarta, Indonesia*

IEEM16-P-0379
Experience Reuse to Improve Agility in Knowledge-Driven Industrial Processes
Valentina Maria LLAMAS[1], Thierry COUDERT[2], Laurent GENESTE[2], Juan Camilo ROMERO BEJARANO[3], Aymeric DE VALROGER[3]
[1]*University of Toulouse, France*
[2]*University of Toulouse, France, Metropolitan*
[3]*Axsens bte, France*

IEEM16-P-0401
Research on Knowledge Push Method for Business Process Based on Multidimensional Hierarchical Context Model
Faping ZHANG, Li LI
Beijing Institute of Technology, China

IEEM16-P-0456
Study on Main Delivery Actors in Technology Delivery System (TDS) Based on Multi-Data Sources
Ying GUO, Ganlu SUN, Ying HUANG, Yun FU, Yue QIAN
Beijing Institute of Technology, China

IEEM16-P-0361
Does Innovation Promote Exports? Evidence from Chinese Manufacturing Firms
Ke JI, Jianwei DANG, Kazumitsu NAWATA
The University of Tokyo, Japan

IEEM16-P-0495
Product Configuration System and its Impact on Product's Life Cycle Complexity
Anna MYRODIA, Katrin KRISTJANSDOTTIR, Sara SHAFIEE, Lars HVAM
Technical University of Denmark, Denmark

IEEM16-P-0270
Implementation of Lean Knowledge Work in Oil and Gas Industry - A Case Study from a Risk-Based Inspection Project
Andika RACHMAN, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Operations Research 4

6/12/2016 11:00 - 12:30
Room: Mengwi 2

Chairs: Lionel AMODEO, *Universite de Technologie de Troyes*
Charles MBOHWA, *University of Johannesburg*

Abstracts: see page 77

IEEM16-P-0642
Efficient Metaheuristic for Multi-Product Disassembly Lot Sizing Problem with Lost Sales
Mustapha HROUGA, Matthieu GODICHAUD, Lionel AMODEO
University of Technology of Troyes, France

IEEM16-P-0264
An Application of Microsoft Excel's Evolutionary Solver Based on a Novel Chromosome Encoding Scheme to the 1/N Portfolio Tracking Problem
Oliver STRUB, Norbert TRAUTMANN
University of Bern, Switzerland

IEEM16-P-0285
Makespan Minimization in Aircraft Landing Problem Under Congested Traffic Situation Using Modified Artificial Bee Colony Algorithm
Kam Hung NG, Carman Ka Man LEE
The Hong Kong Polytechnic University, Hong Kong SAR

IEEM16-P-0272
The Resource Transfer Problem: Modeling and Solving Integrated Scheduling and Routing Problems
Illa WEISS, Christoph SCHWINDT
Clausthal University of Technology, Germany

IEEM16-P-0292
U-shaped Line Balancing Model with an Uncertainty Time on some Tasks
Suthep VARNASILPIN, R. MASUCHUN
King Mongkut's Institute of Technology Ladkrabang, Thailand

IEEM16-P-0411
Joint Financing Strategy for a Cash-Constrained Supply Chain
Jinjin ZHANG[1], Ting NIE[1], Junzhe HUANG[2], Yan CHEN[1]
[1]*Macau University of Science and Technology, China*
[2]*Ping An Insurance (Group) Company, China*

Supply Chain Management 4

6/12/2016 11:00 - 12:30
Room: Mengwi 3

Chairs: Jayendran VENKATESWARAN, *Indian Institute of Technology Bombay*
Alireza FARAZ, *University of Applied Sciences Upper Austria*

Abstracts: see page 78

IEEM16-P-0641
Empirical Studies of New Product Diffusion Under Uncertainty
Jayendran VENKATESWARAN, Siddhartha PAUL, R. VIDYADHAR, Chetan Singh SOLANKI, N.C. NARAYANAN
Indian Institute of Technology Bombay, India

IEEM16-P-0308
Make Sure You Understood Your Strategic Partner in Your Buyer-Supplier Relationship
Alireza FARAZ[1], Zach ZACHARIA[2], Markus GERSCHBERGER[1]
[1]*University of Applied Sciences Upper Austria, Austria*
[2]*Lehigh University, United States*

IEEM16-P-0333
Development of Risk Assessment Model for Farmers in Tomato Supply Chain
Gowri RAJAGOPAL, Malliga POOSANDARAM, R. KALA
Anna University, India

IEEM16-P-0602
Game Theoretical Analysis of Supply Chain Configurations
Soh SAKURAI, Tatsushi NISHI
Osaka University, Japan

IEEM16-P-0015
Relating Supply Chain Integration with the Culture and Strategy of its Constitutent Members: A Theoretical Framework
Dhan SINGH, R R K. SHARMA
Indian Institute of Technology Kanpur, India

IEEM16-P-0661
Maturity Model For Supply Chain Collaboration: CMMI Approach
Thi Phuong Dung HO, Arun KUMAR, Nirajan SHIWAKOTI
RMIT University, Australia

IEEM16-P-0455
Estimating the On-Time Probability for Vendor Selection Problem
B. Ashish KUMAR[1], Parthasarathy RAMACHANDRAN[1], Girish MODGIL[2]
[1]*Indian Institute of Science Bangalore, India*
[2]*GE Power Services, United States*

Production Planning and Control 1

6/12/2016 11:00 - 12:30
Room: Mengwi 5

Chairs: Laith HADIDI, *King Fahd University of Petroleum and Minerals*
Vipul JAIN, *Victoria University of Wellington*

Abstracts: see page 79

IEEM16-P-0233
Solving the Scheduling Problem of Machines with Auxiliary Tools
Ya-Chu YANG, Yu-Ting LIN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

IEEM16-P-0234
Solving Cutting Scheduling Problem by Simulated Annealing Search Method
Kuan-Ting TUNG, Chih-Yu CHEN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

IEEM16-P-0236
Testing Multiple Threads Tabu Search by Solving Scheduling Problems
Shuo-Cheng SHUN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

IEEM16-P-0241
Comparisons of Three Mixed Integer Programming Models for Parallel Machine Scheduling
Shan-Hao YU, Yi-Feng HUNG
National Tsing Hua University, Taiwan

IEEM16-P-0254
Modeling Fabric Cutting Scheduling as Mixed Integer Programming
To-Ju WANG, Jia-Ying PENG, Yi-Feng HUNG
National Tsing Hua University, Taiwan

IEEM16-P-0328
Integration Aggregate Production Planning and Maintenance Using Mixed Integer Linear Programming
M. ERFANIAN, Mohammadali PIRAYESH
Ferdowsi University of Mashhad, Iran

IEEM16-P-0658
Production Planning for Customer Innovated Products
Johannes ATUG, Andreas HEES, Marcel WAGNER, Stefan BRAUNREUTHER, Gunther REINHART
Fraunhofer IWU, Germany

Manufacturing Systems 2

6/12/2016 11:00 - 12:30
Room: Mengwi 6

Chairs: Sirichai TORSAKUL, *Rajamangala University of Technology Thanyaburi*
Junfeng WANG, *Huazhong University of Science and Technology*

Abstracts: see page 80

IEEM16-P-0368
A Finite Element Simulation for Shape Influences of the Drawbead on the Non-Symmetrical Deep Drawing Process
Sirichai TORSAKUL[1], Alexander BREZING[2]
[1]*Rajamangala University of Technology, Thailand*
[2]*King Mongkut's University of Technologz North Bangkok, Thailand*

IEEM16-P-0074
Active Energy Saving Strategy for Sensible Manufacturing Systems Operation Based on Real Time Production Status
Junfeng WANG[1], Jin XUE[1], Yi FENG[1], Shiqi LI[1], Yan FU[1], Qing CHANG[2]
[1]*Huazhong University of Science and Technology, China*
[2]*Stony Brook University, United States*

IEEM16-P-0227
External Buildings Retrofit: Employing Guillotine Cuts for Aesthetic Envelopes
Andres Felipe BARCO, Michel ALDANONDO, Elise VAREILLES, Paul GABORIT
University of Toulouse, France, Metropolitan

IEEM16-P-0208
A Hybrid Discrete Cuckoo Search Algorithm for Cell Formation Problem with Alternative Process Routings and Operation Sequence
Hao HUANG, Hanxin FENG, Ershun PAN, Lifeng XI
Shanghai Jiao Tong University, China

IEEM16-P-0449
Non-Cyclic Scheduling of Dual-Armed Cluster Tools for Bi-Objective Minimization of Wafer Residence Time and Makespan
Masaru SAKAI, Tatsushi NISHI
Osaka University, Japan

IEEM16-P-0513
Internet of Things Value for Mechanical Engineers and Evolving Commercial Product Lifecycle Management System
Satoshi GOTO, Osamu YOSHIE, Shigeru FUJIMURA
Waseda University, Japan

IEEM16-P-0247
Variation of Elastic Modulus During Cold Drawing of Seamless Tubes and it's Influence on Springback
Dada KARANJULE[1], Sunil BHAMARE[2], Thota RAO[3]
[1]*Sinhgad College of Engineering, India*
[2]*Maharashtra State Board of Technical Education, India*
[3]*Indian Seamless Metal Tubes Limited, India*

Decision Analysis and Methods 3

6/12/2016 11:00 - 12:30
Room: Mengwi 7

Chairs: Ali SIADAT, *Arts et Metiers ParisTech*
Mauro MANCINI, *Politecnico Di Milano*

Abstracts: see page 81

IEEM16-P-0585
Multi-Criteria Performance Management Methodology for Decision Support in Industrial Project Selection Problems
Fan LI[1], Alain ETIENNE[1], François VERNADAT[2], Ali SIADAT[1]
[1]*Arts et Métiers ParisTech, France*
[2]*University of Lorraine, France*

IEEM16-P-0336
A Real Options Investment Model for the Evaluation of Wind and Photovoltaic Plants
Mauro MANCINI[1], Roberto SALA[2], Daniele TEDESCO[3], Agnese TRAVAGLINI[1]
[1]*Politecnico di Milano, Italy*
[2]*University of Bergamo, Italy*
[3]*BMW Group, Italy*

IEEM16-P-0610
Conflict Analysis in Redevelopment of Brownfield Caused by Contingency: Tianjin Port "8•12" Explosion Hazard, in China
Xia LI, Yuming ZHU, Yumeng SHI
Northwestern Polytechnical University, China

IEEM16-P-0606
Theory of Inventive Problem Solving (TRIZ) Based Contradiction Resolution Strategies for Shaanxi Aviation Industrial Upgrading
Wenqi YAN, Yuming ZHU, Naveed AHMAD
Northwestern Polytechnical University, China

IEEM16-P-0012
About the Computation of Robust PROMETHEE II Rankings: Empirical Evidence
Yves DE SMET
Université libre de Bruxelles, Belgium

IEEM16-P-0652
Simultaneous Barrel Cutter Design and Tool Path Planning in 5-Axis Machining of Freeform Surfaces
Chih-Hsing CHU
National Tsing Hua University, Taiwan

IEEM16-P-0370
Risk Perception, Risk Propensity, and Unsafe Behavior: An Empirical Study of Workers in Chinese Construction Industry
Yiping HUANG, Xueqing WANG, Ruxi DING, Nini XIA
Tianjin University, China

Project Management 2

6/12/2016 11:00 - 12:30
Room: Mengwi 8

Chairs: Jan Harm PRETORIUS, *University of Johannesburg*

Abstracts: see page 82

IEEM16-P-0340
Investigating the Effects of Replacing the Project Manager During Project Execution
James DUBBER, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

IEEM16-P-0031
Multistakeholder Engagement in the Face of Stakeholder Adversities Among Globally Distributed ICT Projects - A Conceptual Model and a Research Agenda
Krishnan MYSORE, Abbas ELMUALIM, Konstantinos KIRYTOPOULOS
University of South Australia, Australia

IEEM16-P-0315
An MIP-Based Heuristic for Scheduling Projects with Work-Content Constraints
Adrian ZIMMERMANN
University of Bern, Switzerland

IEEM16-P-0321
Process Maturity Models for the Development of Mechatronic Products
Christoph HOLLAUER, Lennart HORNAUER, Udo LINDEMANN
Technical University of Munich, Germany

IEEM16-P-0273
The Key Drivers of Sustainability
Hosein DANESHPOUR, Josu TAKALA
University of Vaasa, Finland

IEEM16-P-0403
Success by Efficient Resource Planning in a Project Based Environment
Mandy THURM, Ralph RIEDEL, Egon MÜLLER
Chemnitz University of Technology, Germany

IEEM16-P-0578
Methods Collection to Support Requirements Engineering with Focus on Structuring and Consolidation of Requirements
Dominik WEIDMANN, Niklas KATTNER, Christoph HOLLAUER, Lucia BECERRIL N CHUCHOLOWSKI, Udo LINDEMANN
Technical University of Munich, Germany

Big Data and Analytics

6/12/2016 11:00 - 12:30
Room: VIP Room

Chairs: Selina NG, *Adam Science Technology and Research International*
Philipp BAUMANN, *University of Bern*

Abstracts: see page 83

IEEM16-P-0085
An Independent Study of Two Deep Learning Platforms – H2O and SINGA
Selina NG, Wei ZHU, Wilson TANG, Louis WAN, Andrew WAT
Hong Kong Applied Science and Technology Research Institute (ASTRI), Hong Kong SAR

IEEM16-P-0320
Sparse-Reduced Computation for Large-Scale Spectral Clustering
Philipp BAUMANN
University of Bern, Switzerland

IEEM16-P-0108
A New Area Linearization Method for Unequal Area Facility Layout Problem
Yue XIE, Shenghan ZHOU, Yiyong XIAO, Wenbing CHANG
Beihang University, China

IEEM16-P-0037
Evaluation of Air Traffic Management System Using a Hybrid Model
Yuefei MA, Xiaoyue WU
National University of Defense Technology, China

IEEM16-P-0152
Vessel Speed Analytics Using Satellite-Based Ship Position Data
Roar ADLAND, Haiying JIA
Norwegian School of Economics, Norway

IEEM16-P-0028
Redesign of Thresher Machine for Farmers Using Rapid Upper Limb Assessment (RULA) Method
Nilda Tri PUTRI, Lusi SUSANTI, Anugrah TITO, Agus SUTANTO
Andalas University, Indonesia

IEEM16-P-0086
Parameter Estimation for Load-Sharing Systems with Degrading Components
Bin LIU, Jianyu XU, Xiujie ZHAO
City University of Hong Kong, Hong Kong SAR

Reliability and Maintenance Engineering 4

6/12/2016 11:00 - 12:30
Room: Pecatu 1

Chairs: Peihan WEN, *Chongqing University*
Seung Ki MOON, *Nanyang Technological University*

Abstracts: see page 84

IEEM16-P-0013
Reliability Analysis Method of Phased-Mission Nuclear Power Equipment Based on Goal Oriented Methodology
Huina MU[1], Jianwen LIU[2], Mingchao LU[2], Jianfeng CHEN[2], Xiaojian YI[1]
[1]*Beijing Institute of Technology, China*
[2]*Shanghai Nuclear Engineering Research & Design Institute, China*

IEEM16-P-0141
Machinery Classification and Prioritization: Empirical Models and AHP Based Approach for Effective Preventive Maintenance
Katarzyna ANTOSZ[1], R.M. Chandima RATNAYAKE[2]
[1]*Rzeszow University of Technology, Poland*
[2]*University of Stavanger, Norway*

IEEM16-P-0059
A Partitioning Method of Experimental Levels for Low Failure Probability Estimation Problems
Kunling SONG, Yugang ZHANG, Xinshui YU, Bifeng SONG
Northwestern Polytechnical University, China

IEEM16-P-0042
Reliability Analysis of Rubber O-rings Used in the Rockets
Li SUN[1], Xiaohui GU[1], Lei FENG[2], Yi DI[1]
[1]*Nanjing University of Science and Technology, China*
[2]*Navy Military Representative Office of Missile Equipment in Chongqing Area, China*

IEEM16-P-0278
Joint Optimization of Degradation-Based Burn-in, Quality, and Preventive Maintenance
Zhen CHEN, Yapin LI, Ershun PAN
Shanghai Jiao Tong University, China

IEEM16-P-0381
Critical Success Factors for Developing Building Maintenance Strategies: A Case of Namibia
Michael MUTINGI[1], Rudolf KALUMBU[1], Charles MBOHWA[2]
[1]*Namibia University of Science and Technology, Namibia*
[2]*University of Johannesburg, South Africa*

IEEM16-P-0615
Selecting a Modeling Approach for Predicting Remnant Fatigue Life of Offshore Topside Piping
Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Technology and Knowledge Management 4

6/12/2016 13:30 - 15:00
Room: Mengwi 1

Chairs: Yang Yang ZHAO, *Norwegian Institute of Systems Engineering*
Chong GUAN, *SIM University*

Abstracts: see page 86

IEEM16-P-0282
Knowledge Societies and Their Role in Sustainable Development
Ambica DATTAKUMAR[1], Guan CHONG[2], Lin MALONE[1], Ravi S. SHARMA[1], Jesus Felix VALENZUELA[3]
[1]*Nanyang Technological University, Singapore*
[2]*SIM University, Singapore*
[3]*Agency for Science, Technology and Research, Singapore*

IEEM16-P-0226
Knowledge Roadmap Across Design and Engineering: An User-centric Didactic Approach
Arne Kjetil RUGAAS, Yang Yang ZHAO
University College of Southeast Norway, Norway

IEEM16-P-0687
On the Estimation of Hospital Beds Occupancy After Hip Surgery
Sergio SOUSA, Cristina RODRIGUES, Eusebio NUNES
University of Minho, Portugal

IEEM16-P-0663
Customization of the CAD Software in a Typical Drawing Office for a Power and Electricity Distribution Company in Zimbabwe
Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

IEEM16-P-0684
Process Improvement and Utilization of Machines in the Production Area of a Shoe Manufacturing Company
Ma. Carole MARCELO, Gerlie AVILA, Monti CRUZ, Baldwin PRADO, M. M. NAVARRO
Technological Institute of the Philippines, Philippines

IEEM16-P-0332
A Robust Design Based Methodology for Investigation of Optimal Parameters' Combination in Ultrasonic Assisted Face Grinding
Roman WDOWIK[1], R.M. Chandima RATNAYAKE[2]
[1]*Rzeszow University of Technology, Poland*
[2]*University of Stavanger, Norway*

Operations Research 5

6/12/2016 13:30 - 15:00
Room: Mengwi 2

Chairs: Lionel AMODEO, *Universite de Technologie de Troyes*
Ahmed EL-BOURI, *Sultan Qaboos University*

Abstracts: see page 87

IEEM16-P-0172
A Hybrid Supplier Selection Model Considering Non-Homogeneous Group Decision Makers
Tuan Son NGUYEN, Sherif MOHAMED, Anisur RAHMAN
Griffith University, Australia

IEEM16-P-0421
A Score-Based Dispatching Rule for Job Shop Scheduling
Ahmed W. EL-BOURI
Sultan Qaboos University, Oman

IEEM16-P-0465
Maintenance Optimization Considering Winterization Problem for the Power Supply System of Railway in Norway
Fuqing YUAN
University of Tromsø, Norway

IEEM16-P-0671
A Linear Programming Based Iterative Heuristic for the Recreational Vehicle Scheduling Problem
Sarang KULKARNI[1], Andreas ERNST[2], Abhiram RANADE[1], Mohan KRISHNAMOORTHY[2]
[1]*Indian Institute of Technology Bombay, India*
[2]*Monash University, Australia*

IEEM16-P-0668
The One-Shot Decision Theory Based Production Planning Models
Xide ZHU, Peijun GUO
Yokohama National University, Japan

IEEM16-P-0701
Analysis of Visual Representation Techniques for Product Configuration Systems in Industrial Companies
Sara SHAFIEE[1], Katrin KRISTJANSDOTTIR[1], Lars HVAM[1], Alexander FELFERNIG[2], Anna MYRODIA[1]
[1]*Technical University of Denmark, Denmark*
[2]*Graz University of Technology, Austria*

Supply Chain Management 5

6/12/2016 13:30 - 15:00
Room: Mengwi 3

Chairs: TMA ARISAMADHI, *Bandung Institute of Technology*
Yan CHEN, *Macau University of Science and Technology*

Abstracts: see page 88

IEEM16-P-0348
Inter-Organizational Trust and Knowledge Sharing Model Between Manufacturer and Supplier in the Automotive Industry
Fadillah RAMADHAN, T. M. A. ARISAMADHI
Bandung Institute of Technology, Indonesia

IEEM16-P-0428
Modeling and Evaluation of Overbooking Rules for Primary Health Care Clinic with Different Patient Behavior
Ping FAN[1], D. FAN[2], Yong-Hong KUO[3], Yan CHEN[2]
[1]*Zhuhai College of Jilin University, China*
[2]*Macau University of Science and Technology, China*
[3]*The Chinese University of Hong Kong, China*

IEEM16-P-0446
Integrated Versus Non-Integrated Perspectives of Auditors Concerning the New ISO 9001 Revision
J. Pedro DOMINGUES[1], Luis FONSECA[2], Paulo SAMPAIO[1], Pedro AREZES[1]
[1]*University of Minho, Portugal*
[2]*Polytechnic Institute of Porto, Portugal*

IEEM16-P-0644
Fuzzy-AHP Approach for Warehouse Performance Measurement
Sharfuddin Ahmed KHAN[1], Fikri DWEIRI[1], Amin CHAABANE[2]
[1]*University of Sharjah, United Arab Emirates*
[2]*École de Technologie Supérieure (ETS), Canada*

IEEM16-P-0667
Statistical Process Control Automation in the Final Inspection Process: An Industrial Case Study
Liliana GUERRA, Sergio SOUSA, Eusebio NUNES
University of Minho, Portugal

Production Planning and Control 2

6/12/2016 13:30 - 15:00
Room: Mengwi 5

Chairs: Laith HADIDI, *King Fahd University of Petroleum and Minerals*
Seung Ki MOON, *Nanyang Technological University*

Abstracts: see page 89

IEEM16-P-0043
An Optimization Model Integrated Production Scheduling and Preventive Maintenance for Group Production
Wenzhu LIAO, Xiufang ZHANG, Min JIANG
Chongqing University, China

IEEM16-P-0157
Reducing Schedule Nervousness in Production and Operations Under Non-Stationary Stochastic Demand: The Case of an Airline Catering Company
Narat HASACHOO, Ruedee MASUCHUN
King Mongkut's Institute of Technology Ladkrabang, Thailand

IEEM16-P-0054
Joint Optimization of Flowshop Sequence-Dependent Manufacturing Cell Scheduling and Preventive Maintenance
Hanxin FENG, Wen DA, Hao HUANG, Lifeng XI, Ershun PAN
Shanghai Jiao Tong University, China

IEEM16-P-0209
Integrated Preventive Maintenance and Production Scheduling Optimization on Uniform Parallel Machines with Deterioration Effect
Wen DA, Hanxin FENG, Ershun PAN
Shanghai Jiao Tong University, China

IEEM16-P-0288
The Planning and Documentation Problem of Emergent Changes
Peter SJÖGREN[1], Johannes HECK[2]
[1]*Mälardalen University, Sweden*
[2]*Swiss Federal Institute of Technology in Zurich (ETH Zurich), Switzerland*

IEEM16-P-0612
Investigating Production Planning and Control Challenges in the Semi-Process Industry, the Case of a Metal Parts Producer
Philipp SPENHOFF[1], Marco SEMINI[1], Daryl POWELL[2]
[1]*Norwegian University of Science and Technology, Norway*
[2]*University of Groningen, Netherlands*

Manufacturing Systems 3

6/12/2016 13:30 - 15:00
Room: Mengwi 6

Chairs: Avanish Kumar DUBEY, *Motilal Nehru National Institute of Technology Allahabad*
Arnesh TELUKDARIE, *University of Johannesburg*

Abstracts: see page 90

IEEM16-P-0637
MES to ERP Integration: Rapid Deployment Toolset
Arnesh TELUKDARIE
University of Johannesburg, South Africa

IEEM16-P-0026
Intelligent Modeling and Multi-Objective Optimization of Powder Mixed Electrical Discharge Diamond Grinding of MMC
Ashvarya AGRAWAL[1], Avanish Kumar DUBEY[2], Pankaj Kumar SHRIVASTAVA[3]
[1]*Shri Ram Group of Institutions, India*
[2]*Motilal Nehru National Institute of Technology, India*
[3]*AKS University, India*

IEEM16-P-0261
Process Parameters Optimization for Multiple-Inputs-Multiple-Outputs Pulsed Green Laser Welding via Response Surface Methodology
Safwan ALTARAZI[1], Leen HIJAZI[1], Elke KAISER[2]
[1]*German Jordanian University, Jordan*
[2]*TRUMPF Laser Technology, Germany*

IEEM16-P-0431
Inventory Management Models and Their Effects on Uncertain Demand
Ndivhuwo NEMTAJELA[1], Charles MBOHWA[2]
[1]*University of South Africa, South Africa*
[2]*University of Johannesburg, South Africa*

IEEM16-P-0230
Machine Reliability Modelling in Manufacturing: A Continuous-Time State-Dependent Heterogeneous Markov Chain Approach
Na LI[1], Xin YU[1], Mike ZHANG[2]
[1]*Shanghai Jiao Tong University, China*
[2]*Tianwei New Energy Co, Ltd, China*

IEEM16-P-0294
Seru Loading with Worker-Operation Assignment in Single Period
Lan LUO[1], Zhe ZHANG[1], Yong YIN[2]
[1]*Nanjing University of Science and Technology, China*
[2]*Doshisha University, Japan*

Decision Analysis and Methods 4

6/12/2016 13:30 - 15:00
Room: Mengwi 7

Chairs: Kaushik NAG, *American University of the Middle East*
Mangesh GHAROTE, *Tata Consultancy Services*

Abstracts: see page 91

IEEM16-P-0473
A Fuzzy TOPSIS Approach in Multi-Criteria Decision Making for Supplier Selection in a Pharmaceutical Distributor
Kaushik NAG, Magdy HELAL
American University of the Middle East, Kuwait

IEEM16-P-0060
Excellence in Integrating Care into the Product Development Process: A Case Study of Nokia
Jukka MAJAVA, J. Ville ISOHERRANEN
University of Oulu, Finland

IEEM16-P-0605
A Combination Use of Bagging and Random Subspace with Memory Mechanism for Dynamic Financial Distress Prediction
Chong WU, Jiaming LIU
Harbin Institute of Technology, China

IEEM16-P-0318
Collaborative Distribution - Application to the City of Yogyakarta, Indonesia
Anna Maria Sri ASIH, Wandhansari Sekar JATININGRUM, Bertha Maya SOPHA
Gadjah Mada University, Indonesia

IEEM16-P-0146
Minimal Cost Stable Workforce Allocation in Presence of Ties
Mangesh GHAROTE[1], Rahul PATIL[1], Sachin LODHA[2]
[1]*Indian Institute of Technology Bombay, India*
[2]*TATA Consultancy Services, India*

IEEM16-P-0109
Rule-Based Discrete Event Simulation for Optimising Railway Hump Yard Operations
Harshad KHADILKAR, Sudhir Kumar SINHA
Tata Consultancy Services, India

Project Management 3

6/12/2016 13:30 - 15:00
Room: Mengwi 8

Chairs: Reza KIA, *Firoozkooh Branch*

Abstracts: see page 92

IEEM16-P-0588
Solving a Multi-Objective Mathematical Model for a Multi-Skilled Project Scheduling Problem by CPLEX Solver
Reza KIA, Parisa SHAHNAZARI-SHAHREZAEI, Sina ZABIHI
Islamic Azad University, Iran

IEEM16-P-0556
Determinants of On-Going Trust Within a Collaboration
Xiao-Li CHEN, Ralph RIEDEL, Anne GOETZE, Egon MÜLLER
Chemnitz University of Technology, Germany

IEEM16-P-0471
Why Construction Workers' Workplace Deviant Behavior Happens? The Effect of Psychological Ownership
Xing LIU, Xueqing WANG, Nini XIA
Tianjin University, China

IEEM16-P-0482
Scenario Selection Optimization in System Engineering Projects Under Uncertainty: A Multi-Objective Ant Colony Method Based on a Learning Mechanism
Majda LACHHAB[1], Thierry COUDERT[2], Cedrik BÉLER[1]
[1]University of Toulouse, France
[2]University of Toulouse, France, Metropolitan

IEEM16-P-0533
An Approach for Improving Method and Model Application in Engineering Design Processes: Case Study of a German Plant Engineering Company
Christoph HOLLAUER[1], Peter RIEBL[2], L. BECERRIL[1], N. KATTNER[1], D. WEIDMANN[1], N. CHUCHOLOWSKI[1], Karl RUHLAND[2], Karl AMANN[3], Udo LINDEMANN[1]
[1]Technical University of Munich, Germany
[2]BHS Corrugated, Germany
[3]Ostbayrische Technische Hochschule Amberg-Weiden, Germany

IEEM16-P-0115
The Need for Integration Between Organizational Project Management and Change Management
Julien POLLACK
The University of Sydney, Australia

Engineering Economy and Cost Analysis

6/12/2016 *13:30 - 15:00*
Room: VIP Room

Chairs: *Elita AMRINA, Andalas University*
Yves DE SMET, *Université libre de Bruxelles*

Abstracts: see page 93

IEEM16-P-0360
Artificial Neural Networks in Activity Based Costing Optimization
Noppadol AMDEE[1], T. ARUNCHAI[2], K. SONTHIPERMPOON[3], Warawut PHANBOONMEE[4]
[1]Muban Chombueng Rajabhat University, Thailand
[2]Rajamangala University of Technology Suvarnabhumi, Thailand
[3]Naresuan University, Thailand
[4]UK Engineering & Supply Co., Ltd., Thailand

IEEM16-P-0507
Risk Assessment in Costing Systems Using Costing at Risk (CaR): An Application to the Coffee Production Cost
Victor Javier JIMÉNEZ, Paulo AFONSO
University of Minho, Portugal

IEEM16-P-0598
A Risk Addendum for Complex Risky Projects
Pradip K BHAUMIK
International Management Institute, India

IEEM16-P-0725
Supporting Product Platform Decisions with Lifecycle Costing
Sebastian MAISENBACHER, Kristin GOEVERT, Udo LINDEMANN, Markus MÖRTL
Technical University of Munich, Germany

IEEM16-P-0279
Reliability Analysis of Dynamic Reliability Blocks Through Conversion into Dynamic Bayesian Networks
Kanjing LI, Ren YI, Zheng MA
Beihang University, China

IEEM16-P-0158
Simulating Dynamic Vehicle Routing Problem Using Agent-Based Modeling and Simulation
Bertha Maya SOPHA, Afriana SIAGIAN, Anna Maria Sri ASIH
Gadjah Mada University, Indonesia

Reliability and Maintenance Engineering 5

6/12/2016 13:30 - 15:00
Room: Pecatu 1

Chairs: Behzad GHODRATI, *Lulea University of Technology*
Asokan MULAYATH VARIYATH, *Memorial University*

Abstracts: see page 94

IEEM16-P-0185
Railway Switches and Crossings Reliability Analysis
Behzad GHODRATI, Stephen FAMUREWA, Seyed Hadi HOSEINIE
Luleå University of Technology, Sweden

IEEM16-P-0587
Nonparametric Information Criterion for Change Point Problems
Asokan MULAYATH VARIYATH, Chithran Vadaverkkot VASUDEVAN
Memorial University, Canada

IEEM16-P-0123
A Maintenance Waste Risk Appraisal Model Based on Modified Failure Mode and Effect Analysis (FMEA)
Agung SUTRISNO[1], Indra GUNAWAN[2], Iwan VANANY[3], Hadi Akbarzadeh KHORSHIDI[4]
[1]*Sam Ratulangi University, Indonesia*
[2]*The University of Adelaide, Australia*
[3]*Institut Teknologi Sepuluh Nopember, Indonesia*
[4]*Monash University, Australia*

IEEM16-P-0073
The Reliability Analysis of Repairable K-Out-of-N Systems with Component Lifetimes and Repair Time Subjected to Phase-Type Distribution
Wei WANG, Tong CHEN, Di PENG
Naval University of Engineering, China

IEEM16-P-0006
Preventive Maintenance Operations Based on Weighted Similarity Coefficient
Abdelhakim ABDELHADI[1], Tamara KHREIS[2]
[1]*Prince Sultan Univesity, Saudi Arabia*
[2]*Ministry of Education, Jordan*

IEEM16-P-0072
Analysis on Reliability Model for Warm Standby System with a Repairman Taking Multiple Vacations Based on Phase-Type Distribution
Fang LI[1], Dongliang YIN[2], Bin HU[1]
[1]*Naval Research Center for Warship Equipment Integrated Logistic Support, China*
[2]*Naval University of Engineering, China*

Poster
6/12/2016 15:30 - 17:00
Room: Pecatu 2

Big Data and Analysis

Decision Analysis and Methods

E-Business and E-Commerce

Engineering Economy and Cost Analysis

Engineering Education and Training

Facilities Planning and Management

Healthcare Systems and Management

Human Factors

Information Processing and Engineering

Intelligent Systems

Manufacturing Systems

Operations Research

Production Planning and Control

Project Management

Quality Control and Management

Reliability and Maintaining Engineering

Safety, Security and Risk Management

Service Innovation and Management

Supply Chain Management

System Modelling and Simulation

Technology and Knowledge Management

Abstracts

Session	Operations Research 1
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 2
Chairs	Norbert TRAUTMANN, *University of Bern*, Egon MUELLER, *Chemnitz University of Technology*

IEEM16-P-0519

An Implementation of the Parallel Schedule-Generation Scheme for Applying Microsoft Excel's Evolutionary Solver to the Resource-Constrained Project Scheduling Problem RCPSP

Norbert TRAUTMANN, Mario GNÄGI
University of Bern, Switzerland

Since the 2010 version, the Solver Add-in of Microsoft Excel comprises the so-called Evolutionary Solver. The application of this Solver to a combinatorial optimization problem requires a spreadsheet which determines the objective function value corresponding to given values for the decision variables. This paper refers to the resource-constrained project-scheduling problem; we study how to implement the parallel schedule-generation scheme on a spreadsheet. We compare the performance against the serial schedule-generation scheme based on the j30 PSPLIB test set. It turns out that the CPU time required for scheduling an activity is considerably lower in the parallel than in the serial schedule-generation scheme; as a consequence, more schedules can be analyzed within a prescribed amount of time. For the novel implementation of the parallel scheme, the average deviation from the minimum makespan is considerably smaller than for the serial scheme, and the number of instances solved to optimality is surprisingly high.

IEEM16-P-0300

Agile Energy Modelling: A Business Centric Approach

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

Energy management is a crucial aspect to global sustainability. Multinational Manufacturing Corporations (MMC's) utilise a large amount of energy, making energy optimisation a priority. The ability to evaluate MMC's total energy utilisation effectively and efficiently is a challenge. This research focuses on holistically modelling the business energy systems of MMC's by adopting a business process centric approach. MMC's conduct business based on global or regional business processes depending on the function, global/regional functional enablement. The agile energy model proposed in this research integrates key knowledge areas of energy assessment, business management, business processes and system engineering, to deliver a comprehensive simulation toolset for energy quantification, evaluation and optimisation.

IEEM16-P-0163

Elevator Performance Estimation Model Based on Square Lattices

Yoichi SHIMAKAWA[1], Yuki SATO[1], Hiroyuki GOTO[2]
[1]*Salesian Polytechnic, Japan*
[2]*Hosei University, Japan*

In this study, we propose a stochastic model for estimating elevator performance criteria from the average number of passenger arrivals. We present a basic framework for our model and try to construct a mathematical formulation. More specifically, a probability distribution of service times for one operation is formulated, where the elevator starts service for the first passenger, finishes all services, and returns to a fixed position. Using this probability distribution, we develop an expression for elevator performance and expected service time for one operation. To show the validity of our model, we compare the value from a numerical simulation with the estimated value. We thus clarify the validity and limitations of the model.

IEEM16-P-0165

Multi-Objective Constraint Optimization in Mail-Order Pharmacy Automated Distribution System

Toshiyuki MIYAMOTO[1], Natsuhito UENO[1], Debiao LI[2], Sang Won YOON[3]
[1]*Osaka University, Japan*
[2]*Fuzhou University, China*
[3]*State University of New York at Binghamton, United States*

In this research, we study a scheduling problem in mail-order pharmacy automated distribution (MOPAD) system. In MOPAD scheduling, two kinds of objective: the collation delay (CD) and makespan, should be considered and in the previous study of some of authors three kinds of genetic algorithms (GA) are applied and evaluated. In this paper, we apply constraint programming (CP) for the scheduling problem. We proposed a CP formulation of the problem and evaluated through computational experiments. The results show that the proposed method is effective for small-scale problem but further study is required to compare with GA methods in large-scale problems.

IEEM16-P-0504

Measuring Organizations' Operations Competitive Priorities

Andre VERMEULEN, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

Effective organizations require operations strategies based on competitive priority analyses such as cost, quality, flexibility and delivery speed. These factors indicate how an organization is effectively doing the right thing whilst operations strategy involves the overall activities that drive the organization to achieve its organizational operational goals. This paper focuses on enterprise process improvement methods aimed at assisting operations strategies in terms of an organization's capability in generating strategies in order to gain a sustainable competitive advantage. This included improvement in speed, flexibility, reliability, cost and quality by means of continuous capability performance measurement. Research results show a lack of competitive priorities, operational process capability and organizational improvement methods in terms of an effective operations strategy. Furthermore, the results obtained from the study suggest a range of research possibilities which may lead to finding possible solutions why organizations cannot maintain the implementation of enterprise improvement methods.

IEEM16-P -0551

Single Machine Scheduling for Multi-Assembly Jobs with Preemption

Luksamon BOONMA, Ronnachai SIROVETNUKUL, Thana SARTTRA
Mahidol University, Thailand

This research proposes a mathematic model for scheduling multi-assembly jobs with uncertain arrival of raw materials or sub-assembly parts and allowable preemption, aiming to minimize tardiness penalty and set-up cost under a single machine. The experimental results show that using the exact algorithm (Branch and Bound) in Lingo 12 is not capable of solve the large-sized problems. Balancing tardiness and set-up cost (BTS) algorithm, therefore, is developed and is capable to solve much larger size of the problem with reasonable solution quality and computational time.

IEEM16-P-0153

The Evaluation of Green Manufacturing: A DEA-Based Approach

Mei-Niang FAN[1], Jun-Der LEU[1], André KRISCHKE[2]
[1]*National Central University, Taiwan*
[2]*Munich University of Applied Sciences, Germany*

Natural resource scarcity, climate change, and stakeholder requirements have prompted businesses to implement green initiatives involving resource conservation and clean production to deliver green organization performance for sustainable operations. This research is an application case of a global chemical manufacturer using a resource-based view (RBV) in a Data Envelopment Analysis (DEA) slacks-based model. The inputs that must be minimized cover an environmental aspect energy and water consumption and a social aspect employees' working hours. Good output that must be maximized are production volume, and undesirable outputs to be minimized also cover an environmental aspect carbon dioxide, waste disposal, volatile organic compounds and a social aspect the total recordable (injury and illness) rate. The effectiveness of resource utilization in the supply chain framework makes the business more sustainable and delivers competitive advantages in the industry. This research illustrates a tool that can be used to deliver these increasingly important requirements.

Session	Supply Chain Management 1
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 3
Chairs	Aries SUSANTY, *Diponegoro University,* Yong LIN, *University of Greenwich*

IEEM16-P-0036

The Effect of Collaborative Communication, Power Dependency, and Price Satisfaction on Trust and Loyalty of Individual Farmers to Dairy Cooperative Case Study Dairy Supply Chain in Boyolali

Aries SUSANTY, Arfan BAKHTIAR, Hery SULIANTORO, Christoper MANALU
University of Diponegoro, Indonesia

The study aims to investigate the effect of collaborative communication, power dependency, and price satisfaction on trust of individual farmers to the dairy KUD (a dairy cooperative). This study also aims to investigate the effect of trust on the loyalty of individual farmers to the dairy cooperative. The investigation will represented by the 165 individual farmers and several dairies cooperative in 6 districts in Boyolali, Central Java, Indonesia. The finding of this study indicates that the collaborative communication and price satisfaction have a significant positive effect on individual dairy farmer's trust of the competence-goodwill and producer's contractual of dairy cooperative; whereas, the imbalance power-dependency have a negative significant effect on the competence-goodwill and producer's contractual of dairy cooperative. The finding of this study also indicates that competence-goodwill and contractual trust of individual farmers have a significant effect on the level of their loyalty to the particular dairy cooperative.

IEEM16-P-0645

Supply Chain Collaboration: A Triadic View

Lin HUANG, Yong LIN, Li ZHOU, Petros IEROMONACHOU
University of Greenwich, United Kingdom

This research aims to investigate the collaboration patterns in supply chain with a triadic view. Case study was adopted in this research. Four triadic collaboration patterns throughout the whole supply chain have been summarized in according to various business segments. In upstream supply chain, there are two types of triadic collaboration pattern - directed collaboration triad and cultivated collaboration triad; and in downstream supply chain, there are another two types of triadic collaboration patterns as well - concerted collaboration triad and derived collaboration triad.

IEEM16-P-0147

Designing a Recycling Supply Chain Network for a Bottle Manufacturing Factory

Parichehr PAAM, Regina BERRETTA, Mojtaba HEYDAR
The University of Newcastle, Australia

Nowadays it is paramount to design recycling supply chains efficiently because of both economic and environmental concerns. In this article, a dynamic fuzzy mathematical model for a recycling supply chain network is presented with the dual aims of total costs and the environmental impacts minimization. The Artificial Bee Colony algorithm is utilized to discover Pareto optimal solutions. To show the validation of the proposed algorithm, 12 instances in two scales of small and large are considered, and to evaluate the performance of the algorithm, it is compared with the epsilon-constraint method. In small-size instances, the both approaches' solutions are compared with one another by analysis of variance according to three comparative metrics. The results indicate the dominance of the proposed ABC algorithm against epsilon-constraint method in terms of quality.

IEEM16-P-0474

Effect of Manufacturing Machines Upgrading on Green Supply Chain Planning

Elnaz MOAYYERI, Farzad DEHGHANIAN, Mahla BABAGOLZADEH
Ferdowsi University of Mashhad, Iran

Due to the increase in environmental concerns and the environmental regulations enacted by governments, green supply chain has received more attention. In this paper, a mixed-integer linear programming model is presented for supply chain planning under emission trading scheme in which carbon footprints is considered in transportation, storage and production. Moreover, since machine upgrade would influence carbon emission, the model has been powered with the ability to decide in which planning periods these upgrades should take place. The model is validated by examining a hypothetical example.

IEEM16-P-0619

Evaluation of Supply Chain Resilience Enhancement with Multi-Tier Supplier Selection Policy Using Agent-Based Modeling

Shijian CHEN[1], Kang TAI[1], ZhengPing LI[2]
[1]*Nanyang Technological University, Singapore*
[2]*Singapore Institute of Manufacturing Technology, Singapore*

Resilience evaluation and enhancement has become a vital issue concerning the effectiveness of a current supply chain. This research paper proposes a multi-tier supplier selection policy for resilience enhancement as well as a customer-service-level oriented resilience measurement approach using on-time delivery rate as the indicator. A simple case study involving main supplier failure disturbance is designed and simulated with LeCas agent-based modelling tool to compare the efficacy of supply chains with various policy configuration. Results demonstrate that supply chain which adopts the proposed policy is more resilient than normal supply chain during an upstream disruption, with a reduction in recoverability index by a factor of 10. It also shows a significant decline in both maximum customer service level loss and recovery time.

IEEM16-P-0389

Commodity Price Volatility Mitigation in Supply Chain Risk Management: Real Options to Assess the Value of Flexibility-Driven Strategies

Nicola COSTANTINO[1], Roberta PELLEGRINO[1], Danilo TAURO[1]
[1]*Politecnico di Bari, Italy*

Commodity Price Volatility (CPV) management is becoming extremely important both from an academic and a practitioner perspective, even if from the screening of the literature it turns out that there are few works focusing on how to manage CPV. Such works are limited to either outlining an approach to assess a company's risk exposure or identifying and simply describing the most common CPV mitigation strategies. In fact, these strategies are not assessed and benchmarked. The aim of this study is to accomplish this objective, focusing on two of the most common non-financial and supply chain-driven CPV mitigation strategies. The main contribution of the present research is the development of a model that is easy to implement and that will support companies to (i) assess and manage their CPV and its inherent risk on their profitability and (ii) select the proper mitigation strategy, on a commodity-by-commodity base.

Session	Engineering Education and Training
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 5
Chairs	Rui SOUSA, *University of Minho,* Jan Harm PRETORIUS, *University of Johannesburg*

IEEM16-P-0124

Gamification Based Lean Knowledge Dissemination: A Case Study

Rui SOUSA[1], Dorota STADNICKA[2], Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[3], J. Ville ISOHERRANEN[4]
[1]*University of Minho, Portugal*
[2]*Rzeszow University of Technology, Poland*
[3]*University of Stavanger, Norway*
[4]*University of Oulu, Finland*

It is generally recognized that traditional teaching methodologies, e.g. expositive lectures, are prone to become inefficient, especially in terms of knowledge retention, because many students quickly lose attention. Therefore, it is vital the adoption of new teaching methodologies that enable the students' engagement in their own learning process. Based on a case study, this manuscript aims to demonstrate how games/hands-on approaches can improve the teaching/learning processes in Industrial Engineering education, more specifically in the Lean Manufacturing context. The investigation is focused on: (i) type of achievable learning objectives (according to Bloom's taxonomy) and (ii) alignment with the students' learning styles (according to Felder-Silverman's model).Data about (ii) is gathered by a questionnaire applied to students after the lean manufacturing game. The discussion of (i) is based on the questionnaire and on the analysis of the type of game applied.

IEEM16-P-0197

Trends Preventing Engineers from Obtaining Professional Registration with ECSA in the Required Time

Nishaal ROOPLALL, Annlize MARNEWICK, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

Graduate engineers in South Africa are expected to operate as professional engineers within a time-frame of approximately 3 years after graduation; however they do not achieve this. It is vital that engineers are able to operate at the expected levels of a professional engineer in the required time to promote the growth of the engineering sector. An industry survey was used to investigate the trends why professional registration is not obtained within time.
It was confirmed that engineers do not achieve professional registration within the required time. Secondly it was highlighted that they do not always operate at the expected levels of responsibility in the workplace as suggested by literature.
Ensuring that engineers operate at the suggested levels of responsibility could further assist them in obtaining professional registration within the required time. The research identified self-development and training needs of engineers in South Africa to enable registration within required time.

IEEM16-P-0324

Attraction, Education and Retention of Technical Women in South Africa

Hannelie NEL, Johan MEYER
University of Johannesburg, South Africa

Women engineers form a small but integral part of the South African and global engineering fraternity. The resultant gender disparity in all technical professions presents a significant challenge to women in the sector, as well as to governments, corporates and higher education institutions. If the future of engineering aims to be more gender equitable, the attraction, education and retention of technical women must be understood and addressed effectively. Research was conducted over a two-year period with nine technical women in South Africa to gain a deeper understanding of these factors. The respondents agree that a future exists for women engineers, but that current policies, education structures and financial systems must be restructured to make engineering a more attractive career for women. The paper presents the research findings and strategies for the future education and retention of technical women in the engineering and built environment sectors.

IEEM16-P-0386

A Comparison Study of Methods to Solve the Mental Health Problem Between the Engineering and Non-Engineering Students

Ming Foong LEE, W. M. H. WAN ADAM
Universiti Tun Hussein Onn Malaysia, Malaysia

Mental health is always affect the performance of an individual but has never aroused general concern among educator. Therefore, the main objective of this study was to identify the level of mental health between the engineering and non-engineering students, as well as the dominant methods being applied by the students in dealing with mental health problem. A survey has been used as the research design for this study. A total numbers of 450 engineering and non-engineering students were selected as respondents from three technical universities in Malaysia. The DASS-21 inventory and a set of self-developed questionnaire were used as the instrument for this study. The collected data were analyzed by using frequency, percentage, mean score and Mann Whitney U test. The findings showed that there was no significant differences in mental health problem and the selection of methods to overcome mental health problems between engineering and non-engineering students. In conclusion, the parties who play an important role in students' mental health problems should take the proactive action in order to monitor and help those who are facing the mental health problem.

IEEM16-P-0452

Competencies Model for Entrepreneur Development in Software Industries

Atya AISHA[1], Joko SISWANTO[2], Iman SUDIRMAN[2]
[1]*Telkom University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

Most of entrepreneurs in software industries in Indonesia have sufficient capabilities for developing their products, but lack of managerial skills in managing business. To achieve business success, the entrepreneurs need not only technical knowledge gathered from their technical education, but also need managerial business knowledge. This paper aims at presenting an integrated competency model for entrepreneurs in software industries. The research was firstly carrying out with a comprehensive literature study related to competency model. In-depth interview was conducted to gather qualitative data from some entrepreneurs in the industries to validate the model. The result of this research is a competency model for entrepreneurs in software industry which consists of three groups of competencies, namely entrepreneurial, managerial and industrial context competencies. The model may provide a preliminary guidance for competencies development of entrepreneurs in software industries.

IEEM16-P-0475

Broadening Access to Problem-Based Learning: Design of the Shell Eco-Marathon Car-In-A-Box Concept

Sune VON SOLMS, Johan MEYER, Warren HURTER
University of Johannesburg, South Africa

Problem-based learning has proven to develop teamwork, problem solving skills, communication and critical thinking skills amongst learners. Due to these advantages, secondary schools in South Africa engage with problem-based events to promote the participation of learners in Science, Technology, Engineering and Mathematics (STEM). However, many schools face lack of time, lack of available funds and lack of the required technical skill set, which limits them from participating in these events. The Car-In-a-Box concept was developed to broaden access to a STEM problem-based learning event, called the Shell Eco-Marathon. The Car-In-A-Box concept addresses the three challenges that would normally prevent a school from entering the Shell Eco-Marathon, disenabling learners to harness the advantages of problem-based learning. The impact of the Car-In-A-Box concept for broadening access to problem-based learning is discussed.

IEEM16-P-0182

A study on Information System Quality Management on Productivity Monitoring Model in a governmental organization with multi-performance Objectives â€“ A case study in National Iranian Gas Company

Ali MASSAELI
National Iranian Gas Company (NIGC), Iran

Obviously, one of the objectives in governmental organizations is increasing the productivity to an acceptable level in a dynamic environment; based on this as per upstream strategy of Iranian vision in 2020; the total productivity share in GDP in Iran must be reached to 31.3% (at least). So the first step is measuring the current situation of our organization and defining the attributes and the KPIs and metrics for evaluation.

In technical inspection department of National Iranian Gas Company a BSC-DEA model has been developed in order to measure productivity level [1]. For facilitating the data accusation and processing and increasing the reliability of this model an Information Processing System has been studied and an Information Process Quality Management Model for the more accurate outcomes has been developed.

Session	Human Factors 1
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 6
Chairs	Seng Fat WONG, *University of Macau*, Titis WIJAYANTO, *Universitas Gadjah Mada*

IEEM16-P-0238

Intelligent Car Seat Design with Ingress, Egress and Sit-to-Stand Services

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

With the population ageing, it is a critical factor in the public transportation to erect a physical setting that fosters independent living. However, none of research studies designed a barrier free car seat device for supporting elderly and disabilities ingress or egress the vehicle, as well as sit to stand movement. In this present work, it applied ergonomics concept to design intelligent barrier free car seat device. The device is controlled by mobile application to facilitate them. Moreover, 22 healthy subjects volunteered the effect of standup assistant function experiment. The result indicates this function helps sit-to-stand sequences compared with normal movement.

IEEM16-P-0095

Criteria Based Ergonomic Assessment in a Manufacturing Industry

V. KAMALA, Malliga POOSANDARAM, G. M. PRIYANKA
Anna University, India

The purpose of this paper is to design a tool for quantifying ergonomic level in organization and test its practical compatibility. The study has been undertaken to fill the research gap that no research has been attempted to develop an index for the evaluation of workspace in an ergonomic perspective of a manufacturing firm. An ergonomic quantification tool was designed by referring to a 15 criteria ergonomic model. A scoring pattern with a maximum 1000 marks was incorporated in the ergonomic quantification tool which was then subjected to experimentation in an Indian manufacturing company. From the result, it can be inferred that the firm is ergonomic to a degree of 76.2% using the scoring method which denotes that the organization is ergonomically designed. Gap analysis indicates that significant difference is observed in the case of 'Bio Mechanical Aspects' criterion followed by 'Energy Expenditure', 'House Keeping' and 'Temperature/Climate'.

IEEM16-P-0220

Pothole- and Patch Repair Failure Recurrence in Gauteng: The Human Influence

Joanne MULLER [1], Annlize MARNEWICK[2]
[1]*Much Asphalt (Pty) Ltd, South Africa*
[2]*University of Johannesburg, South Africa*

A reduction in the in-service life spans of Gauteng roadways, have been seen due to increases in the formation and recurrence of potholes and patch repair failures. With much attention being focused on the technical causes, human factors adding to this problem have not received the attention it requires resulting in increased cost and risk to road users and asset owners. With roadway maintenance and management as the focus of the research, highlighting these human aspects and their influence on degrading roadway conditions within Gauteng was crucial. A survey performed during the research, showed that human factors pose as large a threat to asset service life and quality during the in-service maintenance period, as the technical aspects. Failure to consider both human aspects, as well as technical aspects during roadway maintenance management can therefore trap a roadway in a continual cycle of decline.

IEEM16-P-0353

Investigating the RGB-D Camera Tracking Accuracy in Different Carrying Tasks

Pin-Ling LIU, Chien-Chi CHANG, Chih-Ting CHEN
National Tsing Hua University, Taiwan

The musculoskeletal disorder is still one of the significant concerns among all work-related injuries. A great deal of research efforts had been made in developing tools that can be used in practical working environments for real time assessment of manual workloads. To perform those evaluations, the working posture analysis is required. Recently, the RGB-D camera has been considered by researchers as a potential device to record and track the human motion. In this study, the traditional motion tracking system was used as the reference to calculate the joint coordination errors while using RGB-D camera to generate the movement data in three different carrying task ranges: 0°-45°, 45°-90°, 90°-135°. The result showed that the 0°-45° range yielded the lowest error. The highest error was observed in the range 90°-135°. The lower body resulted a lower average error in comparison to the upper body.

IEEM16-P-0479

The Relation Between Performance of Lean Manufacturing and Employee' Mental Workload

Ari WIDYANTI, Wiku LARUTAMA
Bandung Institute of Technology, Indonesia

The application of lean manufacturing that is so standardized gives negative aspects for a company, such as the possibility of increased mental workload of employees. The purpose of this study is to observe the relation between lean manufacturing performance and employee' mental workload. This research is conducted at an Indonesian aircraft company in division Manufacturing (DPM), Component Assembly (CA), and Final Assembly and Delivery Center (FD). To assess the implementation of lean manufacturing at the company, lean manufacturing benchmarks questionnaire that has been validated into Indonesian is used. Three lean manager in each division fulfill the lean manufacturing benchmark questionnaire. For the measurement of mental workload, the Raw-NASA-TLX is used. 30 operators in each division is participated by fulfilling the raw NASA-TLX questionnaire. Nonparametric statistics showed no significant correlation between the lean manufacturing performance and mental workload. Moderate mental workload in each division is found related with lean manufacturing implementation.

IEEM16-P-0630

Adoption of Near Field Communication in Hotel Industry Based on Risk Perspectives and Individual Characteristics

Kin Meng SAM[1], Chris CHATWIN[2]
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[2]*University of Sussex, United Kingdom*

The emergence of the mobile phone has created great opportunities for businesses, especially those providing services to customers. Hotels are very important to a country as they provide accommodation to travelers. Better services attract more hotel customers. With the advent of NFC, a wireless mobile technology, hotel customers can use NFC to get hotel services efficiently. Previous studies found that risk and users' individual characteristics are very important in analyzing the adoption of Internet communication technologies. This paper presents a quantitative study on hotel customers' adoption of Near Field Communications (NFC) based on six dimensions of risk perspectives and individual characteristics. The results can provide useful indicators for the hotel industry to utilize NFC for a more productive business.

Session	Healthcare Systems and Management
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 7
Chairs	Juha PUUSTJÄRVI, *University of Helsinki,* Manuel CRISOSTOMO, *Institute of Systems and Robotics*

IEEM16-P-0640

Low Cost Vision System for Human Gait Acquisition and Characterization

Paulo FERREIRA[1], João FERREIRA[2], Manuel CRISÓSTOMO[1], Antonio COIMBRA[1]
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[2]*Superior Institute of Engineering of Coimbra, Portugal*

This paper presents a low cost system for human gait analysis. Two opposite-faced web cameras are used to acquire images of the walking of a person carrying a set of passive marks, where the color is chosen to contrast with the ambient dominant color. It is also used a treadmill with passive marks, where the user walks at different speeds. The acquired trajectories of the marks are used to determine body joint angles and other 3D crossed angles, obtained by both opposite sides from video images processing. With this low cost measurement system the analysis and reconstruction of human gait can be done with a mean error of 2 degrees, becoming a good alternative to more expensive systems to be used in human gait characterization. The system can be used to detect human gait pathologies and to accomplish physical rehabilitation.

IEEM16-P-0002

Practicing Information Therapy in Self-Care: A Solution to the Rise in Health Care Costs

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[2]*The Pharmacy of Kaivopuisto, Finland*

Self-care is what people do for themselves to establish and maintain health, prevent and deal with illness. It is also seen as a solution to the global rise in health care costs placed on governments. This is an important aspect as it is estimated that 70% to 95% of all illnesses are managed without the intervention of a doctor. A big challenge in self-care is keeping the patient informed about relevant medical treatment information. We have studied the suitability of information therapy and the Semantic Web technologies in solving this challenge. Information therapy refers to the prescription of specific evidence based medical information to specific patients at just the right time to help them make specific health decisions or behavior changes. The information prescription should include all information, which is relevant while including as few non-relevant information as possible. How this goal can be achieved from technology point of view is the main contribution of this paper. The key components in our proposed solutions are the notions of structured clinical guidelines and clinical guideline pathways, as well as their integration with PHRs (Personal Health Records).

IEEM16-P-0527

Benchmarking Lean Practices and Performance Measures of a Hospital

Gopalakrishnan NARAYANAMURTHY, Anand GURUMURTHY
Indian Institute of Management Kozhikode, India

Purpose of this study is to benchmark the lean thinking practices and performance measures adopted in a case hospital by comparing it with a with-in benchmarking partner and best-in class benchmarking partner hospital which has been known for pioneering in lean implementation. Multiple case study approach and Xerox benchmarking model is being deployed to achieve the purpose of the study. A case hospital chosen has been implementing lean and value based improvement for more than nine years. Primary data of case organization and secondary data of benchmarked partners have been used for the comparison. Benchmarking the practices and performance measures implemented at the case hospital revealed that the hospital is in its transformation stage when compared to with-in benchmarking partner and best-in class benchmarking partner. Current study is the first one to detail the procedure on how to perform benchmarking for a hospital implementing or attempting to implement lean thinking.

IEEM16-P-0194

Comparison of 3D Scanning and 3D Modelling of a Workplace from Various Aspects

Marek BURES, Jiri POLCAR
University of West Bohemia, Czech Republic

The paper investigates differences in data gathering and preparation of the workplace environment for virtual ergonomic analyses. The two investigated scenarios are classical digitization of the workplace by measurement of dimensions and subsequent modelling of the workplace in 3D drawing software compared to3D scanning of the workplace by an industrial scanner. Those two scenarios are assessed in terms of time and accuracy. The 3D scanning method was, on average, four times faster than 3D modelling and also more precise. However, the quality of the 3D model was better than the model obtained from the scanner. The need for accuracy in ergonomic analyses is also discussed in the paper.

IEEM16-P-0655

A Regression-Based Approach to Identifying Factors Affecting Operational Efficiency in Surgical Rooms

Jun-Der LEU, Larry Jung-Hsing LEE, Yi-Wei HUANG
National Central University, Taiwan

The operational efficiency of surgical rooms has a significant influence on the overall performance of a hospital. In this study, we used a multiple regression model to identify the influence of factors on the operational efficiency of surgical rooms. We analyzed the patient flow in the surgical room to identify the potential influencing factors in terms of patients, surgical type, medical staff, and medical resource inputs in the surgical process. Then, 21,944 surgical data were collected as a research sample from the healthcare information system of a case hospital with 772 clinical beds. Surgical cost, surgical fee, and surgical overtime are considered performance outputs. The analytical results show that the type of anesthesia and the complexity of surgery are significant factors contributing to the surgical cost. In addition, surgical time, surgical cost, and anesthesia cost are significantly influenced by the type of anesthesia.

IEEM16-P-0180

Hierarchical Status and Job Idiosyncrasy in Formalized Organizations: A Field Study on Hospital Physicians

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[2]*University of Innsbruck, Austria*

Job idiosyncrasy refers to deviations between formal and actual job design, attributable to changes by the job incumbents. Research on idiosyncratic deals (i-deals) focusses on special arrangements negotiated by individual employees with employer representatives (e.g., supervisors, management). This structure-oriented analysis examined the role of hierarchical status in negotiating personalized work tasks, career support, and working time flexibility. A survey study of N = 155 hospital physicians confirmed that higher ranking employees were more likely to request and negotiate more far-reaching task and career i-deals. Flexibility i-deals applied mostly to part-time work. Differences in attributed reasons for successful negotiation existed, such that higher ranks emphasized own contributions and value. Denied task i-deals was the strongest negative predictor of job satisfaction, aside from a positive effect of career i-deals. Influences of gender and part-time on negotiation outcomes were explored. Implications for theory and practice are discussed.

IEEM16-P-0367

Simulation Study of Patient Arrivals and Doctors Scheduling in a Children's Emergency Department

Leslie CHIA[1], Weidong LIN[2]
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[2]*Temasek Polytechnic, Singapore*

This paper aims to ascertain the optimal number of consultation rooms to operate so that patients with high severity medical conditions are attended to promptly, yet with capacity to spare for low severity patients but without fully providing for this latter group to be seen within a very short duration of time upon arrival. The research methodology is based on the concepts from simulation-based lean and six-sigma approach. The dynamic interactions between the fluctuation of patient arrivals and Doctor schedules are experimented through a discrete event simulation model. This paper describes the different stages of the research such as identifying the problem, analyzing the historical data, constructing the simulation model, as well as identifying the optimal Doctor schedules through simulation experiments. This paper illustrates the system dynamic behavior of the Emergency Department under study, and demonstrates the combination use of data analytics and simulation modeling in dealing with such complexities.

Session	Systems Modeling and Simulation 1
Date	5/12/2016
Time	13:30 - 15:00
Room	Mengwi 8
Chairs	Jayendran VENKATESWARAN, *Indian Institute of Technology Bombay,* Sirichai TORSAKUL, *Rajamangala University of Technology Thanyaburi*

IEEM16-P-0426

Simulation and Optimisation Based Approach for Job Shop Scheduling Problems

Pooja KULKARNI, Jayendran VENKATESWARAN
Indian Institute of Technology Bombay, India

This paper presents a hybrid Simulation based Optimization (SbO) approach to solve job shop scheduling problems. SbO structure for classical job shop scheduling introduced by [6] is extended for flexible job shop scheduling problem (FJSSP). Performance of SbO is bench-marked in terms of number of decision variables, constraints, objective value and computational time against various Mixed Integer Programming (MIP) based methods from literature. SbO outperforms for all the parameters and performs better with increasing problem size. Further, an hybrid solution architecture, Combined Simulation & Optimization (CSO) is introduced which integrates SbO and MIP to expedite the conversion to exact optimal solution. Results for CSO are also bench-marked against MIP based approaches, which shows that CSO performs better and converges faster.

IEEM16-P-0413

Using Animation to Develop a MOOC on Information Security

Cheuk Hang AU[1], Kyle Chun Sing LAM[2], Walter S. L. FUNG[2], Xin XU[2]
[1]*The Chinese University of Hong Kong, Hong Kong SAR*
[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

This is a set of research exploring using animation in the Massive Open Online Course (MOOC) / Small Private Online Course (SPOC) for learning information security. We established an Information Security SPOC course, with animations made of GoAnimate for learning. The course content was largely based on the standard of the Certified Information Systems Auditor (CISA) from Information Systems Audit and Control Association (ISACA). After completing the course, the students were asked to complete a questionnaire related to their learning experience, with questions to measure the satisfaction of the course and the animation, and their further comments. 128 students provided their feedback. We analyzed the relationship between the satisfaction of the course content, animation clips and intention of using MOOC / SPOC in the future. We also generate a concept map by text-mining from the feedback of the open-ended question.

IEEM16-P-0269

Simulation Approach for Practical Testing Improvement of Logistics Professional Qualification System Level 1 in Thailand

Chawalit MANISRI, Tharinee MANISRI, Jenjai LITTLE
Sripatum University, Thailand

A practical testing level 1 of the road freight operator in Thailand's logistics professional qualification system has three stations: receiving, placement, and delivery. The number of examinees and the capability of officers in each station affect the complete number of examinees in limited time and average cost per examinee. In this article, the Markov chains model is used to describe the testing system on Arena simulation software. It shows that in Alternative#4 with four officers in three stations, one officer can service two examinees at the same time. It is suitable to install this alternative on the system because it provides the best result of a maximum number of complete examinees and minimum cost per examinee, with 63 examinees and 63.49 THB per examinee, respectively.

IEEM16-P-0289

Integrating Usage Data into the Planning of Product-Service Systems

Daniel KAMMERL, Gabriel NOVAK, Christoph HOLLAUER, Markus MÖRTL
Technical University of Munich, Germany

During the use phase of Product-Service Systems (PSS) various kinds of usage data describing the interaction of user and PSS are collected. This information could be used to design PSS tailored to the needs of the users, but in industry there is a lack of support for the analysis of the data. In this paper we present an approach and a model for systematically integrating usage data into the planning process of PSS.

IEEM16-P-0418

An Investigation of Chloride Penetration and Maintenance Strategies for Concrete Structures by a Modeling Approach

Tharana YOSPRAKOB, Chaiwoot BOONYASIRIWAT, Farida CHAMCHOD
Mahidol University, Thailand

It has been known that chloride penetration can cause detrimental effects on concrete structures especially in the marine environment. In this study, we investigate the penetration of chloride ions into the concrete structures and factors that may influence the maintenance plan by mathematical approach. With the aid of a simple model derived from Fick's second law and the finite difference techniques, we found that physical holes on the concrete surface, maintenance strategies for the year of cover replacement, cracks and their angles are important determinants of service life prediction of concrete structures and their replacement schedules.

IEEM16-P-0638

Finite Element Modeling for Stress Analysis of a Buried Pipeline Under Soil and Traffic Loads

Natapol MEESAWASD[1], Supachara KONGNUAN[2], Chaiwoot BOONYASIRIWAT[1], Farida CHAMCHOD[1]
[1]*Mahidol University, Thailand*
[2]*Thammasat University, Thailand*

Due to the durability and sustainability, concrete pipes have been widely used in many water management systems. As they are buried underground, several factors such as soil and pipe properties, installation strategies, functional and external loads may involve in determining their failure and service life. In this study, we investigated the effects of such factors on the stress distribution of a buried pipeline. Our results suggest that buried depth, seismic and traffic loads are important determinants of the stress distribution. In addition to the latter, we demonstrated that weights, speeds and patterns of car size arrangement play their parts in causing variation of stress on the pipeline. With the same thickness, pipelines with a larger diameter may have a shorter service life than ones with a smaller diameter.

IEEM16-P-0392

Quality Improvement by Variance Reduction of Component Using Learning Investment Allocation Model

Cucuk Nur ROSYIDI[1], Aris Wahyu NUGROHO[1], Wakhid Ahmad JAUHARI[1], Bambang SUHARDI[1], Kunihiro HAMADA[2]
[1]*Sebelas Maret University, Indonesia*
[2]*Hiroshima University, Japan*

Improving customer satisfaction is important in order to create a good relationship between a company and its customers which will give benefit to both sides. One way to accomplish it is by conducting quality improvement. Quality improvement has a strong relationship with the customer satisfaction, so it is an important issue in manufacturing. This paper discusses an optimization model to allocate learning investment using exponential learning investment model and achieve quality improvement through variance reduction of component and assembly product. The variance reduction of as the results of investment has been made to increase the quality of the product. The implementation of the proposed model has been demonstrated by solving a numerical example problem that used a simple assembly product which consists of three components. Oracle Crystal Ball is used to solve the numerical example.

Session	Intelligent Systems
Date	5/12/2016
Time	13:30 - 15:00
Room	VIP Room
Chairs	Fumiaki SAITOH, *Aoyama Gakuin University*, Yue WANG, *Hang Seng Management College*

IEEM16-P-0017

Predictive Modeling of Corporate Credit Ratings Using a Semi-Supervised Random Forest Regression

Fumiaki SAITOH
Aoyama Gakuin University, Japan

A company's ability to fulfill its obligations is evaluated as its credit rating by rating agencies. In recent years, learning models including a neural network and support vector machine have been applied to financial data, to predict company credit ratings with a high degree of accuracy. However, the number of companies that have yet to be rated is overwhelmingly greater than the number of companies that have been rated. To utilize effectively the information on unrated companies, we propose the use of a semi-supervised learning model for their rating prediction. We adopt the use of a random forest, which is a powerful tool in terms of its identification accuracy and generalization capability when applied as a credit rating prediction model. To confirm the effectiveness of the proposed method, through this research, the financial data and rating information for all listed companies in Japan were used to evaluate the prediction accuracy. The prediction residuals of both a normal random forest (RF) and the proposed method were evaluated experimentally based on a cross-validation.

IEEM16-P-0296

A Conceptual Framework of Decentralized Learning Neural Network Control Approach for Multi-Robot Cooperation in an Object Balancing Task

Nattapon JAISUMROUM, Pholchai CHOTIPRAYANAKUL, Sunpasit LIMNARARAT
King Mongkut's Institute of Technology Ladkrabang, Thailand

This paper presents a conceptual framework of a neural network control approach for robot manipulator cooperative, which is based on decentralized learning. Back propagation neural network is used for learning procedure to adapt and adjust the neuron-controller's parameters which depend on the approximated error. Dynamic model of two cooperating 3-DOF robot manipulators are defined and implement with neural network control. Visual feedback enables two robots to correct and calibrate their movement to compensate their object balancing task whereas both robots hold a flat plate balancing a round object on it. This conceptual framework of the decentralized learning procedure will be verified by a simulation and experiments in near future.

IEEM16-P-0364

A New Approach for Solving Single Machine Total Weighted Tardiness (SMTWT) Problem

Qunjie FU, Tsui-Ping CHUNG
Jilin University, China

This paper considers a single machine total weighted tardiness (SMTWT) problem which has been proved to be NP-hard. A meta-heuristics algorithm, Variable Neighborhood Search (VNS), is proposed to solve this problem. In the proposed VNS, multiple neighborhood structures are performed. The searching method is systematic for considering searching direction and searching depth. Based on extensive computational experiments, we found that the VNS algorithm has an excellent performance and is of better results in the solution quality and computation time than those compared algorithms.

IEEM16-P-0365

Two-Stage Hybrid Flowshop Scheduling Problem with Waiting Time

Heng SUN, Tsui-Ping CHUNG
Jilin University, China

This paper considers a two-stage hybrid flowshop problem where there are a single batch processing machine and a single machine. Each job with release time is assigned into some batches. The waiting time between the batch processing machine and the single machine is limited to make the problem more practical. A MIP model is developed to describe the proposed problem. Since the problem is NP-hard, a new algorithm, named immunoglobulin-based artificial immune system (IAIS), is proposed to solve the problem. To verify the proposed algorithm, comparisons with an existing algorithm for the problem are presented. Computational results have shown that the proposed IAIS algorithm has quite good performance.

IEEM16-P-0724

Genetic Algorithm for Scheduling Double Different Size Crane System with Different Truck Ready Times

XiaoMeng GAO, Yang YANG, ZhenHui WU
Shanghai Maritime University, China

In order to improve the competitiveness of the container terminal, how to reduce the truck waiting time is the key point. In this paper, the optimization of double different size crane (DDSC) system with different truck ready time is studied. Firstly, a mathematical model for the minimum of truck waiting time is established. Then, genetic algorithm is designed to formulate an optimum DDSC scheduling scheme solving the interference between big crane and small crane. Finally, the results are analyzed and the numerical results show that the proposed method can quickly obtain an optimal solution of the problem.

IEEM16-P-0429

Financial and Strategic Impact of VCs on Start-up Development: Silicon Valley Decacorns vs. Northern-European Experience

Mait RUNGI, Egon SAKS, Kristiina TUISK
Tallinn University of Technology, Estonia

Venture capitalists financing is the main source to keep start-ups up and running. Financial support is not the only thing VCs provide, sometimes they are asked to provide advice and sometimes they force their advice. When and what type of help VCs can give were researched in qualitative multiple-case study setting in top Silicon Valley unicorns – Uber, Airbnb, Snapchat, Pinterest and Dropbox. Their results were contrasted with Northern-European success experience to find similar patterns and context-specific differences. Biggest difference between US and European start-ups are governmental funding at early stage in Europe (it used to be so also in Silicon Valley during its emergence in last century), the role and use of accelerators and level of VC involvement.

IEEM16-P-0683

Quantitative Assessment of Crack Size Based on Lamb Wave and Bayesian Method

Jingjing HE, Jinsong YANG, Yi YANG, Yunxia CHEN
Beihang University, China

This paper presents a general procedure for quantitative assessment of crack size using in-situ Lamb wave test and Bayesian updating. Surface-bonded piezoelectric discs were arrayed as actuators and sensors to generate and collect the fundamental symmetrical mode (S0), respectively. Two damage features namely, the phase change and the normalized amplitude are found to be effective for crack size quantification. Lamb wave coupon test on simple plates with artificial cracks of different sizes is performed to obtain a baseline quantification model between the crack size and damage sensitive features. In order to make the baseline model also suitable for realistic engineering application, the damage data from an in-situ fatigue testing on a realistic lap-joint component are used to update the baseline model using Bayesian method.

Session	Reliability and Maintenance Engineering 1
Date	5/12/2016
Time	13:30 - 15:00
Room	Pecatu 1
Chairs	David VALIS, *University of Defence*, Kuan Eng CHONG, *Universiti Teknikal Malaysia Melaka*

IEEM16-P-0062

Mathematical Analysis of Soot Particles in Oil Used as System State Indicator

David VALIS[1], Libor ZAK[2], Zdenek VINTR[1], Kamila HASILOVA[1]
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[2]*Brno University of Technology, Czech Republic*

Different state indicators are used when assessing technical systems. If we are to use indirect diagnostic measures, lubrication oil seems to be a good source of different information. It is possible to get the information on the state of the oil and the system. In our article we focus on specific oil particles, i.e. soot. It is formed as a by-product during fuel combustion. Soot contaminates the oil and its concentration might indicate that operation conditions are getting worse. The essential and interesting thing is that some additives in the oil are able to dissolve the soot. In our article we introduce some results obtained from processing oil soot data. The data introduced depend on a few operating measures - kilometres [km], days [day] and moto-hours [Mh]. In the analysis we use deterministic and fuzzy mathematical methods. Our aim is to estimate and study the hitting time of a critical threshold.

IEEM16-P-0314

Simulation Study on the Influence of Process Parameters on the Hybrid Forging Quality of a Control Arm

Jonathan ROSS, Johannes KNUST, Arne JAGODZINSKI, Malte STONIS, Bernd-Arno BEHRENS
Institut für Integrierte Produktion Hannover gGmbH, Germany

Hybrid forging combines forming of bulky and sheet metal elements in one process step. During the forming of the bulky and sheet metal elements a joining operation is initiated by the energy provided by the forging operation. Thereby component areas with high loads can be designed using a bulky element whereas areas with lower loads can be designed using a sheet metal element. In consequence, significant weight reductions as well as energy savings within the forging process are achievable. The paper presents the development of a hybrid forging process, using a control arm as demonstration part. By the aid of Finite Element Analysis computations the interactions between the main process parameters and the target value process quality are being derived. It will be shown that the bulky element's shape has a major impact on further process parameters and that the temperature is crucial for material bonding.

IEEM16-P-0067

Optimal Preventive Maintenance for System in Time-Varying Operation Condition

Jiawen HU, Zuhua JIANG
Shanghai Jiao Tong University, China

A modified hybrid imperfect maintenance model (MHIM) for machine working in piecewise constant operational condition (PCOC) is proposed considering the limitation of traditional age-based hybrid imperfect maintenance model, with the assumption that failure time in different operational condition (OC) satisfies accelerated failure time model (AFTM). Method for estimating the parameters also has been provided. A policy based on optimization of average cost rate of former and current preventive maintenance intervals is presented. A numerical example is conducted to show the effectiveness of the proposed policy.

IEEM16-P-0283

Risk Based Inspection of Offshore Topsides Static Mechanical Equipment in Arctic Conditions

Yonas Zewdu AYELE, Abbas BARABADI
University of Tromsø - The Arctic University of Norway, Norway

As oil and gas industry expands into the Arctic, operators struggle to reduce risks and improve safety, while keeping the cost of inspection and repair to a minimum level. One of the most effective ways to minimize the inspection and repair costs is to apply risk-based inspection (RBI) methods and tools. To identify, assess and map risk of failure of equipment, a number of RBI models, techniques and standards have been developed. Most of the conventional RBI approaches are, however, broad, holistic, practical guides or road-maps, developed for off-the-shelf systems, for non-Arctic offshore operations. The main purpose of this paper is thus to discuss the peculiar modes of failure of topsides static mechanical equipment in the Arctic climate and, to suggest solutions to fill the gaps that are available in the current RBI practices.

IEEM16-P-0564

Economic Life Prediction of Repairable Multi-Component Systems Based on Extension Theory

Wenjun GONG, Yunxia CHEN, Yi YANG, Rui KANG
Beihang University, China

Economic affordability is a crucial factor for repairable systems. Previous work about economic life prediction of systems mainly concerned about cost models, regardless of system structure or components' relationship. In this paper, a new economic life prediction method has been proposed with combination of a maintenance model and an accumulative damage model. The maintenance model is to depict the repairable deteriorating components of system. Non-repairable components' degradation processes are described by the accumulative damage model. Each component failure threshold can be obtained by allocating system failure threshold based on the extensive theory. Then, the objective of minimizing total cost determines the economic life value of system. Finally, a pump example is presented to illustrate the procedures.

IEEM16-P-0677

A Conditional Test for the Exponential Distribution in Load-Sharing Systems

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Load-sharing processes are commonly used to model systems with dependent components. The exponential distribution is widely used in load-sharing systems to model the component lifetimes because of its memoryless property. Testing the exponentiality in loadsharing systems is a challenging task due to the dependent components. In this article, we develop a conditional Monte Carlo test based on a sufficient statistic to test the validity of the exponential distribution. A simulation study shows that the performance of the conditional Monte Carlo test is better than two alternative tests.

IEEM16-P-0729

Two Dimensional Maintenance Contract with Coordination Between Owner and Agent

Hennie HUSNIAH[1], Udjianna S. PASARIBU[2], Bermawi ISKANDAR[2]
[1]*Langlangbuana University, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

A two dimensional maintenance contracts with coordination between two parties is studied in this paper. The contract is applied to a dump truck operated in a mining industry. The situation under study is that an agent offers two dimensional service contract to the owner of the truck. The owner's decision to get high availability and the agent's decision to minimize the total maintenance cost are coordinated in order to reach a win-win solution. In addition, we consider the use of incentive contracts to the agent based on a combination of a target uptime level and a bonus. This is done in order to obtain a win-win situation and provides flexibility in allocating the extra profit generated from coordination.

Session	Service Innovation and Management
Date	5/12/2016
Time	13:30 - 15:00
Room	Pecatu 2
Chairs	Nur Aini MASRUROH, *Gadjah Mada University*, Soontarin NUPAP, *Mae Fah Luang University*

IEEM16-P-0468

Study on Hotel Revenue Management Without Explicitly Incorporating Competition

Nur Aini MASRUROH, Hafizha NABILA ABSARI, Yun PRIHANTINA MULYANI
Gadjah Mada University, Indonesia

Revenue Management (RM) is a common strategy to win the competition among hotel industries. Various competition models have been developed including monopoly, duopoly model, and oligopoly model. Previous research shows that oligopoly model is the best model to represent real condition. However, constructing an oligopoly model is not easy, since the data of every competitor are hard to obtain. This is what underlies the emergence of a theory explained that the model that does not incorporate competition explicitly is simpler without loosing its accuracy. Thus, this study analyzes the possibility of applying model that is not explicitly incorporate competition in hotel industries. Three scenarios are evaluated; (i) each seller understands how its own price affects its own demand but does not directly account for how its competitor's price does (known slope), (ii) each seller knows the total market size, and tries to learn how its own price affects demand, while failing to directly account for the effect of its competitor's prices (known intercept), and (iii) the seller has no information regarding parameters of demand model (unknown slope and unknown intercept). The demand is considered as stochastic. The result shows that the model that does not incorporate competition explicitly is not representative for the long run market response. It is only representative for the short-run market response. Even so, the oligopoly model still gives better results than this model.

IEEM16-P-0186

Measuring Service Productivity and Complexity in Medical Rescue Services

Markus HARLACHER, Andreas PETZ, Philipp M. PRZYBYSZ, Susanne MÜTZE-NIEWÖHNER, Christopher M. SCHLICK
RWTH Aachen University, Germany

The increasing importance of services in high-wage countries calls for a detailed examination of service productivity and complexity in current research projects. This paper describes the development of a measurement model with regard to service productivity and complexity of emergency medical services. While the measurement model of service productivity is partly literature-based, a novel construct is developed for service complexity. The reliability and validity of these constructs have been analyzed by a Germany wide survey with 400 participants. The reliability of the construct is estimated by analyzing Cronbach's alpha, inter-item correlation and item-to-total correlation. The correlation between the measurement model and a self-assessment is analyzed and a confirmatory factor analysis is conducted in order to establish the validity of the questionnaire. The results indicate that the developed constructs have sufficient reliability, although the examination of validity highlights difficulties in quantifying service productivity and complexity.

IEEM16-P-0376

Electricity-Saving Behavior Antecedents: Electricity-Saving Motivations, Constraints, Knowledge and Beliefs

Hung Chih LAI, Yao Cheng YU, Yi-Min TUAN
National Taiwan University, Taiwan

The purpose of this study is to understand how positive and negative factors influence people on performing electricity-saving behaviors in households based on the MOA theory and "Green Consumption Behavior Model". Research data were collected through a professional market survey, in which the 1,067 sampling respondents represent the characteristics of Taiwanese population. This study found that, through structural equation modeling, coefficients of most of the paths in the model were significant, with only one exception. In addition to positive and negative factors, effectiveness of intervening variables (such as "electricity-saving knowledge and beliefs") worth discussion because of their impacts on dependent variables (such as "sustaining electricity-saving behavior"). Consequently, the effectiveness of direct paths seemed preferable to that of indirect paths.

IEEM16-P-0385

Characterization and Empirical Analysis of Variety-Induced Costs in Integrated Product-Service Systems (PSS)

Guenther SCHUH, Michael RIESENER, Jan KOCH, Stefan BREUNIG, Jan KUNTZ
RWTH Aachen University, Germany

In this paper a framework for the categorization of cost drivers in product-service systems is presented. Cost drivers were derived in a literature research and allocated to the corresponding categories within the product or service domain. The significance of the identified cost drivers was validated by an empirical study analyzing the impact of cost drivers on the organization. The study particularly focused on companies providing a portfolio that was combined by products and services. Moreover, companies were grouped into companies providing a product-dominated portfolio, a service-dominated portfolio and a balanced portfolio of products and services with equal importance. The results indicate that variety-induced costs for products predominantly occur in activities in Sales, Engineering and Quality Assurance, while service provision, for instance, is affected by short-term changes and coordination efforts.

IEEM16-P-0467

An Integration of Function- and Affordance-Based Methods for Product-Service System Utilizing Finite State Automata

Hyunwoong KO[1], Seung Ki MOON[1], Kristin L. WOOD[2], Hyung Sool OH[3]
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Manufacturing and service sectors are evolving towards achieving a design of a systemically integrated product-service system (PSS). While there exist limitations, we propose an integrative design architecture and a design method for PSSs. For the integrated architecture, our study adopts the concepts of functions and affordances as fundamentals of PSS designs to achieve both the product and life-cycle related service design specifications. Also, finite state automata is applied to the modeling of the integrated PSS to add computations into the method. While the discussions on an automotive system shows the method's advancement as a PSS design tool, it is expected that this study will provide engineering designers and managers with a structured method that can be consistently applied through different PSSs life cycles.

IEEM16-P-0523

Identification of Variant-Creating Factors in Product Service Systems

Guenther SCHUH, Jan KUNTZ, Katharina HEEG, Philipp JUSSEN, Jan KOCH, Stefan BREUNIG
RWTH Aachen University, Germany

Nowadays, providing purchasable goods is not enough for a company to survive on the global market. Because of competitive prices and a large range of products available, companies need to offer additional benefits to their customers in order to create a unique selling point. They add services to their product portfolio and offer clients the opportunity to acquire an additional service solution to go with it. The offered services need to fit to the customer´s needs, resulting in a variety of available services, great com-plexity of the service range and decreasing transparency of the resource utilization. This paper addresses the problem by identifying variant-creating factors in product service systems, transferring them into an organizational framework and verifying their significance.

IEEM16-P-0660

Software Development of a Catalogue of Engineering Symbols as an Add-On Facility for Use in CAD

Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

Production of engineering drawings have evolved from manual to Computer Aided Design (CAD), primarily for the speed and accuracy presented by CAD. Unlike modelling and simulation packages that are equipped with building blocks, CAD packages are generally supplied with no pre-drawn symbols. From best practices in industrial engineering and working for companies that make use of CAD systems, evidently a lot of time is spent in repetitive tasks in the development of engineering drawings. An industrial engineering approach was adopted in this research where programming was used as a separate process from any specific application to an organization through the creation of a catalogue of almost 500 commonly used engineering symbols and storing them in a database, coupled with an add-on facility for AutoCAD for easy retrieval, aimed at avoiding these repetitive tasks, hence facilitating the rapid production of drawings to improve productivity and efficiency when using CAD systems.

Session	Technology and Knowledge Management 1
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 1
Chairs	Weng Marc LIM, *Swinburne University of Technology*, TMA ARISAMADHI, *Bandung Institute of Technology*

IEEM16-P-0084

Enhancing the Sense of Power and User Adoption in Gerontechnology: An Experimental Investigation of Near-Field Communication Lighting Systems

Weng Marc LIM[1], Pei-Lee TEH[2], Pervaiz Khalid AHMED[2], Alan H.S. CHAN[3], Soon-Nyean CHEONG[4], Wen-Jiun YAP[4]
[1]*Swinburne University of Technology, Malaysia*
[2]*Monash University, Malaysia*
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[4]*Multimedia University, Malaysia*

Through the method of experimentation and multiple rigorous statistical analyses, this study exposes a sample of older adults to a near-field communication (NFC)-enabled gerontechnology in the form of an NFC lighting system (NLS) and examines their ease-of-use and usefulness evaluations of NLS, along with the subsequent impacts of these evaluations on their sense of power and intentions to use and recommend NLS. Findings suggest that (1) gerontechnology that is easy to use and useful enhances the sense of power among older adults and that (2) by having a greater sense of power, older adults will have a higher tendency to use gerontechnology as well as recommend the use of gerontechnology to others.

IEEM16-P-0484

Relationship Among Individual Factors, Knowledge Sharing, and Work Performance: A Model from Baby Boomers, Generation X, and Generation Y Perspective

Amelia KURNIAWATI[1], T. M. A. ARISAMADHI[2], Iwan Inrawan WIRATMADJA[2]
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[2]*Bandung Institute of Technology, Indonesia*

Knowledge sharing has emerged as a core process of knowledge management. By doing knowledge sharing, organization can solve problems and improve individual work performance of its member. Individual members involved in knowledge sharing have different characteristics. These characteristics related to the role in knowledge sharing, which are knowledge provider and knowledge receiver. Besides the characteristics related to the role in knowledge sharing, individual members of the organization consist of various ages. The age differences is classified into generations. The common generations which exist in current workplace are baby boomers, generation X, and generation Y. This research develops a model which investigates relationship among individual factors, knowledge sharing, and individual work performance, in different generations. The data only support that there is relationship among knowledge receiver characteristics, online knowledge sharing, and individual work performance.

IEEM16-P-0022

Impact of Tacit and Explicit Knowledge on Knowledge Sharing at Indonesian Small and Medium Enterprise

Augustina Asih RUMANTI, T. M. A. ARISAMADHI, Iwan Inrawan WIRATMADJA
Bandung Institute of Technology, Indonesia

Tacit knowledge is an asset that kept within individual while explicit knowledge that can be documented directly an organization. Tacit and explicit knowledge is an important factor in the development of knowledge sharing within an organization. The object of observation in this study is Small and Medium Enterprises (SMEs), in which knowledge sharing is important to help cooperate with other SMEs in a particular area because generally SMEs in Indonesia growing and developing together in the cluster. The main objective of this research is to analyze the impact tacit knowledge and explicit knowledge on knowledge sharing. Tacit knowledge, explicit knowledge and knowledge sharing are the constructs or latent variables that will be analyzed. Respondents in this study were all individuals who are in SMEs include the owners. The results of this study indicate that each indicator in each construct the model has good validity value, reliability and high level of significance. This shows that the tacit knowledge of each individual in SMEs and explicit knowledge stored by SMEs need to be considered to achieve optimal knowledge sharing process.

IEEM16-P-0454

Web Usability and Self-Efficacy in Promoting Individual Knowledge Sharing

Ceicalia TESAVRITA[1], Kadarsah SURYADI[2], Iwan Inrawan WIRATMADJA[2]
[1]*Universitas Katolik Parahyangan, Indonesia*
[2]*Bandung Institute of Technology, Indonesia*

Nowadays, many organization used a Knowledge Sharing (KS) systems that is supported with ICT's. Many previous research used a combination of Technology Acceptance Model (TAM) into social capital theory to describe user's KS behavior. This research used a different approach in measuring technology aspect in KS. Technological aspect was measured by usability concept that has five indicator, that are usefulness, efficiency, effectiveness, learnability, satisfaction. The model also considered user's self-efficacy in knowledge sharing. Questionnaire was distributed to 144 academics staff in several university in Bandung. From the final model it can be concluded that both self-efficacy and system's usability has a significant positive correlation with knowledge sharing. The data was divided into three group that represent three different work forces generation. Path analysis was done for each group and the final model showed that each group has different output.

IEEM16-P-0521

The Effects of R&D Engineers

Hideki SHIMIZU-TANAKA
Aomori Public University, Japan

This paper aimed to present the evidence of (1) how job demand and job resource affected on R&D engineers' work engagement and depression, and (2) whether job resources and work engagement facilitated R&D engineers' positive attitude to knowledge sharing at their workplace. We collected from over 400 Japanese R&D engineers and analyzed them for the relation among job demand, job resource, work engagement and depression. Also, we tested the effect of work engagement and workplace climate on positive attitude to knowledge sharing. From the results by statistical analyses, while job demand partly had negative impacts on R&D engineers' work engagement and depression, job resource has significant positive impacts on work engagement and partly a positive impact on depression. In addition, work engagement has strong positive impacts on attitude to knowledge sharing behavior and the interaction between work engagement and supervisors' support has positive on knowledge sharing. Therefore, we concluded that workplace climate and work engagement were important for positiveness for knowledge sharing, and we should pay more attentions on workplace climate and R&D engineers' work engagement for enhancing knowledge sharing behavior.

IEEM16-P-0664

Applying Balanced Scorecard for Quality Assurance in Educational Management: A Case Study of a Research Group in a University

Soontarin NUPAP
Mae Fah Luang University, Thailand

Quality assurance (QA) in education of university management is one of the main concerns for every university in Thailand. The royal Thai government (RTG) has assigned the Office of the Higher Education Commission (OHEC) to regulate the OHEC QA standard and has used it for controlling the educational quality of each school in universities working under its control. Therefore, every university in Thailand has put substantial energies into the performance assessment improvement responsibilities. The case study is a research group working under the school of a university controlled by the RTG. This paper aims to create a framework for the case study by applying the BSC in order to improve the performance of the OHEC QA standard in element number 4, "research" , indicator number 3, "research or creative artworks subsidy or funding per number of full-time lecturers and researchers". It demonstrates the approach in which the managerial tool initially implemented for improvement in the corporation sector facilitates educational management.

IEEM16-P-0357

Evolution of Product Design and Development Process on Organizational Growth Stages : A Knowledge Management Strategy

Made ANDRIANI, Kadarsah SURYADI, T. M. A. ARISAMADHI, Joko SISWANTO
Bandung Institute of Technology, Indonesia

This study aims to develop a model formulation of a knowledge management strategy based on the characteristics of organization growth stage and business processes are executed. Model development was done by studied the literature on previous researches related to the organization growth stages, business process models, especially the design process and product development, as well as knowledge management strategy models. Process characteristics identification was done using two dimensions, namely actors and decision makers in the product design and development process, and the period of implementation of design and development products. The conceptual model was validated by using a historical case study on a fashion company. The results showed that different characteristics of the growth stages causes the differences in the characteristics of business processes were executed. Therefore, every growth stage requires a different knowledge management strategy.

Session	Operations Research 2
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 2
Chairs	Juergen ZIMMERMANN, *Clausthal University of Technology*, Zhe ZHANG, *Nanjing University of Science and Technology*

IEEM16-P-0293

A Two-Stage Heuristic Approach for Solving the Long-Term Unit Commitment Problem with Hydro-Thermal Coordination in Large-Scale Electricity Systems

Alexander FRANZ, Juergen ZIMMERMANN
Clausthal University of Technology, Germany

Within this study, we consider a long-term planning and scheduling problem for thermal power plants and renewable energy sources, for which a customer demand has to be entirely balanced at minimized operating costs. The problem is enhanced by adding pumped storages, where water is stored in reservoirs, being turbinated, or pumped when necessary. Besides an enhanced tight mixed-integer linear programming model for the well-known unit commitment problem with hydro-thermal coordination, we present a new decomposition methodology. The two-stage decomposition first performs an isolated dispatching of thermal plants using a greedy algorithm, rule-based algorithms, and local optimization steps, followed by a re-optimization stage in order to embed energy storages into the final solution. The iterative two-stage heuristic approach is able to find outstanding feasible schedules for large-scale real-world electricity systems as well as near-optimal solutions for benchmark instances in a few minutes of computation time using a standard PC.

IEEM16-P-0181

Relationship between Overall Equipment Effectiveness, Throughput and Production Part Cost in Semiconductor Manufacturing Industry

Chong KUAN ENG[1], Kam-Choi NG[2]
[1]*Technical University Malaysia, Malaysia*
[2]*Infineon Technologies, Malaysia*

Globalization and highly competitive business environment are pushing many organizations to realize numerous productivity improvement efforts in order to continue to survive. To gain competitive advantage, manufacturing organizations are compelled to adopt productivity enhancement programs such as total quality management (TQM), total productive maintenance (TPM), lean manufacturing concept to achieve operational excellence. Overall Equipment Effectiveness (OEE) is a well accepted production performance measure to gauge the equipment effectiveness. OEE is defined as how much the equipment is performing to meet the production planned target. OEE, in manufacturing is merely a percentage figure to evaluate how effective the manufacturing equipment is utilized. OEE is not directly linked to profitability. Most companies do not associate increases or decreases in OEE to financial performance. This paper presents the relationship between OEE, production throughput and production part cost in order to express and translate OEE in monetary units.

IEEM16-P-0306

Formulation of Service Network Design with Time Requirements to Schedule Heterogeneous Fleet

Zujian WANG, Mingyao QI
Tsinghua University, China

To satisfy specific real-life demand of freight transportation carriers, this paper proposes an arc-based formulation for service network design with time requirements to schedule heterogeneous fleet. The computational study indicates the validity of the formulation both academically and practically. The results shows that heterogeneous fleet is essential to tactical planning for increasing the loading rate of vehicles and reducing the waste of resources.

IEEM16-P-0398

A Heuristic Algorithm for Maximizing the Total Weight of Just-In-Time Jobs Under Multi-Slot Conditions

Ryo SAITO, Eishi CHIBA
Hosei University, Japan

Maximizing the total weight of just-in-time jobs under multi-slot conditions was proven recently to be NP-hard. We consider a heuristic algorithm for this problem. First, we compute a schedule that minimizes the number of time slots. Next, we make a new set of jobs by merging existing jobs in the schedule. Then, we compute a minimum cost flow for the network constructed from this new set of jobs. Finally, we obtain a feasible schedule from the flow. Moreover, we implement the heuristic algorithm, and consider its features and performance from the computational experimentation.

IEEM16-P-0330

A New Solution Representation for the Rectilinear Block Packing Problem

Ken MATSUSHITA[1], Yannan HU[1], Hideki HASHIMOTO[2], Shinji IMAHORI[3], Mutsunori YAGIURA[1]
[1]*Nagoya University, Japan*
[2]*Tokyo University of Marine Science and Technology, Japan*
[3]*Chuo University, Japan*

The rectilinear block packing problem is a problem of packing a set of rectilinear blocks into a larger rectangular container, where a rectilinear block is a polygonal block whose interior angles are either 90◦ or 270◦. This problem has many applications, such as VLSI design and timber cutting. In this paper, we propose a new solution representation, based on an order of items, to decide a layout of rectilinear blocks whose x-coordinates are fixed. When the shapes of given items have certain characteristics, our representation guarantees optimality. We also generalize this result to the case of general shapes. We then propose an exact algorithm that iteratively generates x coordinates of items and finds the corresponding optimal layout. The computational results show that our algorithm obtains five exact and one heuristic solutions for six instances and it improves the running time of an existing algorithm.

IEEM16-P-0417

Facility Location and Routing Decisions for a Food Delivery Network

Niraj Ramesh DAYAMA, Mohan KRISHNAMOORTHY
Monash University, Australia

This paper addresses the problem of designing efficient logistical arrangements for preparation and delivery of edible food (by a voluntary organization). The short shelf-life of edible, ready-to-eat food items complicates the provisioning and distribution networks. The design of the underlying logistical system constitutes an interesting combinatorial optimization problem. Our paper explains the problem background and rigorously defines the underlying mathematical problem. Thereafter, we develop a set of algorithms/techniques (exact and heuristic) to solve the problem faster. We blend the stronger lower bounds (obtained from an alternate MIP formulation) with better upper bounds (obtained using a fast and efficient heuristic approach) to develop a new exact technique. We report the detailed results from computational analysis of our new techniques.

IEEM16-P-0065

Improving Column Generation Methods or Sheduling Problems Using ZDD and Stabilization

Roel LEUS, Daniel KOWALCZYK
KU Leuven, Belgium

In this work we tackle the parallel machine scheduling problem with identical machines to minimize the sum of weighted completion times.We study the set covering formulation for this problem that was introduced by van den Akker et al. [1], and improve the performance of their branch-and price algorithm by a number of techniques, including zero suppressed binary decision diagrams (ZDD) and stabilization. These techniques are sufficiently generic to be promising also for other scheduling problems.

Session	Supply Chain Management 2
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 3
Chairs	Yi-Hui LIANG, *I-Shou University,* Sobhan ASIAN, *RMIT University*

IEEM16-P-0070

Applying the Volatility Models for Supply Chain Forecasting: The Case of the Taiwanese TFT-LCD Industry

Yi-Hui LIANG
I-Shou University, Taiwan

The bullwhip effect denotes that an augment in demand variability on the supply chain can enlarge its influences through an undertaking's supply chain. The question of forecasting is very important in upstream industrial background because the upstream partners look to be decreased from downstream consumer demand. The supply chain forecasting system must ponder the volatility of demand. The purpose of this study is to supply the volatility models for supply chain forecasting. This study uses the model for production forecasting of Taiwanese TFT-LCD industry. The results illustrate that the proposed volatility GARCH models ameliorate the prediction accuracy for production forecasting in the supply chain.

IEEM16-P-0156

Capacity Investments and Technology Decisions Under Regulatory Uncertainty

Tarun JAIN, Jishnu HAZRA
Indian Institute of Management, India

Understanding the capacity investment and technology decisions is vital for a firm particularly due to the fact that not meeting regulatory restrictions or insufficient investments could hurt the firm in the long run. Our aim in this paper is to study the investment decisions of companies considering potential risks of regulatory uncertainties that could alter previous investment decisions. We consider a firm facing random demand and uncertainties in the design regulatory standards. We find the firm's capacity investments and technology selection decisions to mitigate potential risks of regulatory uncertainties and demand uncertainties.

IEEM16-P-0204

Correlation of Barriers to Reverse Logistics Performance Using Structural Equation Modeling

Pornwasin SIRISAWAT, Tossapol KIATCHAROENPOL
King Mongkut's Institute of Technology Ladkrabang, Thailand

The main aim of this research is investigate the relationship between reverse logistics barriers and reverse logistics performance measurement of electronics industry in Thailand. A conceptual model is developed by proposing eight hypotheses. The model is examined using structural equation modeling (SEM). Data are collected via a distributed questionnaire to electronic companies of Thailand. The interesting relationship between reverse logistics barriers and reverse logistics performance are found.

IEEM16-P-0718

A Review of Supply Network Configuration Literature and Decision Support Tools

Subodha DHARMAPRIYA, Senevi KIRIDENA, Nagesh SHUKLA
University of Wollongong, Australia

Supply chain literature highlights the increasing importance of effective supply network configuration decisions that take in to account such realities as market turbulence and demand volatility, as well as ever expanding global production networks. Supply network configurations decisions that account for these contingencies are expected to meet the evolving needs of customers while delivering better outcomes for all parties involved. This paper presents the findings of a structured review of supply network configuration literature which is synthesized under the two categories, drivers of supply network configuration decisions and the key parameters considered in developing decision support tools. This review also included an evaluation of the tools used for supporting supply network configuration decisions. The paper identifies the areas for future research, as well as the decision support tools required for building supply network capacity to meet the challenges brought about by the changing business environment.

IEEM16-P-0010

Modeling Disruption Propagation in a Complex Supply Chain

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[2]*Nanyang Technological University, Singapore*
[3]*Agency for Science, Technology and Research (A*STAR), Singapore*

A methodology to ascertain the impact of disruption downstream of the point of disruption is proposed. Two parameters were defined to quantify the extent of disruption in any node in the Supply Chain (SC), including the end customer. A complex SC network consisting of two sub-nets is discussed as an illustration of the methodology. Two experiments were then conducted: (i) disruptions at a single, double and triple nodes and (ii) the propagation of the disruption and its impact on end consumers throughout the simulation timeline. The results indicate that the impact of disruptions at a single, double and triple node can yield insight into their relative significance. The propagation of the disruption downstream gives a visual feel for the severity of the impact over the simulation timeline. The work discussed can be adopted by SC manufacturers to plan and monitor their SC operations.

IEEM16-P-0366

Self-Assembly of Supplier Selection Strategies

Gabriel YEE[1], Yew Soon ONG[2], Puay Siew TAN[1]
[1]*Singapore Institute of Manufacturing Technology, Singapore*
[2]*Nanyang Technological University, Singapore*

This paper focuses on the formation of supplier selection strategies that are used in an operational context. Because of the nature of the modern day environment, designing and forming good strategies is a difficult and laborious task. The goal of this paper is to showcase our work on implementing an algorithm that is capable of self-assembling a strategy without the need for explicit knowledge or assumptions about the known information about an environment. To our best knowledge, this is the first time that self-assembly - a common phenomenon in nature - is proposed as an approach to forming strategies for use in supply chains.

Session	Quality Control and Management 1
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 5
Chairs	Ville ISOHERRANEN, *University of Oulu*, R.M. Chandima RATNAYAKE, *University of Stavanger*

IEEM16-P-0058

Operational Excellence Evaluation Model for SMEs and Regional Findings

Ville ISOHERRANEN[1], Eija-Riitta NIINIKOSKI[1], Tapio MALINEN[2], Martti JOKINEN[2], Pekka KESS[1], Minna Katariina KARKKAINEN[1]
[1]*University of Oulu, Finland*
[2]*Centria University of Applied Sciences, Finland*

Excellence of operations can support all selected strategies. Process excellence is fundamental for companies to be able to implement a chosen strategy. Small and medium size enterprises (SMEs) in the manufacturing industry are no exception to this rule, but the framework to review their processes' maturity has not been widely examined. This study presents a maturity model developed especially for SMEs and discusses the results from are view conducted using this model. The presented model has three dimensions (production, sourcing and sales); each of the dimensions is constructed from six process factors. This tool has been developed to construct a light and fast evaluation model adapted to the resource and time constraints of SMEs, and resulting in actionable analysis of the process maturity and excellence. Results show that the framework can produce relevant information, builds a baseline for companies' operational excellence improvement actions, and enhances companies' strategy operationalization.

IEEM16-P-0609

Software Test Estimation Tool: Comparable with COCOMOII Model

Shaiful ISLAM[1], Bishwajit Banik PATHIK[1], Manzur H. KHAN[2], Md. Mamun HABIB[3]
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[2]*Universiti Utara Malaysia, Bangladesh*
[3]*BRAC University, Bangladesh*

This study illustrates an estimation tool for software test that provides the estimated time and the cost of any sort of software test project. There are different well-recognized estimation tools for software development process [9], however, there remains a lack of standard tools for estimation of Software Test phase. Therefore, the authors developed a web base tool (www.4beats.net/tpet/) in order to determine the time and cost of projects. This paper highlights the comparable result with COCOMOII (Constructive Cost Model) model. More than 22 projects are already estimated by this open tool and from them 5 case projects, namely, Climate Resilient Ecosystems and Livelihood (CREL), Management Accounts Consolidation System for Line Director (LDMACS), PBI (Police Bureau of Investigations) Works Management System Software, PBI Mobile Apps and Human Resources Management System (HRMS) have selected. This paper would play a vital role to estimate time and cost for software test project and be beneficial for the software industry.

IEEM16-P-0047

A Self-Starting Control Chart for Simultaneous Monitoring of Mean and Variance of Autocorrelated Simple Linear Profile

Amirhossein AMIRI, Reza GHASHGHAEI, Peyman KHOSRAVI
Shahed University, Iran

Sometimes, quality of a process can be described by a functional relationship between response variables and explanatory variables which called profile. In some situations, there is an autocorrelation structure within a profile. Most of the times in real practice there is no enough data to estimate the process parameters. In this case, we can use a self-starting control chart which does not need preliminary data to start monitoring in start-up stages. In this paper, we consider a simple linear profile in the presence of a first order autoregressive (AR(1)) autocorrelation structure within profile and propose a self-starting control chart to monitor mean and variance of a simple linear profile simultaneously.

IEEM16-P-0169

The Effects of Violations of Assumptions in Multivariate Shewhart Control Charts

Sudarat NIDSUNKID[1], John BORKOWSKI[2], Kamon BUDSABA[1]
[1]*Thammasat University, Thailand*
[2]*Montana State University, United States*

In manufacturing processes, a vector of multiple responses is often monitored to assess if the process is in-control. A multivariate Shewhart control chart is one method of monitoring the mean vector. If the chi-square statistic exceeds an upper control limit (UCL), then an out-of-control signal occurs. The average run length (ARL) is used to determine the UCL value. ARLs have been estimated under an assumption of a multivariate normal (MVN) assumption. This research explores the sensitivity of ARLs when the MVN assumption is incorrect. ARLs for data from Multivariate t, lognormal, uniform, and beta distributions are estimated and compared to ARLs under the MVN assumption.

IEEM16-P-0439

Design of Gamma Control Charts Based on the Narrowest Confidence Interval

Songhua HAO[1], Shuo HUANG[2], Jun YANG[1]
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[2]*City University of HongKong, Hong Kong SAR*

In statistical process control, Gamma control charts are often designed for time-between-events (TBEs) monitoring. For Gamma distribution, the traditional equal-tail probability limits lead to the problem that some out-of-control events may occur in higher probability than in-control events. To overcome this problem, Gamma control limits with known parameters are proposed based on the narrowest confidence interval. Simulation and case study show that the proposed Gamma control limits outperform the conventional equal-tail probability limits, since the proposed Gamma control charts have shorter width and are more sensitive to detect the increase of parameter than the traditional ones.

IEEM16-P-0524

Monitoring Categorical Processes by Integrating Ordinal Information

Junjie WANG[1], Jian LI[2], Qin SU[2]
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[2]*Xi'an Jiaotong University, China*

It is quite common that the quality is measured by a categorical factor, which is classified into several ordinal levels. Usually, a specific multinomial distribution is utilized to characterize the counts corresponding to each level. However, it neglects the order among the factor levels and a control chart based on it may fail to achieve ideal performance. In this work, the ordinal information is incorporated into a log-linear model, based on which, a Phase II control chart is developed via generalized likelihood ratio test to monitor the ordinal categorical data. The comparative study shows the superiority of the proposed method to that without account of the ordinal information.

IEEM16-P-0646

Assessing the Raters Agreement in the Diagnostic Catheter Tube Connector Production Process Using Novel Fuzzy Similarity Coefficient

Magdalena DIERING[1], Krzysztof DYCZKOWSKI[2]
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[2]*Adam Mickiewicz University, Poland*

The aim of the paper is to present the authors' novel approach to methodology for assessing the level of raters agreement (process operators, quality controllers and/or experts) and its interpretation, that is the methodology for study of reliability for qualitative characteristics. Both mathematical tools and study organizational guidelines are discussed. The method is based on the novel fuzzy similarity coefficient SC. The proposed methodology was used in a measurement system study for attributes of a tube connector of Swan-Ganz catheter production process.

Session	Human Factors 2
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 6
Chairs	Markus HARTONO, *University of Surabaya*, Titis WIJAYANTO, *Universitas Gadjah Mada*

IEEM16-P-0423

Indonesian Anthropometry Update Through Drillis & Contini Revisited and Structural Equation Modeling Incorporating Children, Adult and Elderly Populations

Markus HARTONO
University of Surabaya, Indonesia

Research on anthropometry deals with human physical measurement, capability and limitation. Due to various body measures of user of different cultures, gender, and geographical factors, then an understanding of anthropometry characteristics is a must. This study adopts Drillis and Contini ratio scaling method and complements the previous research by incorporating Indonesian adults [150 subjects], children [200 subjects] and elderly [120 subjects] groups. By employing Structural Equation Modeling (SEM), it was shown that limb and girth & width segments were significantly correlated with stature and weight, respectively to all population groups, both for male and female subjects. Moreover, it was confirmed that the ratio scale method has been sufficiently applied to all anthropometric groups, so that the body segments measures can be predicted. Practically, the finding can be utilized to support product design and development phases, especially in the use of more appropriate anthropometric data.

IEEM16-P-0514

Effects of Morning-Night Differences and Sleep Deprivation on Situation Awareness and Driving Performance

Titis WIJAYANTO, Sunu WIBIRAMA, Zakian Zakaria MARYOTO, Mumtaz Naufal WINADI, M. BAHIT
Universitas Gadjah Mada, Indonesia

The purpose of this study was to investigate the effect of morning-night differences and sleep deprivation on situation awareness and driving performance. Twelve male students (mean of age 21.0±0.7 years old) participated in this study. They drove in following driving scenarios under three conditions: night condition, morning condition with and without sleep deprivation, on a driving simulator. Statistical analysis on situation awareness (SA) data shows that morning-night differences and sleep deprived condition during driving significantly affect Level 1 SA ($F(2,22)=18.54$, $P<0.01$), Level 2 SA ($F(2,22)=14.47$, $P<0.01$), and Level 3 SA ($F(2,22)=4.54$, $P=0.03$). There are also significantly higher risky driving behavior score when driving in the morning with sleep deprived condition, as compared to driving in the Morning with proper sleep ($P<0.01$). The results of this study suggested that sleep deprivation or driving at night produced a degradation of situation awareness and a higher risky driving behavior.

IEEM16-P-0378

Identifying the Visual Interference by Design and Tactile Properties of Leathers Using Automobile Interior

Wonjoon KIM, Gee Won SHIN, Joong Hee LEE, Yushin LEE, Myung Hwan YUN
Seoul National University, South Korea

This study investigates the difference in tactile sensory response when touching leathers under tactile-only and visuo-tactile environment. Total of 7 tactile variables for leathers were selected and utilized to investigate whether they derive significantly different tactile response by existence of visual interaction. As a result, affective variables of 'rugged', 'elastic', and 'thick' showed significant difference in response by varying context. Besides, the level of design variables also led the difference in tactile-only and visuo-tactile response. Increment in level of emboss spacing and young's modulus led larger difference between the two contexts, and thickness made difference in its all levels. Overall, it is possible to grasp the influence of visual interaction when evaluating the leathers for automobile interior, and verify the difference made by changes in design variables.

IEEM16-P-0486

Community Behavior During the Evacuation of Mount Merapi Eruption Disaster

Dwi HANDAYANI, Muhammad Kusumawan HERLIANSYAH, Budi HARTONO, Bertha Maya SOPHA
Gadjah Mada University, Indonesia

This paper explains attributes that can affect people's behavior in evacuation decision-making from Mount Merapi eruption, starting from pre-evacuation phase, vehicle selection phase, to evacuation route selection phase to reach a safe point. These factors were obtained through previous research, relevant to the characteristics of communities around Mount Merapi in facing an emergency evacuation from Mount Merapi eruption. Located in the Special Region of Yogyakarta, Indonesia, Mount Merapi is one of the most active volcanoes in the world which has aunique type of eruption and culture of surrounding communities. In the last stage, this paper also provides guidelines for analysis methods which can be used to solve emergency evacuation problems in order to minimize victims.

IEEM16-P-0601

How to Define the User's Tolerance of Response Time in Using Mobile Applications

Ronggang ZHOU[1], Shuang SHAO[1], Wen LI[2], Lei ZHOU[2]
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[2]*China Mobile Research Institute, China*

System response time can greatly affect the user experience. Society has entered the mobile Internet era, and in mobile applications, as carriers of the mobile Internet, response time is an important performance index related to users attention. Previous studies of user experience of response time have focused more on computers and websites and less on mobile applications. The current study develops an evaluation program for researching user experience of response times in mobile applications; this simulation enables users to give subjective evaluations. The results indicate the following: (1) with an increase in response time, evaluation scores gradually decrease; (2) the relationship between response time and the subjective experience of users fits a logarithmic function, which can provide relevant references for determining mobile applications response time; and (3) this article provides insight into performance standards related to response time for mobile applications.

IEEM16-P-0636

Designing Meaningful User Experiences: Interactive Learning Experience Model

Simon KREMER, Tony SIES, Udo LINDEMANN
Technical University of Munich, Germany

User Experience Design (UXD) addresses the increasing importance of emotional aspects in user product interaction and aims at creating holistic experiences. While UXD is a rather young field within product development, other disciplines outside engineering design (e.g. gaming, sports) traditionally focus on fascinating their users. Based on the approach of transferring insights from experience focused disciplines to UXD we aim at specifying the experience trigger "Learning". Starting with analysis of general learning theory, we developed the "Interactive Learning Experience Model". This model supports analysis and concept development for meaningful learning experiences in user product interaction. We applied and initially validated the model in a product development project for dish care concepts.

Session	Decision Analysis and Methods 1
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 7
Chairs	Yves DE SMET, *Université libre de Bruxelles*, Siana HALIM, *Petra Christian University*

IEEM16-P-0081

On the Use of Reference Profiles to Compute Alternative PROMETHEE II Rankings: A Preliminary Study

Nguyen Anh Vu DOAN, Yves DE SMET
Université libre de Bruxelles, Belgium

Engineering decision problems often involve the simultaneous optimization of several conflicting criteria. Among multicriteria decision aid methods, PROMETHEE has gained a lot of attention during the last three decades. Despite its successful application in different fields, some researchers have emphasized that PROMETHEE does not respect the independence to third alternatives assumption. This leads to the so-called "rank reversal" phenomenon (potential manipulation threat); the relative position of two alternatives may depend on a third one. In this paper, inspired by the ideas of reference profiles to establish rankings, we propose a new way to compute an alternative PROMETHEE II ranking that does not suffer from rank reversal (common basis for the pairwise comparisons for all the alternatives). We show on an illustrative example the results given by this new method and observe that the obtained ranking is compatible with the one established with the classical PROMETHEE II method.

IEEM16-P-0087

Group Decision Using Analytical Hierarchical Process: Surabaya's Universities Library in Digital Natives Perspective

Siana HALIM[1], Felecia FELECIA[1], Dian WULANDARI[2], Fransica Lucy SUSANTI[1]
[1]*Petra Christian University, Indonesia*
[2]2*Petra Christian University Library, Indonesia*

In recent years the numbers of out of shelves books in the Surabaya's universities library is decreasing. This is not a surprising phenomenon. The digital natives, as the primary customers of the library, are generation which always connect to the world through their gadgets. Library which in the past was the solely place for searching the information is no longer the source of finding the information. Using analytical hierarchy process for groups, we investigated the representative library of the digital natives, particularly in six universities in Surabaya. Additionally, we also proposed a correction to the geometric mean which usually used to represents the scale for the group.

IEEM16-P-0235

A Ranking Method for Large Scale Competitions Based on Sample Grouping

Hsiang-Ching WANG[1], Yi-Feng HUNG[1], Hsiang-Hui HUNG[2]
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[2]*Chien-Kung Senior High School, Taiwan*

In a large scale competition, the number of participants is too large to be completely reviewed by any evaluator, so dividing entire participants into several groups such that each of the evaluator reviews only a group serves as an alternative. However, in this case, an evaluator reviews and ranks only a portion of participants and the final result might be distorted. The focus of this study is on the methods of grouping participants and assignments of subgroups to evaluators. Under the assumption of not increasing the workload of evaluators, this study proposes a new method called sample ranking method, which according to simulation experiments yields better results than the commonly used ranking method.

IEEM16-P-0052

A Cloud-Based Approach to Specifying New Components in Open Configuration

Linda ZHANG
IESEG School of Management, France

Open configuration is proposed to assist companies in configuring products that can meet both unforeseen and predefined customer requirements. This study investigates the open configuration process and proposes an approach based on cloud computing. Based on a cloud, the open configuration process includes three sub-processes: new component specification, constraint processing, and component modification and refinement. This study sheds light on the details of new component specification sub-process. Laptop computer open configuration is used to demonstrate how new components are specified.

IEEM16-P-0030

A Method to Group Reliability Data by Hierarchical Clustering

Sheng KANG, Wei-Ting Kary CHIEN
Semiconductor Manufacturing International (Shanghai) Corporation, China

We present an approach of reliability data grouping by the hierarchical clustering method, which is useful for the analysis of reliability result for semiconductor devices. The purpose of this method is to effectively group a series reliability test result based on its characteristics in multiple dimensions. The Ward's method is well recommended to be used for distance definition. According to the grouping result by hierarchical clustering method, the analysis can help identify what data is the baseline performance, and the rest outlier can be further analyzed for special handling, such as a process tool's excursion or a test abnormality. A series of reliability test data of the EM (Electro Migration) for one technology in an 8-inch semiconductor wafer manufactory as an example shows the effectiveness on grouping based on 4-dimension clustering analysis. Moreover, a reliability monitoring flow is developed to feasibly fulfil the clustering method.

IEEM16-P-0734

Sustainable Maintenance Performance Evaluation Model for Cement Industry

Elita AMRINA, Dhova ARIDHARMA
Andalas University, Indonesia

This paper develops an evaluation model of sustainable maintenance performance for cement industry. It begins with a literature study to identify the indicators of sustainable maintenance performance in cement industry. The indicators are then validated by industry practices. As a result, a total of sixteen indicators in terms of economic, social, and environmental aspects have proposed. Furthermore, a network relationship model is constructed using Interpretive Structural Modeling (ISM) method. Finally, the importance weight of the indicators is determined using Analytic Network Process (ANP) method. The results show the occupational health and safety is regarded as the most important indicator, while the work ability as the least important indicator. It hoped the model can aid the cement companies in improving their sustainable maintenance performance as well as increasing the company's competitiveness.

IEEM16-P-0692

Human Capital, Social Capital and Innovation Outcome: A Systematic Review and Research Agenda

Arie Restu WARDHANI[1], N. ACUR[2], K. MENDIBIL[2]
[1]*University of Strathclyde, United Kingdom*
[2]*University of Stirling, United Kingdom*

Many previous studies investigate the effect, process and the performance of innovation. However, the relationship between human capital (HC), social capital (SC), and innovation outcome is still limited. Therefore, this paper aims to present a systematic literature review on identifying the relationship between HC, SC, and innovation outcome over the past three decades (1985-2016). This review also identifies the gaps and future agenda. From 43 relevant papers, we find positive and negative effect of HC and SC to innovation. As well as, we identify the knowledge management orientation, entrepreneurial orientation and culture orientation as the driver of innovation outcome. Finally, we construct the conceptual framework that would be a starting point of strategy development in innovation management to attain the competitive advantage.

Session	Systems Modeling and Simulation 2
Date	5/12/2016
Time	15:30 - 17:00
Room	Mengwi 8
Chairs	Tatsushi NISHI, *Osaka University,* Stefano FAZI, *University of Groningen*

IEEM16-P-0563

General Conversion of Integer Programming Problems into Optimal Firing Sequence Problem of Petri Nets

Akito KODAMA, Tatsushi NISHI
Osaka University, Japan

Given an initial marking and final marking for a Petri net model, an optimal firing sequence problem is defined as the problem to find an optimal transition firing sequence to minimize the objective function. For the purpose of analysis of general integer programming problems, we propose a Petri net representation and reachability analysis of integer programming problems. In the proposed method, an integer programming problem is converted into the optimal firing sequence problem of Petri nets. By utilizing the proposed algorithm, integer programming problems can be visualized and analyzed by the Petri net theory. We apply the proposed methodology to the scheduling problems of dual armed cluster tools. The valid inequalities are derived from the reachability analysis. Numerical results show that those valid inequalities can significantly reduce the computational time of the original integer programming problem.

IEEM16-P-0338

Routing Containers in a Dry Port Transport System

Stefano FAZI
University of Groningen, Netherlands

In this paper, we discuss, model and heuristically solve a particular container transport problem, related to the inland transport between ports and an inland terminal directly connected to it, called dry port. The transport is undertaken by a heterogeneous fleet. Similarly to the classical vehicle routing problem with pickup and delivery (VRPPD), vehicles can deliver containers to the different quays of the sea ports and pick up others to bring to the dry port. The highly clustered setting, the strong heterogeneity of the fleet and time constraints add further features to the classical problem. After a detailed description of the setting, we develop the mathematical model and propose a heuristic approach.

IEEM16-P-0430

Signal Loss of RFID Technology with Short Distance and High Frequency

Seng Fat WONG, Weng Ian HO, K. C. SUN
University of Macau, Macau

To obtain an automatic and intelligent monitoring system, RFID is used to aid with CCTV system which is an innovative method. Therefore, some problems exist as integrating these two technologies, and signal loss is one of the problems as RFID signal is vital to the final result. Since the targets which are necessary to be monitored through the CCTV system are dynamic, the experiments in this research are set to obtain dynamic data with specific environments, which traditional signal loss equations are not available. Empirical loss equation is accurate but computational complexity, a simply empirical loss equation is found in this research and the results are compared with the other existing loss equations.

IEEM16-P-0438

Concept of System Architecture Database Analysis

Kristin GOEVERT[1], Robert CLOUTIER[2], Michael ROTH[1], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*University of South Alabama, United States*

Every company stores more and more product data. Most of the data are not analyzed and possible findings cannot be used. But the utilization of existing knowledge can make the system development process more efficient. Therefore, this paper focuses on the data analysis of system architectures. It develops a concept to identify patterns between system architectures of different products in a database. The concept combines the knowledge discovery process of databases (KDD) and analyzing methods of product architectures. The so identified patterns of system architectures support the usage and fostering of synergies between different products.

IEEM16-P-0584

Modeling Indonesia's Rice Supply and Demand Using System Dynamics

Sinta SULISTYO, Bonitasari ALFA, Subagyo
Universitas Gadjah Mada, Indonesia

Rice is the staple food consumed by approximately 95% of the Indonesian population. Thus, rice becomes one of the strategic issues and all decisions regarding rice impact the population. The Indonesian government targets to achieve food security and rice-sufficiency, which are attainable considering the fact that the total annual domestic rice production has exceeded the total national consumption. A system dynamics model has been used to simulate the rice supply and demand, considering factors such as dried paddy, rice conversion factor, climate anomalies, and delayed harvest time. However, the result of the study has shown that rice importation will still be required to fulfill the demand in 2020, given that there is no improvement from the current situation. Therefore, three scenarios are proposed in order to achieve rice self-sufficiency. Scenario I, improving the productivity, provides the most promising result.

IEEM16-P-0593

Mapping the Construction Innovation System in the Russian Federation: Conceptual Model Development

Emiliya SUPRUN, Rodney STEWART, Oz SAHIN, Kriengsak PANUWATWANICH
Griffith University, Australia

This is an ongoing research project combines System Dynamics (SD) and participatory modelling to identify variables forming the Russian Federation construction innovation system and to create an initial comprehensive conceptual model supported by stakeholder-based techniques. Quantification of this complex and dynamic construction innovation system is complicated as it includes a range of components such as information, resources, strategies, time and uncertainty. To map and conceptualize the system, system thinking and participatory techniques have been used. Methods employed academic and industry consultation and stakeholder engagement through participatory interviews. In this current paper we present the development of a conceptual model as a causal loop diagram to understand the causes, impacts and pathways leading to greater innovation performance in the Russian Federation construction industry. Moreover, the created model underpins the future development of an operationalized system dynamic model.

IEEM16-P-0191

A Module Partition Method Base on Complex Network Theory

Na ZHANG, Yu YANG, Yujie ZHENG
Chongqing University, China

The modularization strategy can dramatically shorten the lead time and reduce the cost of complex products development, and module partition is the basis of the modularization. In this paper, a complex network module is built to represent the complex product structure, and using interval-valued intuitionistic fuzzy sets to calculate the weights of the edges of the network model are brought to illustrate the correlation strengths among parts. Based on this, Software UCINET is given for product module partition. Moreover, the example results illustrate that the network model and UCINET performs.

Session	Safety, Security and Risk Management
Date	5/12/2016
Time	15:30 - 17:00
Room	VIP Room
Chairs	Anisur RAHMAN, *Griffith University*, Yoshinobu TAMURA, *Yamaguchi University*

IEEM16-P-0408

A Training and Development Skills to Support Product - Service Design from Informatics Perspective

Anies Faziehan ZAKARIA, S.C. Johnson LIM
Universiti Tun Hussein Onn Malaysia, Malaysia

Product-service design (PSD) is one of the prevailing approaches in offering an optimal mix of product and associated services to satisfy customer preferences. The key challenge of developing product-related-service packages is ability and skills to process large amount of customer preferences, products and services' design information. Previously, there are a number of design skills in literature that emphasized the skills acquisition in design engineering. However, skills on searching the effective ways in processing large amount of design information are less emphasized. Therefore, in this study, we proposed a conceptual framework of design training to emphasize skills required in developing optimal mix product-related-service packages. We detailed skills training on design information processing by illustrate four main training course in designing product-service packages.

IEEM16-P-0213

A Prediction Model of Hard landing Based on RBF Neural Network with K-means Clustering Algorithm

Xiaoduo QIAO, Wenbing CHANG, Shenghan ZHOU, Xuefeng LU
Beihang University, China

This paper proposes a prediction model for forecasting the hard landing problem. The landing phase has been demonstrated the most dangerous phase in flight cycle for fatal accidents. The landing safety problem has become one of the hot research problems in engineering management field. The study concentrates more on the prediction and advanced warning of hard landing. Firstly, flight data is preprocessed with data slicing method based on flight height and dimension reduction. Subsequently, the radial basis function (RBF) neural network model is established to predict the hard landing. Then, the structure parameters of the model are determined by the K-means clustering algorithm. In the end, compared with Support Vector Machine and BP neural network, the RBF neural network based on K-means clustering algorithm model is adopted and the prediction accuracy of hard landing is better than traditional ways.

IEEM16-P-0397

Risk Perception and Safety Compliance of Construction Workers

Nini XIA, Xueqing WANG, Wei NI, Xing LIU
Tianjin University, China

Safety behavior of construction workers is crucial to safety outcomes, and such behavior can be affected by different ways of risk perception. This research first identifies four main ways of risk perception: risk consequence, risk probability, risk utility, and direct risk perception, and then examines whether they are distinct. Further, the effects of these distinct risk perception ways on workers' safety compliance are investigated. Results show that traditional risk utility is significantly different from individuals' direct risk perception, and the latter exerts a significant influence on safety compliance while the former does not. Effective interventions should be made to improve workers accurate risk perception at workplace.

IEEM16-P-0531

Artificial Intelligence Improving Safety and Risk Analysis: A Comparative Analysis for Critical Infrastructure

Alexander GUZMAN, Shuichi ISHIDA, Eugene CHOI, Atsushi AOYAMA
Ritsumeikan University, Japan

Recently, the sustainability of traditional technologies employed in critical infrastructure brings a serious challenge for our society. In order to make decisions related with safety of critical infrastructure, the values of accidental risk are becoming relevant points for discussion. However the challenge is the reliability of the models employed to get the risk data. Such models usually involve large number of variables and deal with high amounts of uncertainty. The most efficient techniques to overcome those problems are built using Artificial Intelligence (AI). Therefore, this paper aims to investigate and compare AI algorithms for risk assessment. These algorithms are classified mainly into Expert Systems, Artificial Neural Networks and Hybrid intelligent Systems. This paper explains the principles of each classification system, as well as its applications in safety. Lately, this paper performs a comparative analysis of three representative techniques, such as Fuzzy-Expert System, Neural Networks, and Adaptive Neuro Fuzzy Inference System.

IEEM16-P-0565

Risk-Based Decision Making in Complex Systems: The ALBA Method

Simone COLOMBO
Politecnico di Milano, Italy

Making decisions in complex systems it is a complicated task to accomplish. As complexity and uncertainty increase, the use of scenarios to exploring that uncertainty becomes essential to support decision makers. The difficulty associated with the combinatorial need imposed by complex systems requires methods and tools to unburden analysts from the cumbersome task of manually deriving scenarios and the awkward one of properly managing them. The paper presents how the Artificial Logic Bayesian Algorithm (ALBA) method, thanks to the use of artificial logic (or, more formally, the Logic-based Artificial Intelligence), allows for analysts both to build complete partitions (i.e., complete sets of mutually exclusive choices) by "only" defining the logical and stochastic correlations amongst the selected elective random variables (leaving to the algorithm the burden to create the complete partition), and to nimbly managing scenarios.

IEEM16-P-0682

Developing Rail Safety Competencies Based on Accident and Incident Investigations: Using Root Cause Taxonomies to Learn from Accidents

Ibrahim Mujdat BASARAN, Sinan YILMAZ
Bulent Ecevit University, Turkey

In the knowledge age, as knowledge becomes the main determinant of organizational success, organizational safety becomes increasingly dependent on knowledge management systems. As a management process, Knowledge Management includes capturing, developing, sharing and effectively using organizational knowledge. For organizational effectiveness; approaches of knowledge management, systems of organizational memory and organizational learning systems interact with each other. In this study; we examine Accident and Incident Investigation Approaches and the concept of Safety Management in terms of "Organizational Safety Strategies", "Competencies for Organizational Safety" and "Knowledge Management Systems", in light of extant research.

IEEM16-P-0488

The Preemptive Stochastic Resource-constrained Project Scheduling Problem: An Efficient Optimal Solution Procedure

Stefan CREEMERS
IESEG School of Management, France

In this article, we present an optimal solution procedure to tackle the preemptive stochastic resource-constrained project scheduling problem (PSRCPSP). A solution to the PSRCPSP is a policy that allows to construct a precedence- and resource-feasible schedule that minimizes the expected makespan of a project. The PSRCPSP is an extension of the stochastic resource-constrained project scheduling problem (SRCPSP) that allows activities to be interrupted. The SRCPSP and the PSRCPSP both assume that activities have stochastic durations. Although the deterministic preemptive resource-constrained project scheduling problem (PRCPSP) has received some attention in the literature, we are the first to study the PSRCPSP. In addition, when compared to existing optimal scheduling procedures, we significantly improve computational performance.

Session	Reliability and Maintenance Engineering 2
Date	5/12/2016
Time	15:30 - 17:00
Room	Pecatu 1
Chairs	Zhiqiang CAI, *Northwestern Polytechnical University,* Gopinath CHATTOPADHYAY, *Federation University*

IEEM16-P-0450

Issues and Challenges of Balancing Cost, Performance and Risk in Heavy-Haul Rail Asset Management

Gopinath CHATTOPADHYAY
Federation University, Australia

ISO55000 is the International Organisation for Standardization (ISO) standard for asset management published in 2014. It stipulates that effective control and governance of assets by organizations is essential to realize value through managing risk and opportunity, in order to achieve the desired balance of cost, risk and performance. It is a challenge to industries on how to address this. This paper is on the issues and challenges of balancing cost, performance and risk in heavy haul rail asset management. Illustrative example from heavy haul network is used for this and on how to address some of the important challenges faced by heavy haul sector for managing life of rail assets.

IEEM16-P-0170

Evaluation of Mission Success for Binary System with Repairable Spare Parts

Zhiqiang CAI, Peng GUO, Yang LI, Weitao SI
Northwestern Polytechnical University, China

Mission success probability means the ability of a system to fulfill its mission in a prescribe task profile. In this paper, a hierarchical modeling method is proposed for the mission success evaluation of multi-stage system with repairable spare parts. The binary decision diagram (BDD) was used to represent the system structure function. The component and its corresponding repairable spare parts were formed as a group for overall consideration. The component groups were represented by the continuous time Markov chain model. It can describe the component failure process and the repair behaviors simultaneously. Then a simple case study for a radar system was carried out. Evaluation results verified the practicability and effectiveness of the proposed hierarchical modeling method.

IEEM16-P-0137

Reliability Improvement for Electrical Pneumatic Arm Loading System

Laith A. HADIDI, Abdullah F. ALKHALDI
King Fahd University of Petroleum and Minerals, Saudi Arabia

This paper highlights the performance of electrical equipment and discovers any unspecified breakdowns at the electrical equipment. It focuses on the damages that are caused by electrical equipment failures. Moreover, it gives practical solutions and recommendations of how to improve electrical equipment reliability in arm loading system to prevent delay of oil shipment. The report also relied on field and sites observations to collect the required data. All information gathering was carried out through personal observations and deep search on data base available in the Company. The sites search covered the following areas; Power System Equipment Area. All the break down times were carefully detected and documented. The findings of the report supported the electrical equipment reliability.

IEEM16-P-0061

Modelling of Influence of Various Operational Conditions on Li-ion Battery Capability

David VALIS, Kamila HASILOVA, Jan LEUCHTER
University of Defence, Czech Republic

We need energy resources to assure performance of mechatronic systems. The performance assurance is of major importance in present systems since it leads to high availability and capability. It also helps to reduce failure occurrence. In the article we want to find the up state time of Li-ion batteries. Results are related to influence of the operating environment at different climatic levels. We want to find the hitting time of critical threshold, when the capacity/voltage of the battery drops below the determined threshold. One part of the results was achieved due to experiments; another part was achieved by simulation supported by mathematical analysis. For the simulation we use the Wiener process with drift whose parameters are estimated using the least square method and the Weierstass theorem. The aim is to determine the time interval of the first hitting time which assures that the battery will work under given climatic conditions.

IEEM16-P-0305

Bayesian Estimation for Failure Probability Through Bogey Test Data

Wanjiao WANG[1], Qingpei HU[2], Dan YU[2]
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[2]*Chinese Academy of Sciences, China*

The increase of high-cost and high-precision manufacturing process underlines the importance of the reliability estimation of Bogey test data. To estimate the failure probability of Bogey test, Bayesian approaches often focus on the choice of the prior distribution. However, this paper develops a new method, which making use of the concavity of lifetime's distribution function to construct a non-informative prior for the failure probability. By integrating all the test information, not only the number of effective samples but also previous test information, we explore a new form of the likelihood function for failure probability. Through updating the boundaries of the prior in each step by previous steps' estimations, we obtain the failure probability progressively. In the case study, we construct sensitivity analysis to show that our method is more robust to different lifetime distribution assumptions than other existed methods.

IEEM16-P-0669

Investigating the Necessity of Acceleration in a Degradation Test

Lanqing HONG[1], Zhisheng YE[1], Xingqiu ZHAO[2]
[1]*National University of Singapore, Singapore*
[2]*Hong Kong Polytechnic University, China*

When using acceleration in a degradation test, additional parameters are needed to incorporate the accelerating variables into the degradation process, requiring more statistical information to achieve the same level of estimation precision. When the increase of statistical information due to acceleration fails to compensate the information consumption caused by the additional parameters, acceleration is statistically inefficient. This paper identifies situations where acceleration is unnecessary in a degradation test when common stochastic process models are used, including the Wiener, gamma and inverse Gaussian (IG) processes. An acceleration relation index is introduced to unify different kinds of acceleration relations. It is shown that when this acceleration relation index is greater or equal to one, acceleration is always unnecessary. Otherwise, the necessity of acceleration depends on values of the model parameters and the acceleration relation index. The procedure to identify the necessity of acceleration is illustrated by a numerical example.

IEEM16-P-0670

Optimal Supply Planning for Two-Levels Assembly System with Stochastic Lead-Times and Maintenance Actions

Zouhour GUIRAS[1], Sadok TURKI[1], Nidhal REZG[1], Alexandre DOLGUI[2]
[1]*Université de Lorraine, France*
[2]*Ecole des Mines de Nantes, France*

This paper deals with the supply planning for two level assembly systems under stochastic lead time and random failure machine. The objective is to determine the optimal supply planning of the assembly system while considering the maintenance actions and then to study their impact on the optimal release dates for the components at level 2. The optimal supply planning minimizes the total cost which is the sum of inventory holding cost for components at level 1 and 2, assembly cost, maintenance cost, backlogging and inventory holding cost for the finished product. A mathematical model is proposed to compute the total cost and then to determine the optimal supply planning. Numerical results are presented to discuss the impact of maintenance actions on the optimal release dates.

Session	E-Business and E-Commerce
Date	5/12/2016
Time	15:30 - 17:00
Room	Pecatu 2
Chairs	Michel ALDANONDO, *The University of Toulouse Mines Albi,* Yue WANG, *Hang Seng Management College*

IEEM16-P-0101

Extending Configuration Techniques from ATO-MTO Towards ETO with Confidence Indicators Based on Readiness and Maturity

Abdourahim SYLLA[1], Elise VAREILLES[1], Michel ALDANONDO[2], Thierry COUDERT[1], Laurent GENESTE[1], Paul PITIOT[1]
[1]*University of Toulouse, France, Metropolitan*
[2]*The University of Toulouse Mines Albi, France*

Product configuration is a well-known technique that allows safe and reliable customization of products in assembly to order (ATO) or make to order (MTO) industrial situations. When dealing with engineer to order (ETO) situations, the required design activities cannot be handled by conventional configuration techniques. The first goal of this paper is to show how constraint based configuration techniques can be extended towards ETO situations for both product or system and their realization process. As ETO situations requires some design activity, the confidence in the configured item or offer proposed to the customer is lower compared with ATO-MTO situations. The second goal of this paper is to propose a set of indicators that characterize the confidence of the supplier in the configured system and process and therefore in the offer provided to the customer.

IEEM16-P-0434

How Reference Options Affect Customer Decisions in Product Configuration

Yue WANG[1], Guohua TANG[2]
[1]*Hang Seng Management College, Hong Kong SAR*
[2]*Alibaba Group, China*

Product configurators have been widely accepted as important toolkits to bridge customer needs and company offerings in the product customization context. In this scenario, the solution space is predetermined and customers specify each of the product' desired attribute options. Motivated by findings in the areas of consumer behavior and psychology, in this study, we examine how reference or default options affect customers' decisions during the configuration process. Specifically, we investigate how the effect correlates with product type. An experiment is designed and conducted to test the corresponding hypotheses. We find that reference options significantly affect participants' final decisions about innovative attributes. However, the effect is not significant for noninnovative attributes and products.

IEEM16-P-0380

A Continuous Toolchain for User-Driven Customization

Michael ROTH, Lisa MAYR, Maik PLOETNER, Udo LINDEMANN
Technical University of Munich, Germany

User-driven Customization (UDC) is a promising concept to react on current developments in the markets. However, until now no successful applications of UDC for technical products exist. Therefore, this paper develops and implements a continuous toolchain for UDC from the customization toolkit via an OI-platform to the production back-end. The resulting prototype achieves the proof of concept for the feasibility of UDC: Components customized by users are directly transferred to a flexible production system and are manufactured there. To achieve this the paper builds on existing concepts as well as studies and derives a toolchain concept. It is adapted and implemented to realize a successful prototype.

IEEM16-P-0363

An Evaluation of Customer Repurchase Behaviour in Mobile Telecommunication Services in Australia

Hassan Shakil BHATTI, Ahmad ABARESHI, Siddhi PITTAYACHAWAN
RMIT University, Australia

This study identifies and explores key determinants of the customer repurchase behaviour of mobile telecommunication service users in Australia. Customer repurchase behaviour is the most representative form of the consumer-to-business relationship. Telecommunication Industry Ombudsman (TIO) reports, show that there are service quality issues in Australia which can affect end customers and businesses. Moreover, factors such as behavioural intention which lead to customer intention to repurchase the service are measured through the Unified Theory of Acceptance and Use of Technology (UTAUT2), Marketing Mix Theory and Expectation Confirmation Theory. The research findings will highlight several implications for both research and practice in mobile service buying behaviour. In the quantitative phase, the structured online survey was conducted for data analysis. The research framework provides an extension to the UTAUT 2 model and also provides a framework for customer repurchase behaviour in mobile service business.

IEEM16-P-0631

Evaluation of Hospital Web Services Using Intuitionistic Fuzzy AHP and Intuitionistic Fuzzy VIKOR

Gülçin BÜYÜKÖZKAN, Orhan FEYZIOĞLU, Fethullah GOCER
Galatasaray University, Turkey

Professionals in the healthcare industry are constantly pressured to ensure that their provided services are patient-focused. Considering that the healthcare industry seeks continuous performance improvement, well-designed web services can benefit healthcare institutions by improving their reputation and recognition. This paper provides a new perspective for web service performance of healthcare institutions with different quality evaluation criteria for ranking their web services. The proposed framework is based on an integrated multiple criteria decision making (MCDM) methodology that makes use of the intuitionistic fuzzy analytic hierarchy process (IF AHP) and intuitionistic fuzzy Višekriterijumsko kompromisno rangiranje Resenje (IF VIKOR). The methodology presented in this study displays a framework which can be used for better explaining the complicated aspects of the execution of healthcare web services. The proposed approach is applied on a case study to measure the performance of the web based services of ten different healthcare institutions in Turkey.

Session	Technology and Knowledge Management 2
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 1
Chairs	Danping LIN, *Shanghai Maritime University*, Sune VON SOLMS, *University of Johannesburg*

IEEM16-P-0277

Research on Effect Factors Evaluation of Internet of Things (IOT) Adoption in Chinese Agricultural Supply Chain

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This paper investigates the effect factors in the adoption of Internet of Things (IoT) technology in the agricultural supply chain in China by constructing a Technology-Organization-Environment (TOE) framework. The data was analyzed using Structural Equation Modelling. Through statistics analysis, the effect factors were recognized and the TOE model was modified appropriately. The results indicated that resistance from employees and uncertainties are not important factors that influence the IoT adoption. Referring to those supported factors, technical factors (complexity, compatibility, perceived benefit, and cost) have a complicated influence on the technology adoption of IoT in agriculture. In addition, organizational factors (scale of enterprise, executive support, trust among the businesses in the supply chain, and technical knowledge) and environmental factors (external pressure and government support) all have positive relationships with IoT adoption.

IEEM16-P-0136

Technology Acceptance Model of Internet Banking Service for Student's Tuition Fee Payment (Case Study: Public Government University)

Zulhans Ramadhan MAHAROESMAN, Iwan Inrawan WIRATMADJA
Bandung Institute of Technology, Indonesia

In these recent years, a new channel of tuition fee payment using Internet banking has been introduced to Indonesian students. However, based on obtained data field, payment method using Internet banking service has turned out to be not quite popular among the students. The development of this study is adapted from Chan and Lu [4] research model about Internet banking service adoption in Hong Kong. In addition, it also integrated with Teo and Noyes [29] research model about Perceived Enjoyment. Data processing was performed using the method of Structural Equation Modeling (SEM). Target survey respondents were the potential adopters of public government university students. The results showed that Perceived Usefulness, Perceived Enjoyment and Subjective Norm were the significant factors affecting student's intention to use Internet banking. On the other hand, Perceived Ease of Use and Perceived Risk has not been proven affecting intention to use Internet banking

IEEM16-P-0316

Strategic Planning of Immature Technologies for Serial Application Using the Example of Selective Laser Melting

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Karlsruhe Institute of Technology, Germany

The serial application of a new technology requires a positive monetary valuation of the technologies overall costs including the development project and manufacturing benefits. The endeavor of planning and therefore also assessing an immature technology's serial application is severely hampered by strong advances in the technology's development. In most cases, previous research has not taken future stages of development into account. Hence, this paper aims at assessing and planning an immature technology ' s serial application under consideration of future stages of development. The methodology shall be introduced using the example of the additive manufacturing process of selective laser melting (SLM). For the purpose of reaching this objective, a cost model supporting the planning process shall be elaborated and combined with a scenario analysis for forecasting future technological development.

IEEM16-P-0347

One's Fault is Another's Lesson: What Motivates the Employees to Participate in the Learning Activity?

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[2]*Shibaura Institute of Technology, Japan*

Many companies seem poor at learning from failure even though managers in which know the importance of it to improve their business performance. There is, however, a unique company in Japan, which has succeeded in establishing their learning system from failure and has never repeated same failure (according to the executives in the company). Authors explored the key success factors of their learning-from-failure through interviews and questionnaire to employees. We find that there is mutual benefit between fault-disclosing employee and disclosed employee, and it can be one of the keys to succeed in learning from failure.

IEEM16-P-0520

Development of a Toolkit of Methods for Simulations in Product Development

Cristina CARRO SAAVEDRA[1], Nils Jorge MARAHRENS[1], Sebastian SCHWEIGERT[1], Philipp KESTEL[2], Simon KREMER[1], Sandro WARTZACK[2], Udo LINDEMANN[1]
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Simulations contribute to the efficiency of the product development process and the quality of the developed products. However, their integration in the development process can be improved. We propose a knowledge-based framework, containing a toolkit of simulation methods as its central element to integrate simulations in the product development process. Within this paper, we briefly introduce the knowledge-based framework and we present the toolkit structure and the methodology for its development.

IEEM16-P-0635

Evaluating the Regional Innovation Inputs Inequalities in China: Gini Coefficient Based on the Innovative Outputs

Yingying JIA, Peng GUO
Northwestern Polytechnical University, China

A formal evaluation procedure is employed for ranking regions in China according to the innovative human and monetary inputs inequalities. The proposed procedure is developed by integrating the Lorenz curve, entropy weights and grey relation analysis. More specifically, based on the ratio of outputs over inputs measured by the slope of the Lorenz curve, the weights of the indicators are determined by the entropy analysis, and the regions are ranked by using the grey relation analysis. The findings reveal that regions in China are classified into three polarized areas consisting of the Pearl River Delta, the Yangtze River Delta and the Beijing-Tianjin region, which is consistent with reality. The results demonstrate the suitability and feasibility of the proposed procedure and provide an evidence-based approach for regional decision-makers to promote the adoption of innovative inputs.

IEEM16-P-0746

Effect of Maintenance Resource Constraints on Flow-Shop Environment in a Joint production and Maintenance Context

Sandeep KUMAR, Bhupesh Kumar LAD
Indian Institute of Technology Indore, India

Production and maintenance planning decisions for any manufacturing industry are very crucial to make shop floor operations effective. Despite the dependencies, these policies are often considered and optimized independently in literature and practice. Recently, researchers have started focusing more on integrating these policy options. However, the effect of maintenance resource constraints during such consideration is missing in the literature. The present paper investigates the effect of spare parts and maintenance technician's unavailability on joint production and maintenance planning decisions for flow-shop environment. The performance measures considered here are makespan, total production cost and system utilization. Simulation-based optimization techniques are used to obtain the optimal production and maintenance plan. Different cases of spare parts lead times and maintenance technician's unavailability are considered for investigation. For each case production and maintenance planning decisions are analyzed. It is found that spare parts and maintenance technician's unavailability have a significant impact on production performance.

Session	Operations Research 3
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 2
Chairs	Mingyao QI, *Tsinghua University,* Mojahid SAEED OSMAN, *American University of Sharjah*

IEEM16-P-0151

The Electric Vehicle Routing Problem with Time Windows and Battery Swapping Stations

Jinbo CHEN, Mingyao QI, Lixin MIAO
Tsinghua University, China

As battery electric vehicles are more and more popular nowadays, this paper presents an Electric Vehicle Routing Problem with Time Windows and Battery Swapping Stations to extend their range of application. In the problem, a fleet of the same kind of battery electric vehicles will fulfill the demand of all customers within the serving area by means of delivery operation with a fixed battery swapping time. Time windows of customers are taken into consideration. Small instances of benchmark problem are extended and testified by Gurobi optimizer. Two models of swapping and recharging pattern are compared with the same parameters, verifying that the swapping mode can decrease the number of vehicles.

IEEM16-P-0490

Maintenance Data Allocation Model for Repairable Items in Echelon Inventory System

Mojahid F. SAEED OSMAN
American University of Sharjah, United Arab Emirates

This paper addresses the implementation of Automated Identification Technologies (AIT) to support and manage the maintenance of repairable equipment and components that are intended for relatively long use in echelon inventory system with the aim of optimizing the data allocation in a given automated identification system. The paper presents the development of general model for optimizing the use of AIT system for repairable equipment and items, and the allocation of preventive and corrective maintenance data on tags. The primary criterion for optimization is to maximize the value of maintenance data while not exceeding the available data capacity of the AIT system. The value of maintenance data through the life cycle of repairable equipment and items is determined by the variable value of data per use that varies based on its frequency of usage and its basic fixed value.

IEEM16-P-0566

An Exact Approach for the Identical Parallel Machine Scheduling Problem with Sequence-Dependent Setup Times and the Job Splitting Property

Taha ARBAOUI, Farouk YALAOUI
Universit´e de Technologie de Troyes, France

Parallel machine scheduling problems have long been studied due to their importance in manufacturing and planning. We consider the identical parallel machine scheduling problem with sequence-dependent setup times and the job splitting property. Jobs can divided into sections which can be assigned to different machines simultaneously. A setup time is required between any two job sections. The aim is to minimize the makespan. We propose an exact approach based on Benders decomposition that is able to solve to optimality the instances considered in the literature. The problem is decomposed in two parts. The master problem assigns the job sections to machine while partially considering the setup times. The subproblems sequence the jobs to assess the makespan on each machine using a Traveling Salesman Problem (TSP) exact algorithm. The master problem is updated by adding Benders cuts after solving the subproblems. The computational results are presented and discussed.

IEEM16-P-0572

An Iterated Dual Substitution Approach for the Min-Max Regret Multidimensional Knapsack Problem

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[2]*University of Modena and Reggio Emilia, Italy*
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We consider the multidimensional knapsack problem (MKP) with min-max regret criterion under interval profits. We examine three typical algorithms widely applied for minmax regret criterion: fixed-scenario approach, Benders-like decomposition and branch-and-cut. We further propose a new heuristic framework, which we call the iterated dual substitution algorithm. Computational experiments on a wide set of benchmark instances are carried out, and the proposed iterated dual substitution algorithm performs best on all of the tested instances.

IEEM16-P-0613

Modeling Thailand Power Market: Mathematical Program with Equilibrium Constraints

Seksun MORYADEE
Chulachomklao Royal Military Academy, Thailand

The Thai power industry has a partial liberalization structure, which encourages a partial competition under supervision of the Thai Department of Energy. To this end, the author proposes a mathematical model with equilibrium constraints (MPECs) whose upper-level problem depicts a stated-owned utility, the Electricity Generation Authority of Thailand (EGAT), deciding on optimal power generation capacities and generation quantities given prices and interaction of other power producers in the lower level problem. The MPECs are reformulated as mixed-integer nonlinear program (MINLP) using Special Order Set 1 (SOS1) transformations and linearizations. The main contributions in this paper are two-fold. This paper develops a novel, mathematical program with equilibrium constraints to simulate the Thai power market. Second, the paper analyzes the complicated structure of power market in Thailand.

IEEM16-P-0603

A Robust Approach for Newsvendor Problem with the Alternative Product Under Price and Ordering Quantity Competitions

Takashi HASUIKE
Waseda University, Japan

This paper considers a robust approach for an inventory model considering standard and high qualities of a product under price and quantity competitions. In the case the competitive store sells a standard product, another store must decide the purchase volumes, prices and ordering quantities of standard and high quality products in order to manage a loss risk as well as maximize the total profit. In this paper, a robust-based mathematical programming problem of the proposed model is proposed considering these conditions and uncertainty of consumer demands. Furthermore, in order to obtain the optimal prices and ordering quantities, a scenario-based approach is developed.

Session	Supply Chain Management 3
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 3
Chairs	Sobhan ASIAN, *RMIT University,* Vipul JAIN, *Victoria University of Wellington*

IEEM16-P-0319

Dynamic Priority Repair Policy for Service Parts Supply Chain

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We study a repairable service parts inventory system with a central repair facility and several inventory holding locations. In case of a part failure, the failed part is identified and replaced with a ready-to-use part. Afterwards, the failed part is sent to the repair facility, where it is repaired and allocated to one of the bases. The objective is to identify the base with the most urgent need of a service part in order to minimize the expected backorder cost. To this aim, we investigate the initial base-stock provisioning problem in conjunction with the real time stock allocation decision making. We propose a heuristic technique for stock allocation based on relative value function and average backorder cost. We compare the performance of the heuristic model against the myopic policy to validate the efficiency of our proposed mechanism. Results reveal that the proposed stock allocation policy outperforms the myopic policy.

IEEM16-P-0651

Reverse Logistics Service Provider Selection: A TOPSIS-QFD Approach

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[2]*University of Sharjah, United Arab Emirates*

Reverse logistics is an activity associated with a product/service after the point of sale, the ultimate goal to optimize or make more efficient aftermarket activity. Enterprises that have implemented reverse logistics have been able to enhance consumer service and response times, minimize environmental influences by minimizing waste and enhance complete corporate citizenship. In this connection, this project formulates the RL service provider selection as a multi-criteria decision making problem and develops a methodology to select the best reverse logistics service provider for injection molding parts manufacturing company using Technique for Order Preference by similarity to Ideal Solution (TOPSIS) and integrating it with Quality function deployment (QFD).

IEEM16-P-0280

Integrated Methodology for Supplier Selection in Supply Chain Management

Naveen JAIN[1], Amit Raj SINGH[1], Akhilesh CHOUDHARY[2]
[1]*National Institute of Technology, India*
[2]*Indian Institute of Information Technology, Design & Manufacturing Jabalpur, India*

Selection of potential supplier is a strategic decision taken by purchasing department which helps in ensuring a long term commitment between supplier and industry. Selection of supplier is a multi criteria decision making (MCDM) problem involving quantitative, qualitative, tangible and non tangible diverse criteria's. In this work a strategic frame work has been proposed which allows decision makers to consider more criteria's for supplier selection. In this paper an integrated method of modified Kano model and Weighted Aggregated Sum Product Assessment (WASPAS) method has been proposed. Kano model has been applied for criteria classification and importance weight to criteria's has been assigned by modified Kano model and WASPAS method has been applied for assigning ranks to suppliers A numerical example has been taken up to demonstrate the proposed methodology.

IEEM16-P-0307

Supply Chain Management Framework Development for New Multiple Life Cycle Product Development

Mohamad Fariz MOHAMED NASIR, Abd Rahman ABDUL RAHIM, Halim Shah HAMZAH
Universiti Teknologi Malaysia, Malaysia

Industry driven by the sustainable environment, has made product remanufacturing into an important aspect in providing the solution for efficient supply chain management as early during design stage. Strategic assets are focused in this research, in order to provide it with a flexible framework to be implemented for multiple life cycle products meant to be remanufactured. This paper discusses the supply chain management, multiple life cycle products, remanufacturing processes and critical success factors in new product development. It is also to solidify the requirements for any products, of which should be designed to incorporate the remanufacturing identity. In summary, the idea is novel to assist engineering designers to collaborate with supply chain managers in order to develop remanufacturing framework.

IEEM16-P-0498

Assessing the Effectiveness of Diesel and Petrol Supply Chain: A Case of Namibia

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[3]*University of Johannesburg, South Africa*

Effective management of diesel and petrol supply chain (DPSC) is essential to achieve security of fuel supply. This study used qualitative and quantitative approaches to assess the effectiveness of DPSC in Namibia, recommending appropriate strategies to improve the supply chain. The study reveals that organizations' internal arrangements in support of the DPSC are generally in a good state, though most internationally used strategies are underutilized. Close partnership with suppliers, close partnership with customer, and strategic planning, are the most used strategies. Government policy was adequate, and the road infrastructure and its management are in a good state. However, the national railway infrastructure and its management are in a very poor state. Further assessment showed that poor railway infrastructure and inadequate fuel storage facilities are the main challenges in the management of the supply chain. These should be the focal point for strategic improvement of the supply chain.

Session	Quality Control and Management 2
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 5
Chairs	Ville ISOHERRANEN, *University of Oulu*, Zhiqiang CAI, *Northwestern Polytechnical University*

IEEM16-P-0511

Application of Quality Function Deployment to Improve Smart Services Applications, Dubai Public Entity as a Case Study

O. A. L. ZAWATI, Fikri DWEIRI
University of Sharjah, United Arab Emirates

QFD is a well-known tool that forms a cross-functional planning process to transform customers' needs into detailed requirements. However, it is not that famous in the field of smart applications since technical people usually rely on customer relationship management people to identify their customers' needs and work accordingly. This article describes how public sector entities can use QFD to identify and prioritize smart service applications' characteristics, map them to customer needs and cascaded them down to a lower operational level which is the technical processes. Using a case study of one of Dubai public entities, the process of multi stages or phases has led to identify the importance of using QFD in identifying customers needs of smart services and the main technical processes to enhance them. Modifications have been introduced to the tool to suit the public sector characteristics. This research marks the importance of this tool to the public sector to improve its service similar to the private sector.

IEEM16-P-0515

Acceptance Sampling Plans Based on Truncated Life Test for the Generalized Weibull Model

Shovan CHOWDHURY
Indian Institute of Management, Kozhikode, India

In this paper, we develop acceptance sampling plan (ASP) when the lifetime experiment is truncated at a pre-assigned time. The minimum sample size required to ensure a specified median life of the experimental unit is provided when the lifetimes of the units follow generalized Weibull distribution which exhibits both monotone and non-monotone failure rates. The operating characteristic values of the sampling plans as well as the producer's risk are also presented. The plan is illustrated through one data analysis.

IEEM16-P-0672

Heteroscedastic Linear Model Based Reliability Evaluation for Solar Cell Degradation Testing

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[2]*Chinese Academy of Sciences, China*

Solar cell is the basic component of satellite photovoltaic panels with complicated redundant system structure. Its reliability plays an important role in the system, and its performance shows a degradation trend over time. In this paper, study is conducted for the solar cell degradation modeling and reliability analysis based on practical testing results. Specifically, we illustrate an accelerated test for the attenuation ratio character test under different accumulative irradiation levels, focusing on the heteroscedasticity of the collected testing data. A heteroscedastic linear model is proposed, and the reliability of the solar cell is expressed by some pivot variables. Based on the pivot expression of the parameters of the heteroscedastic linear model, we can get its life distribution. A numerical example is shown for the purpose of illustration.

IEEM16-P-0649

Integrating Lean Six Sigma with ISO 9001:2015

Pedro Alexandre MARQUES[1], Paulo MEYRELLES[1], Pedro SARAIVA[2], Francisco FRAZÃO GUERREIRO[1]
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[2]*University of Coimbra, Portugal*

Lean Six Sigma is a popular approach that promotes the improvement of systems, processes, or any other type of entity. On the other hand, quality management systems based on the ISO 9001 standard encourage organizations to adopt various forms of improvement to consistently enhance its overall performance, to better be able to meet customer and other stakeholder requirements, as well as to address their future needs and expectations. The integration of these topics has been gathering the attention of industry and academy communities, but no integration model was already suggested to articulate the new version of ISO 9001 published in 2015 with a Lean Six Sigma program. This paper proposes an integration framework where the life cycle stages inherent to a Lean and/or Six Sigma project can be systematically linked to the applicable clauses and sub-clauses of ISO 9001:2015.

IEEM16-P-0546

Refining of Heat Treatment Process Parameters on Large Cup-Type SAE4140 Alloy

Pai-Chung TSENG, Y. C. TENG, P. SAWADOGO
National Chung Hsing University, Taiwan

This study used the cup-type forgings of SAE4140 Cr-Mo alloy with a diameter of 420mm, a length of 700mm, and a thickness difference of 10mm at two ends as the object. It adopted the Taguchi method to conduct the optimization of thermal refining for experiment and analysis. The workpiece was compared with the current conditions so that the quality of workpiece after quenching could obtain the optimum parameters for thermal refining of this type of workpiece. Based on the experimental result, after quenching and tempering of the cup-type forging Cr-Mo alloy, the hardness test showed that, the most significant factor was the placement and tempering temperature. When the cup opening faced upward, the hardness difference of the two ends was HRC 2~2.5, otherwise the difference was HRC 4 ~5. The verification experiment shows when the hardness of the workpiece after quenching and tempering reached HRC 52 and HRC 36 or above, respectively, these results can be used as the standard for on-site test of heat treatment.

Session	Manufacturing Systems 1
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 6
Chairs	Dinh Son NGUYEN, *University of Science and Technology, The University of Danang*, Cucuk Nur ROSYIDI, *Sebelas Maret University*

IEEM16-P-0628

A Method to Generate Lattice Structure for Additive Manufacturing

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[2]*University of Grenoble Aples, France*

Additive Manufacturing (AM), popularly called 3D Printing, is a scientific term indicating the Rapid Prototyping (RP) technologies developed in 1980s. AM technologies can directly fabricate a complex 3D object from three-dimensional Computer Aided Design (CAD) model by adding layer-by-layer of material. Advances in AM technologies are capable of manufacturing highly complicated geometries of product without the need for process planning, the reduction of product development time and cost, the removal of tooling compared to conventional manufacturing technologies. The production of lattice structures is quickly performed by AM technologies in order to attain a product with lightweight and stronger and to provide the high specific mechanical properties such as strength and energy absorption. However, the current product modelling technologies have many difficulties for generation of lattice structure model. Thus, the paper proposes a new approach that allows to create different configuration types of conformal and non-conformal lattice structure model.

IEEM16-P-0464

Make or Buy Analysis Model in a Multi-Stage Manufacturing Processes

Cucuk Nur ROSYIDI[1], Mega Aria PRATAMA[1], Wakhid Ahmad JAUHARI[1], Bambang SUHARDI[1], Kunihiro HAMADA[2]
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In this research, a make or buy analysis model is developed to determine an optimal set of processes and suppliers to minimize manufacturing costs, purchasing costs, quality loss, scrap cost and lateness cost considering the process capability, manufacturing capacity, customer orders, and the routing of the manufacturing process in the multistage manufacturing processes. The constraints of the model are the tolerance limits, process variance for each component, the production capacity of the machine, consumer demand, and the minimum number of machine/supplier selected. A numerical example is given to show the application of the model using a simple assembly consists of three components. There are two production cells in which each cell has three identical machines that can be selected to produce the components. Each machine has different characteristics in terms of manufacturing costs, tolerances, processing time and capacity. In addition, there are also two alternative suppliers to supply the components. The model is used not only in process/supplier selection but also the amount of components allocation to the selected process/supplier.

IEEM16-P-0481

aA Fuzzy Logic Expert System for the Automated Generation of Roadmaps for Automated Guided Vehicle Systems

Sarah UTTENDORF[1], Björn EILERT[1], Ludger OVERMEYER[2]
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So far the generation of roadmaps for automated guided vehicles (AGVs) is mostly done manual. Mathematical path finding algorithms often return results that are mathematical optimal but not applicable to a real production layout. This paper proposes an expert system as a solution that combines traditional path finding algorithms with a fuzzy inference system that incorporates the human knowledge of AGV system planers. Results that prove the efficiency of the proposed solution are shown in the end.

IEEM16-P-0045

Influencing Factors on Goal Achievement in Teamwork of Production Teams

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This paper presents a study on the relationships between leadership, quality of teamwork and goal achievement in production teams. Hypotheses regarding the relations between the constructs were postulated based on literature and results of previous research. A survey of employees working in teams within a production plant of a car manufacturer was conducted. In order to test the hypothesis, a structural equation model was formulated and a confirmatory factor analysis was used. The findings support the hypothesized relations for production teams. Results and implications for teamwork in production are discussed. The paper concludes with an outlook for future research.

IEEM16-P-0231

Heuristics for Minimizing the Total Tardiness in a Re-Entrant Hybrid Flow Shop With Non-Identical Machines in Parallel

Xiang Yi ZHANG, Lu CHEN
Shanghai Jiao Tong University, China

This paper focuses on the production scheduling problem in a rotor workshop. The scheduling problem is formulated as a re-entrant hybrid flow shop problem with non-identical machines in parallel. Some heuristics are developed to solve the problem. The proposed algorithms are compared through various instances that are generated based on real operations in the workshop. Experimental result also reveals that the bottleneck machines in “non-identical” set should be assigned with lower priority.

IEEM16-P-0629

Machine and Production Scheduling Under Electricity Time Varying Prices

MohammadMohsen AGHELINEJAD, Yassine OUAZENE, Alice YALAOUI
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This paper presents two new mathematical models to reduce total energy consumption cost of a single machine manufacturing system. The problem consists of optimizing simultaneously the processing of the jobs and utilization of the machine, each machines state has its own energy consumption and the production shift is composed of a fix number of periods with different energy cost. The first model is an improved formulation of Shrouf et al. (2014) problem that considers a predetermined jobs sequence. Whereas, the second model studies production scheduling on machine and job levels, which proposes an optimal sequence for them by minimizing the occurrence number of each machines state, the optimal allocation of these states during the periods with less energy costs and jobs within the processing state. Finally, difference between these models are discussed based on several numerical examples.

Session	Decision Analysis and Methods 2
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 7
Chairs	Charles MBOHWA, *University of Johannesburg*, Egon MUELLER, *Chemnitz University of Technology*

IEEM16-P-0265

The Choice of a Collaboration Form - A Special Insight in the Case of R&D Consortia

Xiao-Li CHEN, Christina HESSE, Ralph RIEDEL, Egon MÜLLER
Chemnitz University of Technology, Germany

The choice of the right collaboration form is of great importance for the viability of a collaboration. In this paper, based on multi-theories, three clusters of potential determinants are listed out for consideration. Those are characteristics related to the 'resource pooled within the collaboration', 'initial relationship of partners' and 'collaborative tasks'. Further hypotheses are formulated, which attempt to reveal the impact of these potential determinants and shed some light on the theory of collaboration management. A survey based on the experience of organizations is further conducted for the analysis. In the end, general hypotheses have been tested with the case of 'equity or none' decision. Further, an in-depth view has also been provided considering the choice of R&D consortia. All these are composed as a theoretical basis, which helps to bring sound decision support on the strategy of collaboration.

IEEM16-P-0341

Biogas Use as Fuel in Spark Ignition Engines

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These This paper reviews the utilization of biogas in spark ignition engines with a view to making a case for it as an efficient substitute fuel for petrol. However, its gaseous nature which accounts for its low volumetric density implies that apart from the basic modification needed to accommodate the fuel, the engine might need further alterations to get the best from this relatively low cost and readily available fuel. Various modes of enhancing performance particularly methane enrichment, prechamber combustion, alteration of ignition parameters, increasing compression ratio and addition of hydrogen to improve performance and emissions were drawn from previous works to validate its efficiency as a viable substitute fuel in SI engines.

IEEM16-P-0183

A Weighted Preference Graph Approach to Analyze Incomplete Customer Preference Information in QFD Product Planning

Pai ZHENG, Xun XU, Shane XIE
The University of Auckland, New Zealand

Nowadays, effective and accurate analysis of customer requirements (CRs) is vital in the new product development process, especially in the early design stage, where corresponding changes can be made easily into the further development stages. Quality function deployment (QFD), acting as a customer-centric product development tool, is widely utilized in the product planning stage. Despite its "House of Quality" (HoQ) matrix support, it lacks a specific method in analyzing incomplete or imprecise customer preference of CRs. Though many methods have been proposed, they either required much elaborate information (not effective) or relied much on the subjective interpretations by designers (not accurate). Aiming to solve the problem, this paper introduces a novel weighted preference graph (PG) approach to analyze incomplete customer preference information in QFD product planning stage. Both its analysis procedures and fusion of individual perceptions are described. An example of a respiratory mask development is given to validate the process.

IEEM16-P-0432

Generating Decision Rules for Flexible Capacity Expansion to Achieve Better Lifecycle Performance

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[3]*Xidian University, China*

A flexible capacity expansion strategy is important for engineering systems since it enables decision-makers to adjust the capacity of systems as uncertainty unfolds. In a flexible capacity expansion problem, how to generate the optimal decision rule to determine when and how to expand the capacity is a challenging task. In this paper, a parameter optimization framework is proposed to automatically generate decision rules for flexible capacity expansion. The proposed framework provides a systematic way to calibrate decision rules through parameter tuning, which is based on the differential evolution (DE) algorithm. This study is illustrated using a waste-to-energy (WTE) system operated in Singapore. Results show that the flexible design with a DE-based decision rule can achieve the better economic performance, compared with the fixed design and the flexible design with an experience-based decision rule. The proposed framework helps decision-makers analyze and manage flexibility, so as to improve system performance.

IEEM16-P-0674

A Model of the N-Player Multiple Period Bargaining Game with Equal Discounting Rate

Pongsakorn NIMNUAL, Naraphorn PAOPRASERT
Kasetsart University, Thailand

This study extends the classical ultimatum bargaining game to consider a case when there are multiple players who are alternatively making their offers in multiple states. The game begins by letting the first player makes an offer, then the subsequent players will decide whether to accept or reject the offer in order. The approach of backward induction was used to solve for subgame perfect equilibria. The equilibrium depends on whether the final state is even or odd. One result shows that when discounting factors are equal for all players, all players except player 1 receive equal payoffs; however, player 1 does not always have the advantage. Another interesting result shows that the discounting factor must be less than one divided by the number of player minus one; otherwise, player 1 has no incentive to offer anything in the first stage.

IEEM16-P-0412

Performance Comparison of Two Truth Telling Incentive Mechanisms: An Experimental Method

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An experiment of predicting the result of the National Basketball Association (NBA) is designed to compare the performance of Bayesian truth serum (BTS) and robust Bayesian truth serum (RBTS) in expert truth telling incentive. It shows that 1) the fundamental hypothesis of BTS, i.e. individuals treating personal opinions as an "impersonally informative" signal about the population distribution, is valid; 2) the relative position of the individual in a group significantly affects the individual's score of RBTS due to RBTS algorithm, which leads to a poor incentive to tell truth, while BTS does not have this problem; 3) BTS does not encourage extreme opinions, while RBTS cannot effectively reward the extreme opinions due to significant deviation of their RBTS scores. The analytic results prefer to BTS, but when the number of individuals is small, RBTS should be employed.

IEEM16-P-0680

POLCA Simulation Game for Job Shop

Whee Ching HOW, Kuan Eng CHONG
University of Technical Malaysia Malacca, Malaysia

The purpose of this paper is to introduce a POLCA simulation game that can educate engineering students and industry professionals on POLCA material flow control mechanism. This POLCA game provides a hands-on experience, experiential learning to enable a deeper understanding on POLCA system. Comparison between original POLCA and SPT-POLCA is experimented using this simulation game. This article describes the objectives, design, and the results of the game and also analysis of pre- and post- surveys.

Session	Project Management 1
Date	6/12/2016
Time	09:00 - 10:30
Room	Mengwi 8
Chairs	Budi HARTONO, *Universitas Gadjah Mada*, Mauro MANCINI, *Politecnico Di Milano*

IEEM16-P-0263

Knowledge Management Maturity and Firm's Performance: Firm's Size as a Moderating Variable

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

This follow-up study provides a conceptual refinement on the possible linkage between 'knowledge management maturity' (KMM) and 'organizational performance' within the setting of Indonesia construction firms. A moderating variable of 'size of organization' is introduced into the analysis. An empirical study was carried out by means of a cross-sectional survey. Out of 486 questionnaires distributed, 117 were returned and deemed usable. The study found compelling evidence to support the conjecture that company size serves as a moderating variable between the two key variables. Further analysis shows a variety of contribution levels of KMM sub-dimensions towards performance. The study could benefit Indonesia construction firms by providing convincing empirical evidence on the differing efficacy of KMM across different company sizes. The practical insights could assist development of KMM strategy for respective organizations.

IEEM16-P-0334

Guidelines for Building Information Modeling (BIM) Performance Improvement in the EPC industry

Andrea BOTTARI, Gabriele IOUDIOUX, Mauro MANCINI, Agnese TRAVAGLINI
Politecnico di Milano, Italy

Building Information Modeling (BIM) is a set of interacting policies, processes and technologies generating an approach to manage design and project data in digital format throughout the project life-cycle. Although BIM is applied traditionally to the civil industry, the implementation of such a tool seems to be beneficial also for the industrial plants sector. Starting from the assessment of the current status of BIM implementation in the Engineering Procurement Construction (EPC) industry, this research aims to provide guidelines for BIM performance improvement for EPC contractors of the Oil & Gas industry, where the need for information management optimization is increasing.

IEEM16-P-0399

Predicting the Effect of Wastes on Project Cost Using Multiple Linear Regressions

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[1]*Ho Chi Minh City University of Technology and Education, Viet Nam*
[2]*Pukyong National University, South Korea*

Waste has been considered as a great source of value losses of construction projects for a long time. The concepts of waste are based on the philosophies of lean production, which were initiated by Toyota Corporation in 1980s. The main purpose of this study is to develop an appropriate model to estimate the impact of waste factors on project performance cost using Multiple Linear Regressions (MLR). Based on the previous studies, nineteen waste factors were found. Data were collected through a structured questionnaire. The results indicated that MLR model gains the coefficient of determination of 79.8%. The difference between observed values and predicted values is not significant at level of 0.05.

IEEM16-P-0268

Structuring Highly Iterative Product Development Projects by Using HIP-Indicators

Günther SCHUH, Michael RIESENER, Frederic DIELS
RWTH Aachen University, Germany

Nowadays, manufacturing companies are faced with the challenge of meeting heterogeneous customer requirements in short product life cycles with a variety of product functions. So far, some of the functional requirements remain unknown until late stages of the product development. This is mainly caused by an increasing market dynamic in combination with the continuously changing customer expectations. A way to handle these uncertainties is the highly iterative product development (HIP) approach. By structuring the development project as a highly iterative process, this method provides customer oriented and marketable products. Therefore, it is necessary to structure each development into empiric-adaptive or deterministic-normative scopes. Recently first approaches for the combination of deterministic-normative methods like Stage-Gate and empirical-adaptive methods like SCRUM on a project management basis have emerged. Accordingly, this paper aims at the presentation of a methodology which enables the classification of each development scope by using a HIP-Indicator. This indicator reveals optimum suitability of every development scope for the realization with either empiric-adaptive or deterministic-normative approaches.

IEEM16-P-0506

Project Success Factors: The Opinion of Facilities Managers

Edoghogho OGBEIFUN, Charles MBOHWA, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

Project success factors are critical elements considered as major determinants of the project's outcome. The iron triangle of cost, quality and time has long been the measuring instrument used in the execution of capital development. This concept has being challenged in recent times. In reality, the role of the capital asset in the execution of the core functions of the organization should influence the project success factors. The single case study method of qualitative research and the Delphi technique were used to collect data from a pilot higher education institution and the result was compared with the opinions of facilities managers from four other institutions. The findings reveal that facilities managers in higher education institutions expanded project success factors beyond the iron triangle. This is because capital assets are essential in the development of suitable academic environments for teaching, learning and research in order to achieve the objectives of the institutions.

IEEM16-P-0483

Performance Metrics in Engineering Change Management - Key Performance Indicators and Engineering Change Performance Levels

Niklas KATTNER, Tianyi WANG, Udo LINDEMANN
Technical University of Munich, Germany

A key aspect of engineering change management is the efficient handling of engineering changes within the product development process. Thus, performance measurement criteria, i.e. performance metrics or Key Performance Indicators, are often used in a variety of domains to either reveal performance deficit or improve a certain process. However, in the field of engineering change management the literature lacks a broad understanding of Key Performance Indicators as well as its applications. This lack of performance metrics can be remedied by transferring available knowledge of KPIs from other research fields. This paper therefore presents an initial perspective on the research activities on performance metrics in various research domains. Furthermore, constraints in engineering change management are identified for the application of KPIs to improve the overall handling of engineering changes. As a result, a performance level model is described for the application of performance metrics in engineering change management.

Session	Facilities Planning and Management
Date	6/12/2016
Time	09:00 - 10:30
Room	VIP Room
Chairs	Ali SIADAT, *Arts et Metiers ParisTech*, Shin-Guang CHEN, *Tungnan University*

IEEM16-P-0281

Performance Enhancing in the Manufacturing Industry: An Improvement KATA Application

Jose DINIS-CARVALHO[1], R.M. Chandima RATNAYAKE[2], Dorota STADNICKA[3], Rui SOUSA[1], J. Ville ISOHERRANEN[4], Maneesh KUMAR[5]
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[2]*University of Stavanger, Norway*
[3]*Rzeszow University of Technology, Poland*
[4]*University of Oulu, Finland*
[5]*Cardiff University, United Kingdom*

As manufacturing firms (MFs) experience increasing competition in the global economy, it is vital to seek competitive advantage through the continuous improvement of performance within manufacturing processes. This requires a systematic approach to enhance performance by engaging staff at all levels to effectively take part in performance-enhancing efforts. The implementation of Toyota Kata has been proven to be highly successful for continuous improvement in a MF. Toyota Kata provides a holistic system of methods for improving performance, which contains processes and behavioral patterns for strategically aligned goal setting, problem solving, coaching, management and training. It is a simple and human factor focused approach, which covers the management of performance improvement efforts. This manuscript presents a case study performed in a wooden frames manufacturing firm for the implementation of Improvement Kata. Lead time has been selected as the performance indicator. The study describes current challenges, Improvement Kata implementation methodology, and the lead time improvement results.

IEEM16-P-0217

Optimal Re-Arrangement in Fast Enumeration for Integer Programming Problems

Shin-Guang CHEN
Tungnan University, Taiwan

Fast enumeration (FE) is a way of efficiency improvement in explicit enumeration. Since its development in 2013, FE gains much attention in the solution of integer programming problems. An integer programming problem is a mathematical optimization or feasibility programming in which some or all of the variables are restricted to be integers. In many cases, the problems can be divided into integer linear programming problems, integer non-linear programming (INLP) problems, and mixed integer programming problems. FE is a re-arrangement of the order of constraints in its enumeration process. Such re-arrangement can greatly reduce the computation complexity in its enumeration. However, different re-arrangement would result in different degree of improvement in efficiency. Therefore, an optimal re-arrangement should be developed to maximize the degree of improvement in efficiency. This paper proposes an algorithm to generate the optimal re-arrangement in FE for INLP, and presents a numerical example to explain the proposed method.

IEEM16-P-0088

Assessing E-Waste Recycling Programs by Developing Preference Selection Index Under Interval Type-2 Fuzzy Uncertainty

V. MOHAGHEGHI[1], S. M. MOUSAVI[1], Ali SIADAT[2]
[1]*Shahed University, Iran*
[2]*Arts et Métiers ParisTech, France*

End-of-life electronic and electrical waste, referred to as e-waste, has recently formed the rapidest increasing group of waste streams worldwide. Having some well-designed plans for managing this waste is essential. One of the most effective ways is to assess and select the most effective e-waste recycling programs. Since these plans require considering different aspects and criteria, applying multi-criteria decision-making method could provide practical results. Another important factor in this process is uncertainty that should be properly addressed. This paper presents a novel decision-making method to effectively assess e-waste recycling programs under uncertainty. The proposed model applies triangular interval type-2 fuzzy sets (TIT2FSs) to handle the uncertain environment of the process and extends the concept of preference selection index to type-2 fuzzy uncertainty to increase effectiveness of the process. Eventually, to present the applicability of the proposed model, an existing example from the literature is solved by the proposed model.

IEEM16-P-0492

Overall Reliability Index Development for Railway Infrastructure and Rolling Stock with Case Study

Fuqing YUAN
University of Tromsø, Norway

Overall reliability index is an indicator to manifest the health level of an infrastructure. The introduction of this index can facilitate the maintenance optimization. Railway infrastructure is complex containing a plenty of constituent units and various measurement data. This paper discusses a general approach to combine these various data. A real railway case is presented to demonstrate the development of the reliability index. In this case, the overall reliability index is developed based on normal distribution and several indexes are merged by a competing model.

IEEM16-P-0547

Complementing a Delphi Exercise with a Focus Group Session

Edoghogho OGBEIFUN, Charles MBOHWA, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

The Delphi technique as consensus-building tool can be used as a stand-alone tool for data collection if the participants in the exercise are also the ones to use the results, or the purpose of the data collection is to address a generic question. Otherwise, the tool should be used along with others; a focus group session has been found to be a suitable complementary tool. This research reports the development of key performance indicators using the Delphi technique and the results being ratified in a focus group session. The finding reveals that the focus group members validated the developed indicators, but they rearranged the order of priority of some of the indicators. This confirms that complementing the result from a Delphi exercise with another tool helps to produce more refined results for ease of application.

IEEM16-P-0248

Research on Incentive Policies of Medical Information Sharing of Medical Consortium in China Based on the Principal-Agent Theory

Qiang ZHANG, Liya WANG, Jinze CHAI, Donghao PEI, Zhibin JIANG
Shanghai Jiao Tong University, China

Medical information sharing is an important part in effective use of medical resources. However, some hospitals are unwilling to share their medical information or use other hospitals' medical information in self-interest in China. Thus, a government's incentive policy can lead hospitals to step up their efforts in sharing medical information. In this paper, based on the principal-agent theory, we constructed a multi-stage medical information-sharing incentive model regarding to the problem of the Medical Consortium in China. In the model, we consider hospitals can be risk-neutral or risk-averse to some random factors. We also propose the concepts of information complementarity and information usability to measure the attributes of information used and shared by hospitals. Through analytical and numerical analysis, the optimal incentive policy is presented, correlations between Chinese government's incentive coefficient and hospitals' features are discussed and some suggestions are given to the government.

Session	Reliability and Maintenance Engineering 3
Date	6/12/2016
Time	09:00 - 10:30
Room	Pecatu 1
Chairs	Anisur RAHMAN, *Griffith University,* Yoshinobu TAMURA, *Yamaguchi University*

IEEM16-P-0355

Evaluation of Customer's Risk to Lifetime Warranty

Anisur RAHMAN
Griffith University, Australia

Products sold with lifetime warranties are well liked by the customer as this type of warranties secure a prolonged reliable operational or useful life, and act as a shield for the customer against inferior quality as well as the potential high repair costs during indefinite life of consumable product. Under such policies, the customer are exposed to risks of costs and product reliability as products usefullife are unsure and are not recorded well in fair trade legislations. This article proposes mathematical models to determine the customer's risk evaluation for lifetime warranty by taking into account the unsure useful life of product. Risk evaluation models are proposed to estimate the optimal warranty cost through the customer's utility function for repair costs. The sensitivity of the warranty costs are discussed graphically with respect to the customer's risk choice, customer's expected failure rate, and the customer's repair costs (in the case of customer's denial of such warranty).

IEEM16-P-0529

Comparison of Big Data Analyses for Reliable Open Source Software

Yoshinobu TAMURA[1], Shigeru YAMADA[2]
[1]*Yamaguchi University, Japan*
[2]*Tottori University, Japan*

Open source software are used in wide ranging areas of software system development, because of the standardization, cost reduction, quick delivery. Many open source software are useful for the software developer and software managers to develop the software system quickly. Also, the open source software are characterized by the bug tracking system. The bug tracking systems are managed by almost open source projects. In the bug tracking system, many data sets are recorded by project members and software users. In this paper, we compare the methods of big fault data analyses based on the deep learning and neural network. Moreover, we show several numerical examples of big fault data analyses in the actual open source software project. As the effectiveness analysis of the proposed method, the comparison results of recognition rate in terms of the proposed method and the conventional method are shown in this paper.

IEEM16-P-0301

Kinetic Reliability Analysis of Space Four-Links Mechanism Considering Wear

Yu SHI, Bifeng SONG, Tianxiang YU, Yugang ZHANG
Northwestern Polytechnical University, China

In this paper, the characteristics of the kinetic reliability of space four-links mechanism are analyzed and the relationship between the kinetic accuracy and wear clearances in joints is explored, using Advanced First Order and Second Moment (AFOSM) method and Monte-Carlo Simulation (MCS). The Archard wear model is applied to analyze the increasing wear clearances in joints; and the function between the joint clearance and the equivalent length of links is built; then the kinetic accuracy of the space four-links mechanism with the increase of wear clearances is analyzed. Finally a demonstrative application is given, illustrating the reliability degradation of kinetic accuracy with the increase of wear clearances, and AFOSM has much higher computational efficiency compared with MCS. Besides, the influence of the contact forces in joints to the kinetic accuracy of space four-links mechanism is analyzed, with instructive results for the design of space four-links mechanism in engineering applications.

IEEM16-P-0522

Decision-Support Approach for Selecting the Suitable Maintenance Policy

Nasser Youssouf MAHAMOUD[1], Pierre DEHOMBREUX[1], Marc PIRLOT[1], Hassan ELMI ROBLE[2]
[1]*University of Mons, Belgium*
[2]*Research Center of the University of Djibouti (CRUD), Djibouti*

The areas of interest for the maintenance policy selection process are widely known to be related to the financial aspects, availability concerns. Also, practical criteria are arising such as the applicability of the maintenance policy, quality improvement, and safety requirement, etc. An assessment approach of the different maintenance policies (corrective, systematic or conditional preventive, predictive, opportunistic or not) on a limited number of decision criteria recognized from the literature review is proposed. This assessment approach is illustrated in a simple case to facilitate the selection of the suitable maintenance policy to an asset.

IEEM16-P-0676

A Quantitative Study on the Impact of Opportunistic Maintenance in the Presence of Time-Varying Costs

Huy TRUONG BA, Michael E. CHOLETTE, Pietro BORGHESANI, Lin MA
Queensland University of Technology, Australia

In production activities, external events (e.g. weather, low market prices) may provide some opportunities to do the preventive maintenance with reduced cost. Implementing an appropriate maintenance policy considering these opportunities can result a significant savings in total maintenance cost. This study focuses on developing a joint preventive and opportunistic maintenance strategy for a production system. The cost savings of opportunities is considered random with a time-varying distribution. A new approach for accepting (or rejecting) an arrived opportunity is also proposed based on minimizing the single-cycle cost rate. A Simulation â€“ Optimization procedure is proposed to determine the optimal preventive maintenance time and acceptance of opportunities. The simulation results presented in this work show that the joint optimization of preventive and opportunistic maintenance can yield a significant cost savings.

IEEM16-P-0586

Time Series of Multivariate Zero-inflated Poisson Counts

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This paper proposes a state space model to describe multivariate autocorrelated zero-inflated count series. The model extends the classical zero-inflated Poisson distribu tion into multivariate cases but is able to impose different zero inflations on different dimensions. Combing the zero inflation with the log-normal mixture of independent Poisson distribution, this model allows for flexible cross-correlations of multiple counts. Furthermore, By considering the zero-inflation parameters as well as the Poisson mean parameters as latent variables evolving according to state space models, the model can capture the autocorrelations of count data. Monte Carlo EM algorithm together with particle filtering method provides a satisfactory estimation for the model parameters and the latent process.

IEEM16-P-0444

A Fuzzy Logic Based Approach for Deciding the Corrective Action to Minimize Vibration Induced Fatigue Damage on Offshore Pipework

Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Vibration velocity measurement technique (VVMT) coupled with the vibration assessment criteria (VAC), employed to decide the level of fatigue damage on the piping system is afflicted by two main shortcomings. First being that the data measured by VVMT is not a direct indicator of the remnant fatigue life (RFL) of a piping system. The second is that the distinction between different regions of the VAC used to identify the level of fatigue damage on the piping system is too rigid. The paper thus proposes a fuzzy logic based approach to overcome the aforementioned shortcomings. An illustrative case study is presented within which the Mamdani procedure is used to establish the relationship between input variables (vibration velocity and RFL) and the output variable (fatigue failure vulnerability index (FFVI)). Thereby, value of FFVI decides both the level of fatigue damage and the corrective action necessary to minimize fatigue damage on offshore pipework.

Session	Information Processing and Engineering
Date	6/12/2016
Time	09:00 - 10:30
Room	Pecatu 2
Chairs	Juergen ZIMMERMANN, *Clausthal University of Technology*, SC Johnson LIM, *Universiti Tun Hussein Onn Malaysia*

IEEM16-P-0122

Hybrid Methods of Particle Swarm Optimization and Spatial Credibilistic Clustering with a Clustering Factor for Image Segmentation

Peihan WEN, Dongqun ZHOU, Meng Jie WU, Shuping YI
Chongqing University, China

Hybrid methods of fuzzy clustering and particle swarm optimization (PSO) are important techniques for image segmentation. The spatial credibilistic clustering (SCC) shows better performance than traditional fuzzy clustering, because of the "typicality" represented by credibility memberships degree is much more accurate than the "sharing" represented by probability membership degree to characterize the relationships between pixels and classes of images. Current integrated patterns of fuzzy clustering and PSO haven't made full use of both advantages. Therefore, main integrated forms were investigated and uniformly modeled by taking SCC as example, then a new kind of integrated pattern and algorithm was put forth, which integrates evaluation functions and update equations by introducing a clustering factor. Segmentation experiments validate that the method has better performance on running time and segmentation quality. The presented integrated pattern can be generalized to other hybrid methods of fuzzy clustering and PSO.

IEEM16-P-0373

Information Processing and Knowledge Discovery Framework for Sustainable Building Environment Using Multiple Sensor Network

S.C. Johnson LIM, Safullizam PUTEH, Kai Chen GOH
Universiti Tun Hussein Onn Malaysia, Malaysia

Building environment plays an important role in ensuring a healthy and productive environment for indoor occupants. However, with the increasing demand for comfortable thermal environment and the call for sustainable building operation, achieving a balance between energy consumption and user's thermal preference is challenging. From the informatics perspective, previous studies mainly focused on intelligent building system and occupants activity analysis, while the research on knowledge discovery from building information for optimized building operation is less emphasized. In this paper, we propose a framework for information processing and knowledge discovery for sustainable building environment. Using wireless sensor networks, we showcase how we can feasibly collect and analyze sensory data for the benefit of building environmental assessment and building system control. A case study involving indoor environmental monitoring at two university offices is presented to showcase our approach. We then conclude our work with some discussion on future works.

IEEM16-P-0184

An Explorative Study on Management and Maintenance of Systems for Design and Manufacture of Customized Products

Morteza POORKIANY, Joel JOHANSSON, Fredrik ELGH
Jönköping University, Sweden

This paper addresses the issues regarding retrieve, reuse, and update of design information in context of customized products and adaptive design. Capturing and representing design rationale during the development process has been identified as an important factor to support design of product variants. The study explores the development process from identifying customer requirements to production preparation in a case company which has long tradition in automating generation of design variants.

IEEM16-P-0349

Determining the Relationship Between Psychological and Physiological Measurements of Human Trust Using Rough Set Analysis

Wei Shiung LIEW[1], Halimahtun MOHD KHALID[2], Parham NOORALISHAHI[1], Zeeshan RASOOL[1], Chu Kiong LOO[1], Martin HELANDER[2]
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[2]*Damai Sciences, Malaysia*

Trust is a quality representing a person's willingness to rely on a trusted party to cooperate. Quantification of trust is highly subjective since it relies on self-reports. In this study, we analyzed trust between human subjects in terms of objective measures of facial expressions, voice and heart rate features as well as subjective trust scores from self-assessment reports. The objective was to use rough set analysis to determine if there was a relationship between the measured objective features and self-reported trust scores, and the degree to which the objective features contributed towards trust estimation. A number of facial expression and voice features were found to be associated to subjective trust estimation.

IEEM16-P-0463

SPSA-Based PID Parameters Optimization for a Dual-Tank Liquid-Level Control System

Xiangsong KONG, Lingwu QIAN, Ziyan WANG
Xiamen University of Technology, China

PID controllers are widely used in industrial control systems. To improve the performance of a PID-type control system, the controller parameters should be optimized. However, traditional PID parameters optimization methods are usually cumbersome, time-consuming and experience-based. In this paper, a revised PID parameters sequential optimization method based on the Simultaneous Perturbation Stochastic Approximation (SPSA) algorithm was developed and implemented on a dual-tank liquid-level control system. This method searches for the performance improvement direction iteratively by perturbing all the parameters simultaneously and evaluating the corresponding control performance directly. This methodology has been tested both on the tank model and the actual equipment. Through the simulation and experimentation, its effectiveness was verified.

IEEM16-P-0189

A Disassmbly Complexity Assessment Method for Sustainable Product Design

Samyeon KIM[1], Seung Ki MOON[1], Su Min JEON[2], Hyung Sool OH[3]
[1]*Nanyang Technological University, Singapore*
[2]*Advanced Remanufacturing and Technology Centre, Singapore*
[3]*Kangwon National University, South Korea*

With high consideration of sustainability, product recovery has become a major interest of product manufacturers by retrieving obsolete products. Disassembly processes can make an impact on the product recovery and be necessary to develop sustainable product design by achieving the product recovery strategy. Therefore, this paper proposes a method to assess product disassembly complexity that represents the disassembly difficulty. The component and interface complexities are measured by various factors from design for disassembly (DFD). Then, the product disassembly complexity can be measured by the modified entropy theory with considering the number of components and interfaces. The proposed method contributes to understanding current products' complexity and benchmarking products for better product architecture design. A case study with electric shavers is performed to demonstrate the effectiveness of the proposed method.

IEEM16-P-0310

Factors That Drive Purchasing Performance in Engineering Procurement and Construction Companies

Gitesh CHAVAN, Ranjan CHAUDHURI
National Institute of Industrial Engineering (NITIE), India

This paper attempts to provide a conceptual framework on factors that affect the purchasing performance of Engineering, Procurement and Construction (EPC) companies'. Till date purchasing performance models have been published for manufacturing firms, this study fills the gap by investigating the factors that constitute Purchasing Performance of an EPC. To accomplish present research objective, an exploratory study is performed with 16 Industry experts from various EPC companies across India, Australia, USA and UAE. The findings will help in developing a purchasing performance Matrix for EPCs which can be implemented to evaluate buyer's purchasing performance at an individual level as well as departmental level. A global perspective on the construct of purchasing performance is important to understand emerging themes and new concepts that constitute the construct of Purchasing Performance for EPCs.

Session	Technology and Knowledge Management 3
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 1
Chairs	Nurul INDARTI, *Universitas Gadjah Mada*, Weng Marc LIM, *Swinburne University of Technology*

IEEM16-P-0276

Types of Knowledge Transferred in Family Business Succession

Nurul INDARTI[1], Gabriella Hanny KUSUMA[2]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Universitas Atma Jaya Yogyakarta, Indonesia*

This qualitative multiple case study aims to explore the key knowledge that is transferred by predecessors (parents) to successors (children) in a family company. This knowledge becomes a resource to create the family company's competitive advantage. The research sample was composed of 23 participants from 13 family companies. The data were obtained through in-depth, semi-structured interviews. The data were analysed using content analysis and then processed using a visual map and temporal bracketing. This study used source triangulation and member checking to ensure validity and reliability. The results show that the majority of knowledge transferred by predecessors to successors is tacit knowledge. Knowledge transferred by predecessors to successors includes knowledge of the product, knowledge of company management, technical knowledge, and philosophical knowledge.

IEEM16-P-0379

Experience Reuse to Improve Agility in Knowledge-Driven Industrial Processes

Valentina Maria LLAMAS[1], Thierry COUDERT[2], Laurent GENESTE[2], Juan Camilo ROMERO BEJARANO[3], Aymeric DE VALROGER[3]
[1]*University of Toulouse, France*
[2]*University of Toulouse, France, Metropolitan*
[3]*Axsens bte, France*

Companies need to become more agile to survive to the unstable and highly changing market-place. This can be achieved through the adaptation and control of their business processes. A process sufficiently structured but not over constrained by standards and based on experience feedback principles is necessary. This article describes a proposition of agile process driven by the reuse of experiences and knowledge. For this purpose, based on Case-Based Reasoning (CBR) principles, the complete lifecycle of an agile process is introduced, from requirements definition, retrieval, reuse, adaptation, and storage steps. Finally, an example applied to the domain of industrial problem solving is presented to illustrate the methodology.

IEEM16-P-0401

Research on Knowledge Push Method for Business Process Based on Multidimensional Hierarchical Context Model

Faping ZHANG, Li LI
Beijing Institute of Technology, China

This paper puts forward a knowledge push method which is based on multidimensional hierarchical context model for general business process, and constructs a multi-dimensional hierarchical model of business process and a context driven knowledge resource database model, which emphasizes the mapping relation between knowledge and the knowledge context. On this basis, a framework of the knowledge push process including knowledge adapter and knowledge pusher based on context is proposed. At last the application to knowledge push system for aircraft development process shows the method can solve the problem and improve the efficiency of knowledge share.

IEEM16-P-0456

Study on Main Delivery Actors in Technology Delivery System (TDS) Based on Multi-Data Sources

Ying GUO, Ganlu SUN, Ying HUANG, Yun FU, Yue QIAN
Beijing Institute of Technology, China

As innovation becomes important and complex, researchers started to explore innovation process under the background of Big Data. Technology Delivery System (TDS), a systematic method dynamically showing innovation process, has caused the extensive concern worldwide. As an essential step to construct TDS better, this study aims to identify main delivery actors in TDS based on multi-data sources, then analyze the delivery relationships between actors and evaluate various actors' delivery capacity. We hope to improve current technology management and opportunity identification for complex innovations. Firstly, we divide TDS into four phases and apply different matched data sources to identify actors in corresponding phases. Secondly, we try to find technology relationships between actors. Finally, we conduct three indicators to calculate delivery capacity of main actors. With the development of intelligent manufacturing, we choose its new mode, Cloud Manufacturing in China, as a case to verify the feasibility of the approach.

IEEM16-P-0361

Does Innovation Promote Exports? Evidence from Chinese Manufacturing Firms

Ke JI, Jianwei DANG, Kazumitsu NAWATA
The University of Tokyo, Japan

This paper investigates how innovation contributes to export growth by modelling the link between the stock of past patent applications and values of exported goods. Using a rich set of firm-level trade data from China (2000 to 2006) and patent application data, the present study finds that past patent applications are positively correlated with export growth in both static OLS and fixed effect panel regressions. In addition, the result shows that special economic zones in China strengthen this link between innovation and export growth in that firms located in special economic zones show faster growth in exports. As for types of trade, firms participating in processing manufacturing enjoy higher export growth incurred by past innovations, and the result is robust in both OLS and panel settings.

IEEM16-P-0495

Product Configuration System and its Impact on Product's Life Cycle Complexity

Anna MYRODIA, Katrin KRISTJANSDOTTIR, Sara SHAFIEE, Lars HVAM
Technical University of Denmark, Denmark

The purpose of this paper is to identify areas throughout a product's lifecycle processes where complexity can be reduced by implementing a product configuration system (PCS). As discussed in the literature, several benefits are realized by using a PCS in terms of product and process standardization. This also leads to control and reduce of complexity both in products and processes. To this end, this research attempts to quantify and assess these benefits and is supported by empirical evidence. A case study of an engineering company is used and the results indicate significant improvements for the company in several life cycle processes.

IEEM16-P-0270

Implementation of Lean Knowledge Work in Oil and Gas Industry - A Case Study from a Risk-Based Inspection Project

Andika RACHMAN, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Professional engineering service-delivering firms (PESDFs) that provide knowledge-intensive technical services to oil and gas (O&G) operators are under pressure to deliver their services/products in a more effective and efficient way, especially in the current oil crisis situation. While the objective of the firms is to deliver the highest value to their clients, waste is still embedded in the processes involved in value delivery. One initiative to cater for the aforementioned is to implement lean principles that have evolved in the manufacturing industry during the past few decades. The main challenge is to translate these principles to knowledge-intensive technical services that have completely different characteristics when they are compared with manufacturing settings. A case study from a Risk- Based Inspection (RBI) assessment project is undertaken to illustrate the potential of lean implementation. The Value Stream Mapping (VSM) technique is employed to identify the waste as well as to provide recommendations for future process improvements.

Session	Operations Research 4
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 2
Chairs	Lionel AMODEO, *Universite de Technologie de Troyes*, Charles MBOHWA, *University of Johannesburg*

IEEM16-P-0642

Efficient Metaheuristic for Multi-Product Disassembly Lot Sizing Problem with Lost Sales

Mustapha HROUGA, Matthieu GODICHAUD, Lionel AMODEO
University of Technology of Troyes, France

Disassembly planning aims to determine the quantity of end-of-life products in order to satisfy or lost the demand of leaf items over a given planning horizon while the objective is to minimize the sum of setup and inventory holding costs. Disassembly planning problem with two levels, multi-products type and capacity constraints is treated by developing a linear programming model. The objective of this model is to minimize the sum of the fixed costs of disassembly, inventory holding cost of components and lost sales cost. In order to solve it, we propose an efficient optimization method based on genetic algorithm and Fix-and-Optimize heuristic. Our contribution is both the development of a new model allowing lost sales, and then we propose a new approach to solve it for all instances where CPLEX cannot find a solution in reasonable time of calculation. To show the effectiveness of the proposed approach, several tests are performed on many instances adapted from literature.

IEEM16-P-0264

An Application of Microsoft Excel's Evolutionary Solver Based on a Novel Chromosome Encoding Scheme to the 1/N Portfolio Tracking Problem

Oliver STRUB, Norbert TRAUTMANN
University of Bern, Switzerland

The 1/N portfolio is an equally-weighted portfolio composed of all N stocks from a given investment universe. This portfolio offers an attractive risk-return profile but causes substantial management costs if N is large. Therefore, we consider the problem of optimally tracking the 1/N portfolio by constructing an equally-weighted portfolio composed of a subset of the N stocks. This problem can be formulated as a binary quadratic program that, however, becomes computationally expensive to solve for mathematical programming solvers if N is large. In this paper, we present a novel chromosome encoding scheme based on a string of unique integers representing the indices of the selected stocks. We implement this scheme on a spreadsheet and apply Microsoft Excel's evolutionary solver to devise tracking portfolios. We demonstrate that, by using our novel encoding scheme instead of an existing one, the solver determines considerably better solutions.

IEEM16-P-0285

Makespan Minimization in Aircraft Landing Problem Under Congested Traffic Situation Using Modified Artificial Bee Colony Algorithm

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

Due to the increase in air transportation demand, runway capacity is reaching a bottleneck at the international airports, especially during peak hours. Managing on aircraft sequencing or sequencing problems in airport perspective have become a crucial operation nowadays in order to maintain safety landing and utilize the runway facility to handle the schedules for all incoming aircraft under congestion. The traditional approach allows aircraft to remain an economic speed during approaching to the airport. However, such approach may not be applicable in congested air traffic situation. Therefore, the makespan minimization is more practical for the rescheduling efforts afterwards. This article presents a modified artificial bee colony algorithm to obtain nearly optimal solution to support the air tower controller in order to obtain last-minute decisions of landing sequence. The modified artificial bee colony algorithm for aircraft landing problem provides a promising optimal search within 6.1 seconds to handle last-minute disruption.

IEEM16-P-0272

The Resource Transfer Problem: Modeling and Solving Integrated Scheduling and Routing Problems

Illa WEISS, Christoph SCHWINDT
Clausthal University of Technology, Germany

The resource transfer problem (RTP) is a generic framework for integrated scheduling and routing problems, which allows for modeling and solving complex scheduling and rich vehicle routing problems as well as their hybrids in a unified way. Many constraints and specific requirements arising in scheduling and routing applications are covered by the RTP. Basically, the problem consists in scheduling a set of activities that have to be performed at different locations in a network. The activities can be executed in alternative modes, using different amounts of resources. The resources can be transferred between the locations and may require sequence-dependent changeovers between consecutive activities. Moreover, generalized precedence relations between the activities have to be taken into account. For solving the RTP we propose a time-oriented branch-and-bound algorithm exploiting constraint-propagation techniques to reduce the search spaces. We report on computational experience on a set of integrated supply chain scheduling and routing problems.

IEEM16-P-0292

U-shaped Line Balancing Model with an Uncertainty Time on some Tasks

Suthep VARNASILPIN, R. MASUCHUN
King Mongkut's Institute of Technology Ladkrabang, Thailand

U-shaped Assembly Line (UAL) applies the just-in-time principle which decreases the waste in the operations. This paper presents the UAL model which bases on an uncertain task time. It consists of eight certain tasks and three uncertain tasks. The objective function of the model is the minimum number of workstations. The model formulates on a zero-one integer linear programming. The distribution of the uncertain tasks assume discrete. The procedure of the UAL model is run by INTLINPROG toolbox on MATLAB R2014a. The solution of the uncertain tasks is the earliest finish duration. The earliest finish tasks which assign along the UAL line affect the minimum workstations.

IEEM16-P-0411

Joint Financing Strategy for a Cash-Constrained Supply Chain

Jinjin ZHANG[1], Ting NIE[1], Junzhe HUANG[2], Yan CHEN[1]
[1]*Macau University of Science and Technology, China*
[2]*Ping An Insurance (Group) Company, China*

A cash-constrained two-level supply chain with a supplier and a single retailer facing stochastic demand is considered in this paper. Two different financing strategies are investigated and the resulting expected return of the supplier, retailer, and bank are examined. Our numerical study shows that by sharing revenue and risk among supplier, retailer, and bank, the joint financing strategy can improve the expected revenue of all three partners by satisfying customer's need better.

Session	Supply Chain Management 4
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 3
Chairs	Jayendran VENKATESWARAN, *Indian Institute of Technology Bombay*, Alireza FARAZ, *University of Applied Sciences Upper Austria*

IEEM16-P-0641

Empirical Studies of New Product Diffusion Under Uncertainty

Jayendran VENKATESWARAN, Siddhartha PAUL, R. VIDYADHAR, Chetan Singh SOLANKI, N.C. NARAYANAN
Indian Institute of Technology Bombay, India

The operational dynamics arising out of the diffusion of solar lamps (a new product) in rural India has been discussed in this paper. Empirical evidence is provided to show that the shortage of product supply adversely affects the diffusion process. The shortage not only delays the diffusion process, but also creates multiple phases of diffusion wherein each phase exhibits distinct new product diffusion behavior. That is, the effect of past sales and whatever positive word-of-mouth effect that might generate is lost when periods of inactivity due to inventory shortage occurs. So aggregate, independent and dependent Bass diffusion models were fitted to the collected empirical data. Results from computational experiments based on Bass model calibration confirm that new product diffusion takes place in distinct and independent phases due to inventory stock outs (supply shortage).

IEEM16-P-0308

Make Sure You Understood Your Strategic Partner in Your Buyer-Supplier Relationship

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[2]*Lehigh University, United States*

Buyer-supplier relationships have always been an important component in the long-term success of supply chains. This paper constructs a non-parametric Hoteling's T2 control chart to ensure that supply chain partners in dyadic relationships have the same level of understanding about the relationship. The proposed method is helpful to identify any unusual behavior in the relationship before it becomes a real problem.

IEEM16-P-0333

Development of Risk Assessment Model for Farmers in Tomato Supply Chain

Gowri RAJAGOPAL, Malliga POOSANDARAM, R. KALA
Anna University, India

Tomatoes are amongst the most consumed vegetables in India. Due to various issues in cultivation and sale of tomatoes, it is not preferred by most farmers in Tamilnadu, India. This paper showers light on various problems faced by the farmers involved in the tomato supply chain process. Around 20 different issues were identified from literature, brainstorming with experts and direct interactions with farmers. These issues were categorized into three main categories namely Avoidable, Unavoidable and Manageable issues. Further the same are divided into five sub - categories namely finance, crop related, nature, labor and miscellaneous issues. It was identified that majority of the farmers faced labor shortage, knowledge of Post Harvesting Techniques (PHT), and transportation issues and basic amenities. Focusing on selective avoidable and manageable issues a conceptual model named "FArmers and COnsumers Only" (FACOO) has been designed such that it would reduce the impact on the tomato farmers and provide a better way to manage their produce at various stages and acquire profit.

IEEM16-P-0602

Game Theoretical Analysis of Supply Chain Configurations

Soh SAKURAI, Tatsushi NISHI
Osaka University, Japan

In this paper, we propose a game theoretical analysis of supply chain configurations for two manufacturers and two retailers. The supply chain configuration is the structure of the leader-follower relationship in the decentralized decision making of pricing decisions for manufacturers and retailers. The effects of the supply chain configurations on the total profit are investigated. The closed-form equilibrium solutions are derived through the backward induction. The results demonstrate that the change of leader-follower relationship in the supply chain configuration according to the situations enable us to obtain higher total profit.

IEEM16-P-0015

Relating Supply Chain Integration with the Culture and Strategy of its Constitutent Members: A Theoretical Framework

Dhan SINGH, R R K. SHARMA
Indian Institute of Technology Kanpur, India

In this paper, we argue that cost leader supply chain (or Defender SC) has more finance and production related integration; whereas differentiator supply chain (or Prospector supply chain) has more marketing and R& D related supply chain integration. If supply chain members have similar strategies and strategic decision making processes, it leads to better supply chain integration. We also relate different dimensions of culture to the extent of supply chain integration achieved.

IEEM16-P-0661

Maturity Model For Supply Chain Collaboration: CMMI Approach

Thi Phuong Dung HO, Arun KUMAR, Nirajan SHIWAKOTI
RMIT University, Australia

A review of the existing literature has revealed enormous benefits of supply chain collaboration. However, some studies also report failures in the implementation phase. There is a lack of clear theoretical framework which guides organizations in implementing or improving the collaboration maturity level for the supply chain. This research aims at developing a maturity model for supply chain collaboration (MM-SCC), based on Capability Maturity Model Integration (CMMI) approach which is recognized as an important improvement tool for organisations. The framework is considered as a diagnostic tool for analyzing current collaboration practices in organizations as well as a road-map to guide organizations toward advancement level in supply chain collaboration. The proposed model has five maturity stages in terms of best supply chain collaboration processes.

IEEM16-P-0455

Estimating the On-Time Probability for Vendor Selection Problem

B. Ashish KUMAR[1], Parthasarathy RAMACHANDRAN[1], Girish MODGIL[2]
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[2]*GE Power Services, United States*

Customers expect fast delivery of products and services. Businesses understand this requirement and focus on efficient supply chains. The vendor selection process, which is complicated due a host of internal and external factors affecting the decision making, is fundamental to an efficient and responsive supply chain. As a selection criterion, the on-time probability for a vendor to supply a part can be used. In this paper, we have applied three quantitative methods, namely logistics regression, discrete time survival analysis and naïve Bayes classifier to evaluate a vendor. The mathematical models to estimate the on-time probability, were built and tested on a data set provided by a case company and evaluated with the help of key metrics.

Session	Production Planning and Control 1
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 5
Chairs	Laith HADIDI, *King Fahd University of Petroleum and Minerals*, Vipul JAIN, *Victoria University of Wellington*

IEEM16-P-0233

Solving the Scheduling Problem of Machines with Auxiliary Tools

Ya-Chu YANG, Yu-Ting LIN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

Most existing studies on production scheduling considered only one resource type, usually the machines. But in certain actual manufacturing environments, other resources, such as tools, operators, and so on, may become a scare resource for the short term production scheduling. Therefore, this study investigates the scheduling problem that simultaneously considers machines and their auxiliary tools. Both of these two resources are limited and their eligibility to processing various jobs are considered. Also, the initial work-in-process (WIP)job for each machine and for each auxiliary tool is an initial parameter for a problem instance. A mixed integer programming (MIP) model with the objective of minimizing makespan is proposed. Several tested problems are solved to validate the MIP model.

IEEM16-P-0234

Solving Cutting Scheduling Problem by Simulated Annealing Search Method

Kuan-Ting TUNG, Chih-Yu CHEN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

There are three important objectives for the management of apparel production. To maximize the overall throughput of the factory, the first objective is to fully utilize sewing process, the usual bottleneck. The second objective is to maximize the fabric utilization of cut order plan which is determined by the cutting department of a factory. The focus of this study is the third objective which is to minimize work-in-process inventory level under the condition that cut pieces are supplied to the following bottleneck sewing operation in time without making the bottleneck idle. The solutions of the first and second objective that serve as input data are randomly generated to the problem of this study, cutting scheduling. To efficiently solve the problem, this study tested simulated annealing for solving the problem.

IEEM16-P-0236

Testing Multiple Threads Tabu Search by Solving Scheduling Problems

Shuo-Cheng SHUN, Yi-Feng HUNG
National Tsing Hua University, Taiwan

This study addresses the efficiency of multiple threads Tabu search (TS) in solving scheduling problems. Nowadays, most desktop personal computers equip with multicore CPU. It is possible to achieve parallel searching strategy on a desktop computer. A problem of scheduling, which minimizes the total tardiness of a set of jobs to be scheduled on parallel identical machines, is presented as an example in this study. The parallel program uses Open Multi-Processing (OpenMP) library under Microsoft Visual Studio 2010 environment. An experiment of different number of jobs is executed by the parallel Tabu search program with different number of threads, and the results of single thread and multithreads are discussed. In sum, the more threads used for searching process, the lager instances to get a better solution.

IEEM16-P-0241

Comparisons of Three Mixed Integer Programming Models for Parallel Machine Scheduling

Shan-Hao YU, Yi-Feng HUNG
National Tsing Hua University, Taiwan

Based on several existing literatures that use mixed integer programming (MIP) to solve parallel machine scheduling problems, this study tests and compares three MIP models. Each order has its own ready date, due date and processing time. The completion time of the order cannot over the its due date. If not, penalties for tardiness will occur. Formulation 1 used in immediate-precedence variables [1]. Formulation 2 is an improved version of immediate-precedence variables original proposed by [2]. Formulation 3 used linear ordering variables [1]. The results reveal that Formulation 2 has better computational performance than other does.

IEEM16-P-0254

Modeling Fabric Cutting Scheduling as Mixed Integer Programming

To-Ju WANG, Jia-Ying PENG, Yi-Feng HUNG
National Tsing Hua University, Taiwan

There are four major production processes in apparel manufacturing: cutting, sewing, ironing, and packing. Usually, the sewing process is the bottleneck for most apparel factories. Sufficient amount of work-in-process from cutting department must be provided in time to prevent the sewing operation from idleness.
Scheduling a cutting operation problem is similar to a two-dimensional bin packing problem. The operations on cutting tables can be represented by a two-dimensional Gantt chart. The horizontal axis and vertical axis of the Gantt chart represent the time line and the location on the length of the cutting table, respectively. In addition, the cutting operation can be represented by a rectangle, which is placed on the two-dimensional Gantt chart. A mixed integer programming model is proposed in this study to solve such a problem with the objective of minimizing makespan.

IEEM16-P-0328

Integration Aggregate Production Planning and Maintenance Using Mixed Integer Linear Programming

M. ERFANIAN, Mohammadali PIRAYESH
Ferdowsi University of Mashhad, Iran

Aggregate production planning is a planning process and control of entire production activities to meet the variable demands of aggregate products. The goal is to determine the production and inventory levels to minimize the total production cost with limited resources of workforce and equipment. On the other hand, the aim of maintenance planning is to improve the efficiency of equipment to satisfy the production requirements. In this paper an integrated model of aggregate production planning and maintenance planning is developed to determine the optimal plan of production and preventive maintenance in each period. To exhibit the performance of the introduced model, a case study is conducted in a pharmaceutical company and its results are expressed.

IEEM16-P-0658

Production Planning for Customer Innovated Products

Johannes ATUG, Andreas HEES, Marcel WAGNER, Stefan BRAUNREUTHER, Gunther REINHART
Fraunhofer IWU, Germany

Market trends of the last two decades showed a high demand for customer innovated products. The production of individualized batch-size-one products requires a production planning and control (PPC) paradigm shift. This paper therefore provides an insight into requirements for PPC of customer innovated products. Customer-specific order processing, an approach to time and capacity planning as well as an adaptation of flexible-batch-size production are furthermore explained. At the end, a prototypical industrial implementation based on a household appliance manufacturing company is illustrated.

Session	Manufacturing Systems 2
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 6
Chairs	Sirichai TORSAKUL, *Rajamangala University of Technology Thanyaburi,* Junfeng WANG, *Huazhong University of Science and Technology*

IEEM16-P-0368

A Finite Element Simulation for Shape Influences of the Drawbead on the Non-Symmetrical Deep Drawing Process

Sirichai TORSAKUL[1], Alexander BREZING[2]
[1]*Rajamangala University of Technology, Thailand*
[2]*King Mongkut's University of Technologz North Bangkok, Thailand*

This research investigated the effects of three different drawbead shapes under three blankholder forces on the non-symmetrical deep drawing metal workpiece. In the study, simulations were carried out on three grades of cold rolled steel sheets (i.e. SPCC, SPCD and SPCE) using the finite element method (FEM) and the actual experimentations performed for comparison. The experimental drawbead shapes included the half-round, V-shaped and trapeziform shapes, and the blankholder forces were 30%, 50% and 70%. The findings revealed that the SPCE steel, half-round drawbead and 50% blankholder force is the optimal combination for the experimental steel sheet forming. In addition, the FEM simulation and actual results are in good agreement, indicating that the FEM could effectively be deployed to predict the steel forming outcomes and as a tool in the drawbead selection for the deep drawing process.

IEEM16-P-0074

Active Energy Saving Strategy for Sensible Manufacturing Systems Operation Based on Real Time Production Status

Junfeng WANG[1], Jin XUE[1], Yi FENG[1], Shiqi LI[1], Yan FU[1], Qing CHANG[2]
[1]*Huazhong University of Science and Technology, China*
[2]*Stony Brook University, United States*

Energy consumption becomes a very important performance indicator of manufacturing system. By turning non-bottleneck machines into sleep mode, energy saving system operation in real time will be indispensable strategy for modern information rich manufacturing system under Industry 4.0 environment. From the system perspective, a general energy saving operation strategy is proposed to utilize the transient production status of machines and buffers by active sensing and responding in a serial tandem line. A definition of sensible manufacturing system is given to describe the characteristics of the new generation manufacturing system. Based on the captured real time data, the energy saving opportunities are analyzed without sacrificing the production throughput. The key modules including energy saving window, active machine model with sensible ability and multi-granularity state chart model for machine control are described. Some preliminary simulation results are given to show the feasibility and effectiveness of proposed energy saving control strategy.

IEEM16-P-0227

External Buildings Retrofit: Employing Guillotine Cuts for Aesthetic Envelopes

Andres Felipe BARCO, Michel ALDANONDO, Elise VAREILLES, Paul GABORIT
University of Toulouse, France, Metropolitan

The design of façades insulating-envelopes based on rectangular configurable panels is addressed via guillotine cuts. This design is treated as a two-dimensional orthogonal packing problem which considers the specific geometry and structure of each facade. Among the various packing algorithms dedicated to this particular design problem, the cutting approach is the most appropriated to design aesthetic insulating envelopes by including architects aesthetics criteria. The proposed solution exploits human knowledge and expertise to provide consistent envelopes solutions, in competitive computational time and with aesthetics aspects. Our work aims to assist architects in decision-making.

IEEM16-P-0208

A Hybrid Discrete Cuckoo Search Algorithm for Cell Formation Problem with Alternative Process Routings and Operation Sequence

Hao HUANG, Hanxin FENG, Ershun PAN, Lifeng XI
Shanghai Jiao Tong University, China

As the foremost step for designing a cellular manufacturing system, cell formation is a hard optimization problem. It is necessary and significant to develop methods to find near-optimal solutions in a reasonable time. In this paper, the first hybrid discrete Cuckoo Search (HDCS) algorithm is designed to address the cell formation problem. Alternative process routings and operation sequence of parts are considered. The number of cells is not known as a priori. In HDCS, Lévy flights are redefined to perform the evolution of discrete solutions. Local search is employed to expand the search scope. Computational experiments on six cell formation problems available in the literature are also presented. The results reveal that HDCS outperforms the genetic algorithm-based and particle swarm optimization based approaches. HDCS is more robust, effective and efficient.

IEEM16-P-0449

Non-Cyclic Scheduling of Dual-Armed Cluster Tools for Bi-Objective Minimization of Wafer Residence Time and Makespan

Masaru SAKAI, Tatsushi NISHI
Osaka University, Japan

Dual-armed cluster tools are widely used for semiconductor manufacturing. The system consists of several loadlock modules, processing modules, and material handling robots for transferring wafers between them. Most of the conventional works focused on the scheduling cluster tools for the minimization of makespan. It is also important to minimize the residence time in the process module in order to prevent the deterioration of the quality of the wafer surface. Also, cluster tools have to avoid deadlock situations which may lead to excessive loss for wafer fabrication system. In this paper, we propose an efficient scheduling method for deadlock avoidance strategy and the bi-objective of the minimization of makespan and wafer residence time.

IEEM16-P-0513

Internet of Things Value for Mechanical Engineers and Evolving Commercial Product Lifecycle Management System

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

Currently, expectations from Internet of Things (IoT) are extremely high worldwide. However, mechanical engineers working on product design processes do not always benefit. This paper utilizes the up-to-date IoT-enabled commercial product lifecycle management (PLM) system to examine the effectiveness of IoT value for mechanical engineers. Moreover, it discusses the maturity model for digital engineering for the new era of IoT. Furthermore, this paper introduces significant initiatives such as a PLM functionality connected to everything, monitoring of field data for getting back to design process, and virtual 3D data and real field data superposition. This paper concludes that there is high potential to use IoT technology for mechanical engineers from the perspective of quality and reliability design innovations.

IEEM16-P-0247

Variation of Elastic Modulus During Cold Drawing of Seamless Tubes and it's Influence on Springback

Dada KARANJULE[1], Sunil BHAMARE[2], Thota RAO[3]
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[3]*Indian Seamless Metal Tubes Limited, India*

Inelastic recovery behavior of seamless tubes has been investigated by uniaxial tensile tests. Unloading stress–strain curves for different plastic strain reveals that the percentage of inelastic recovery to the total recovery increases with plastic deformation. The results of this study concludes that with increase in plastic strain, Young's modulus reduces drastically first then reduces somewhat slowly and finally stables to certain value. It is observed that this variation of Young's modulus is related to internal stresses, residual stresses, micro cracks, dislocations during plastic deformation. With increase in plastic deformation, residual stresses increases which lowers Young's modulus. This paper is an experimental study how Young's modulus decreases with plastic strain. The results of study concludes that 10-20% degradation occurs in Young's modulus for 5-7% plastic strain.

Session	Decision Analysis and Methods 3
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 7
Chairs	Ali SIADAT, *Arts et Metiers ParisTech*, Mauro MANCINI, *Politecnico Di Milano*

IEEM16-P-0585

Multi-Criteria Performance Management Methodology for Decision Support in Industrial Project Selection Problems

Fan LI[1], Alain ETIENNE[1], François VERNADAT[2], Ali SIADAT[1]
[1]*Arts et Métiers ParisTech, France*
[2]*University of Lorraine, France*

Selecting the most adapted alternative for a new project is a challenging problem because it contains a lot of uncertainty due to lack of information. Moreover, better decision making processes still need to be proposed to help decision makers to select the most effective solution among several alternatives. Although different methods and tools have been developed for this purpose, there is still room for improvement. Therefore, the objective of this paper is to develop a methodology that provides the decision makers with comprehensive and accurate performance expressions for decision support in project selection problems. The proposed methodology consists of three main phases: performance criteria identification, performance quantification and aggregation based on the following performance dimensions: benefit, cost, value and risk.

IEEM16-P-0336

A Real Options Investment Model for the Evaluation of Wind and Photovoltaic Plants

Mauro MANCINI[1], Roberto SALA[2], Daniele TEDESCO[3], Agnese TRAVAGLINI[1]
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[3]*BMW Group, Italy*

Recent years have been characterized by an increasing energy demand and by growing attention to energy production sustainability. For this reason, the number of plants powered by renewable sources has increased. Simultaneously, the energy sector has to face increasing uncertainty due to market liberalization. These factors has made it necessary for investors to find a proper evaluation method for their projects able to take into account also these aspects. This work tries to provide two original contributions: firstly, the creation of a model that helps the investor to understand which technology can best satisfy his energy need; and secondly, the implementation of the RO (i.e. Real Option) approach. To verify the consistency of the model, it has been applied to three different real situations.

IEEM16-P-0610

Conflict Analysis in Redevelopment of Brownfield Caused by Contingency: Tianjin Port "8•12" Explosion Hazard, in China

Xia LI, Yuming ZHU, Yumeng SHI
Northwestern Polytechnical University, China

Unlike the common brownfield, the redevelopment of brownfield caused by contingency has risen the high level of social concern. And the situation is mostly urgent, sensitive and complex. Taking the brownfield caused by Tianjin port "8•12" explosion hazard as the example, the paper applies graph model of conflict resolution (GMCR) to modeling and analyzing, and focuses on the impact of time sensitivity on decision-makers' preference and options. Final equilibria indicate that Government Body (Central government and Tianjin municipal government) and community residents prefer private developers to redevelop brownfield. The paper has important value for solving such conflict and improving decision-making in brownfield redevelopment.

IEEM16-P-0606

Theory of Inventive Problem Solving (TRIZ) Based Contradiction Resolution Strategies for Shaanxi Aviation Industrial Upgrading

Wenqi YAN, Yuming ZHU, Naveed AHMAD
Northwestern Polytechnical University, China

The aim of this paper is to formulate strategies for Shaanxi Aviation Industrial Upgrading (SXAIU). First, a two-level index system was established by combining literature analysis and Delphi methods, which includes the key success factors and external driving forces affecting Shaanxi aviation industry (SXAI). After that, by using the Theory of Inventive Problem Solving (well-known as TRIZ), these key factors were translated into critical problems and strategies were formulated to settle them. This study contributes in two ways. On the one hand, it could help to administrators of SXAI to adopt the short term strategies primarily and implement medium and long term strategies according to their own 3- to 5-year goals. On the other hand, the strategies established in this study are more operational and decision-making process is more transparent and scientific. Therefore, other industries in Shaanxi and other provinces can also adopt strategies developed in this study.

IEEM16-P-0012

About the Computation of Robust PROMETHEE II Rankings: Empirical Evidence

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Université libre de Bruxelles, Belgium

Engineering decision problems often involve the simultaneous optimization of several conflicting criteria. Among multicriteria decision aid methods, PROMETHEE has gained a lot of attention during the last three decades. Despite its successful application in different fields, some researchers have pointed out the fact that PROMETHEE does not respect the independence to third alternatives assumption. This leads to the so-called "rank reversal" phenomenon; the relative position of two alternatives may depend on a third one (and so a manipulation threat might exist). In this paper, we propose an alternative method to compute a complete ranking. Inspired by the ideas of robust statistics, we assess the probability of having a given alternative being ranked before another one based on different samplings of the set of alternatives. This allows us to assess a new pairwise comparison matrix that is then exploited by means of net flow scores.We show on an illustrative example that the new method does not suffer from rank reversal (while the PROMETHEE II ranking does).

IEEM16-P-0652

Simultaneous Barrel Cutter Design and Tool Path Planning in 5-Axis Machining of Freeform Surfaces

Chih-Hsing CHU
National Tsing Hua University, Taiwan

Barrel cutter provides a higher material removal rate and better machining quality than those of cylindrical cutter in machining of complex geometries. Those advantages largely depend on proper design of the barrel cutter geometry and the corresponding tool path, which is still lack of systematic solutions. This work proposes a computational framework that alternatively optimizes the cutter geometry and the tool path in 5-axis machining of freeform surfaces. Revolving a cutter profile expressed in the Bezier form along an axis generates the cutter shape. The first step is to estimate an initial cutter profile from analyzing the tool engagement condition at a series of cutter locations along a tool path. A Response Surface Modeling (RSM) based algorithm is applied to simultaneously adjust all the cutter locations with an objective to reduce the geometrical errors on the machined surface. Should the error amount not satisfy a given tolerance after certain number of iterations, the framework starts to re-design the cutter profile using a stochastic optimization algorithm. The optimization of tool path planning is then conducted for the new cutter. Such an alternative optimization process continues until reaching the tolerance or other termination criteria. Simulation results demonstrate that the proposed scheme is effective on automating the barrel cutter design and precision tool path planning in 5-axis CNC machining of complex parts.

IEEM16-P-0370

Risk Perception, Risk Propensity, and Unsafe Behavior: An Empirical Study of Workers in Chinese Construction Industry

Yiping HUANG, Xueqing WANG, Ruxi DING, Nini XIA
Tianjin University, China

As one of the most important participants in construction industry, construction workers' unsafe behavior is very common on construction sites. From an individual level, this research aims to investigate the relationship among risk perception, risk propensity and unsafe behavior decision-making. A survey is conducted within first-line workers in Chinese construction projects. The results show that: 1) risk propensity is positively and significantly related to unsafe behavior, 2) risk perception is negatively and significantly related to unsafe behavior, 3) risk propensity is negatively and significantly related to risk perception, and 4) risk perception partly mediates the relationship between risk propensity and unsafe behavior. Thus, project managers should pay more attention to risk-seeking workers in order to reduce their unsafe behavior.

Session	Project Management 2
Date	6/12/2016
Time	11:00 - 12:30
Room	Mengwi 8
Chairs	Jan Harm PRETORIUS, *University of Johannesburg*, Reza KIA, Firoozkooh Branch, *Islamic Azad University*

IEEM16-P-0340

Investigating the Effects of Replacing the Project Manager During Project Execution

James DUBBER, Jan Harm C. PRETORIUS
University of Johannesburg, South Africa

It is a setback that many projects face and senior management fear, that a well-run project heading for success can take a turn for the worst when the project manager is replaced as a result of resignation or transfer. The replacement of the leader and foundation of the project can result in poor management of the triple constraint (scope, time and budget), loss of historical project information, as well as cause a ripple effect of conflict, confusion, misunderstanding and poor team spirit within the project team. The term "replacing the project manager" or "RPM" should be easily recognized by organizations, yet, there is very little documentation available discussing this common issue. The frequency of replacement, the circumstances in which the project manager is replaced, and the effect it has on a project during execution is investigated.

IEEM16-P-0031

Multistakeholder Engagement in the Face of Stakeholder Adversities Among Globally Distributed ICT Projects - A Conceptual Model and a Research Agenda

Krishnan MYSORE, Abbas ELMUALIM, Konstantinos KIRYTOPOULOS
University of South Australia, Australia

Globally distributed Information and Communication Technology (ICT)projects, typically engage multistakeholders coming from diverse multicultural backgrounds, with varied interests and collaborating across remote geographical locations using different technologies. This is viewed as a significant challenge and of strategic importance in the face of stakeholder adversities. This paper builds on scientific findings in an integrated approach to analyse the stakeholder engagement in globally distributed ICT projects in line with underlying aspects of people, organisation and business environment. The interplays, adversities and strategies in engaging multistakeholders are explored and a research model is conceptualised to showcase the multifaceted constructs, related to people, organisation and business environment that can be combined to create numerous 'Themes of Interplay' which can affect several stakeholder adversities and the relevant strategies needed to mitigate such stakeholder adversities. The research focal points are highlighted and an agenda for future research is proposed.

IEEM16-P-0315

An MIP-Based Heuristic for Scheduling Projects with Work-Content Constraints

Adrian ZIMMERMANN
University of Bern, Switzerland

We consider the project scheduling problem where each project activity has a prescribed work content that must be completed by a so-called work-content resource, and the activities' resource usage may be varied over time. In each period, the amount of resources allocated to an activity must lie within a prescribed range and cannot be changed for a minimum number of consecutive periods. The amount allocated determines an activity's requirements for further resources. The activities must be scheduled such that the project makespan is minimized. For this problem, we devise an MIP-based heuristic that schedules the activities sequentially. To determine more efficient resource allocations among multiple activities, subsets of activities are rescheduled periodically. Our computational results for a standard test set from the literature indicate that the proposed approach provides very good feasible solutions for small-sized instances, and that it outperforms the state-of-the-art methods for large sized instances.

IEEM16-P-0321

Process Maturity Models for the Development of Mechatronic Products

Christoph HOLLAUER, Lennart HORNAUER, Udo LINDEMANN
Technical University of Munich, Germany

This paper examines the use of process maturity models for the evaluation and improvement of the development process of mechatronic products. It summarizes the characteristics of this process, before maturity models for process evaluation are selected and shortly described. The popular process assessment models CMMI and SPICE are compared to specific maturity models, which were especially developed for the realization of mechatronic products. The models are evaluated according to 24 criteria. With the information gained, potentials and weaknesses of the models are described. The main problems of managing development processes are their complexity and variety. It remains questionable if such kind of process can be managed by a universal maturity model. Finally, the paper gives recommendations how the models could be improved, to increase their benefit for the development process of mechatronic products.

IEEM16-P-0273

The Key Drivers of Sustainability

Hosein DANESHPOUR, Josu TAKALA
University of Vaasa, Finland

Nowadays, sustainability is gaining considerable attention in decision making processes. Since 1987 that the concept of sustainable development was introduced this field of research has faced with some debates and continuous improvements in the logic. However, sustainability is a multi-faceted notion, which has raised the complexity of sustainable management. Therefore, this paper strives to manage this issue by the reduction of dimensions through the application of principal component analysis. For this purpose, a set of data from Eurostat database that includes the indicators of sustainability is evaluated. The results remark the crucial elements of sustainability such as: innovation, efficiency and renewable energy.

IEEM16-P-0403

Success by Efficient Resource Planning in a Project Based Environment

Mandy THURM, Ralph RIEDEL, Egon MÜLLER
Chemnitz University of Technology, Germany

The number and frequency of project activities increase in daily working life. Consequently, the significance of project success gains in importance which requires high accuracy of the project results regarding time / progress, budget and resources. A foundation of project success is built by project planning – especially by project resource planning. Objective resource planning is based on project's characteristics and complexity which can be described by project factors. They allow to determine the required amount of managerial capacities (e.g. project manager, sub-project manager) related to project content within its enterprise-specific restrictions. Such calculation presupposes data of former projects to define the project type and to predict resource demands by using the statistical methods correlation analysis and multiple regression analysis. Finally, a critical acclaim of the new developed resource planning methodology is necessary for its evaluation.

IEEM16-P-0578

Methods Collection to Support Requirements Engineering with Focus on Structuring and Consolidation of Requirements

Dominik WEIDMANN, Niklas KATTNER, Christoph HOLLAUER, Lucia BECERRIL, Nepomuk CHUCHOLOWSKI, Udo LINDEMANN
Technical University of Munich, Germany

The ongoing shift in mechatronics towards an increasing importance of information technology leads to increased discipline interfaces and increasing product complexity. Requirements engineering is a core aspect, in particularly, in interdisciplinary development. Here, methods can support engineers to handle complexity and coordinate development across disciplines. This contribution provides a literature based collection of existing methods. The methods are assessed according to five criteria to enable engineers to quickly select an appropriate method to support particular steps of their requirements engineering.

Session	Big Data and Analytics
Date	6/12/2016
Time	11:00 - 12:30
Room	VIP Room
Chairs	Selina NG, *Adam Science Technology and Research International,* Philipp BAUMANN, *University of Bern*

IEEM16-P-0085

An Independent Study of Two Deep Learning Platforms – H2O and SINGA

Selina NG, Wei ZHU, Wilson TANG, Louis WAN, Andrew WAT
Hong Kong Applied Science and Technology Research Institute (ASTRI), Hong Kong SAR

Two open source distributed machine learning/deep learning platforms, namely H2O and Apache SINGA, compared their deep learning performances using multilayer perceptron on the classic MNIST database for hand written digits recognition. However, the results reported by both parties differ and neither of them can repeat the results reported by the other side. This paper is an independent study of the performances of H2O and SINGA on deep learning, considering both testing accuracies and time required for model training. We reproduced the performance benchmark, then we designed our experiments to test the performances using a 1-node and a 4-node cluster. We repeated the test for multiple runs and checked the difference in accuracy with a paired t-test. Our study showed that H2O generated stable and accurate performance. SINGA could be trained more efficiently in a short time but the accuracy deviates a lot from the expected if training details were changed.

IEEM16-P-0320

Sparse-Reduced Computation for Large-Scale Spectral Clustering

Philipp BAUMANN
University of Bern, Switzerland

Clustering is a fundamental task in machine learning and data analysis. A large number of clustering algorithms has been developed over the past decades. Among these algorithms, the recently developed spectral clustering methods have consistently outperformed traditional clustering algorithms. Spectral clustering algorithms, however, have limited applicability to large-scale problems due to their high computational complexity. We propose a new approach for scaling spectral clustering methods that is based on the idea of replacing the entire data set with a small set of representative data points and performing the spectral clustering on the representatives. The main contribution is a new approach for efficiently identifying the representative data points. First results indicate that the proposed scaling approach achieves high-quality clusterings and is substantially faster than existing scaling approaches.

IEEM16-P-0108

A New Area Linearization Method for Unequal Area Facility Layout Problem

Yue XIE, Shenghan ZHOU, Yiyong XIAO, Wenbing CHANG
Beihang University, China

This paper propose an improved MIP formulation to reach the objective of Unequal area facility layout problems (FLP) that is to minimize the total material handling cost. Facility layout problem is defined as locating departments in facility with a given dimension, and the departments can't overlap. The FLP can be formulated as a mixed-integer programming (MIP). In past researches, many researchers use polyhedral outer-approximation to improved MIP formulation but in this paper the model uses an inner-approximation method to meet the constraints of FLP. The important change will make the area of each departments in the problem can bigger or equal to the given constraints and can meet the needs of the department the function of the area. Test results show the area of departments is all greater or equal to the given departments size rather than less to required area.

IEEM16-P-0037

Evaluation of Air Traffic Management System Using a Hybrid Model

Yuefei MA, Xiaoyue WU
National University of Defense Technology, China

Priority analysis of critical factors and comprehensive evaluation of different development alternatives are very important for construction and improvement of national air traffic management system (ATMS). This paper presents a hybrid model that decomposes the evaluation problem into two levels. In the upper-level, an analytic network process (ANP) is given to evaluate the importance values of critical factors in ATMS. In the low level, the utility values of alternatives under each factor are estimated by the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS). In order to derive global scores of ATMS alternatives, a simplified synthesis process is provided. Finally, a numerical example is given for illustration.

IEEM16-P-0152

Vessel Speed Analytics Using Satellite-Based Ship Position Data

Roar ADLAND, Haiying JIA
Norwegian School of Economics, Norway

In the maritime supply chain, sailing speed is a key variable governing ship-to-air emissions and the profitability of vessels. While there can be substantial economic gains to be had from dynamic speed optimization, real-life constraints such as weather conditions, contractual limitations and supply chain considerations may govern the speed choice in practice. The increasing availability of high-frequency ship positions and vessel speeds reported by the terrestrial and satellite-based Automated Identification System (AIS) enables formal empirical testing of the determinants of vessel speed. We use a panel data set of nearly 62,000 weekly average speed observations for a fleet of 607 Very Large Crude oil Carriers (VLCCs) during 2013 – 2015 to estimate a multiple regression model with technical, operational and macro-economic variables. We find that macroeconomic variables have a marginal influence only on ballast speeds, while laden speeds are influenced mainly by whether the operator is also the cargo owner.

IEEM16-P-0028

Redesign of Thresher Machine for Farmers Using Rapid Upper Limb Assessment (RULA) Method

Nilda Tri PUTRI, Lusi SUSANTI, Anugrah TITO, Agus SUTANTO
Andalas University, Indonesia

The use of thresher machines for threshing rice plants helped farmers in improving agricultural productivity. However, thresher machine design that is currently available has not fairly concerned on the working position and posture of the farmers using it. The working position that was modeled by farmers when operating a thresher machine tent to cause injury because of the dimensions of the engine and the body of farmers that did not conform to each other. RULA method was one of the methods that could analyze work postures. From the results of the data collection and the process using RULA method, it was clear that the measures that had to be taken to the thresher machines which used to be available were promptly modified in order to avoid musculoskeletal problem. Improvements that could be undertaken to avoid the musculoskeletal problem on farmers who used the thresher machine were redesigning the thresher machine based on farmers working posture. One of these ways was by adjusting the dimensions of the farmers' body with the dimensions of the machine. In addition, the use of adjustable concept in the design could probably assist the farmers adjust the working position with the machinery they used.

IEEM16-P-0086

Parameter Estimation for Load-Sharing Systems with Degrading Components

Bin LIU, Jianyu XU, Xiujie ZHAO
City University of Hong Kong, Hong Kong SAR

This paper aims to develop a parameter estimation approach for load-sharing systems subject to continuous degradation. The system consists of multiple components in parallel structure. The components of the system suffer a degradation process, characterized respectively by Wiener process and Inverse Gaussian process. When components fail one by one, the total workload is redistributed among the remaining components, which accelerates the degradation process of the surviving components, which is referred to as a load-sharing system. Maximum likelihood estimation (MLE) is used to estimate the parameters for a load-sharing system. The available data are the failure times of the components and the degradation level of the remaining components at failure time. For Wiener process, a close-form MLE is derived and an analytical solution is achieved. For inverse Gaussian process, however, it is difficult to obtain a close-form MLE and numerical method is adopted instead. Finally, numerical studies are conducted to illustrate the estimation procedure.

Session	Reliability and Maintenance Engineering 4
Date	6/12/2016
Time	11:00 - 12:30
Room	Pecatu 1
Chairs	Peihan WEN, *Chongqing University*, Seung Ki MOON, *Nanyang Technological University*

IEEM16-P-0013

Reliability Analysis Method of Phased-Mission Nuclear Power Equipment Based on Goal Oriented Methodology

Huina MU[1], Jianwen LIU[2], Mingchao LU[2], Jianfeng CHEN[2], Xiaojian YI[1]
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This paper proposes a GO method by taking into consideration the typical characteristics. Then, taking a hoisting mechanism as an example, its steady state availability analysis and qualitative analysis are conducted based on this paper's GO method. In order to illustrate the advantages, reasonability, and feasibility of GO method, the results calculated by GO method are compared with the result of FTA, and the result of MCS. The analysis process of example by using GO method also shows its advantages in establishing reliability model and conducting reliability analysis for complex Phased-Mission Nuclear Power Equipment. All in all, this study not only widens the application of GO methodology; but also provides a new approach for reliability analysis of PMNPE by taking into consideration the typical characteristics.

IEEM16-P-0141

Machinery Classification and Prioritization: Empirical Models and AHP Based Approach for Effective Preventive Maintenance

Katarzyna ANTOSZ[1], R.M. Chandima RATNAYAKE[2]
[1]*Rzeszow University of Technology, Poland*
[2]*University of Stavanger, Norway*

Empirical models play an important role in the classification of machinery for scheduling preventive maintenance (PM) activities for machinery in manufacturing firms (MFs). First, this manuscript discusses the development of empirical models for classifying machines in an MF and the structure of each empirical model. Then, it presents the classification of machinery using the developed empirical models in two different manufacturing areas. It then goes on to demonstrate the development of a common model for the two different manufacturing areas in the case study MF. It is a challenge to allocate the available resources, when the classified groups contain a large amount of machinery. Hence, machines have been grouped into families or types based on their similarities, and an analytic hierarchy process (AHP) has been employed to further prioritize each type of machinery. A generic hierarchical model has been developed to prioritize machinery in the case study MF. Then, the use of AHP has been demonstrated using a tailor-made hierarchical model based on a selected type of machinery, focusing on prioritizing the necessary PM activities.

IEEM16-P-0059

A Partitioning Method of Experimental Levels for Low Failure Probability Estimation Problems

Kunling SONG, Yugang ZHANG, Xinshui YU, Bifeng SONG
Northwestern Polytechnical University, China

Failure boundaries are always far away from the center of the design space of variables for low failure probability problems. In order to make full use of samples, a partitioning method of experimental levels is proposed for improving general design of experiments in this paper. The method is implemented by non-uniformly partitioning experimental levels according to the probability density function of variables, which leads to a wide interval of adjacent experimental levels at the high probability density value, while a narrow one at the low. The translational propagation latin hypercube design was improved by using the non-uniformly partitioning experimental levels method. To validate the practicability and effectiveness of the proposed method, two numerical examples are presented and the results show that the improved translational propagation latin hypercube design is more effective than the previous.

IEEM16-P-0042

Reliability Analysis of Rubber O-rings Used in the Rockets

Li SUN[1], Xiaohui GU[1], Lei FENG[2], Yi DI[1]
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[2]*Navy Military Representative Office of Missile Equipment in Chongqing Area, China*

The prediction of reliability for rubber O-rings used in the rockets is of great significance for the life assessment of the rockets. In this paper, rubber O-rings were aged under accelerated conditions at temperatures ranging from 60°C to 80°C. And a new model based on Wiener process with a time scale transformation was presented to describe the degradation of CS (compression set) which is the characteristic parameter for rubber O-rings. Due to the appearance of implicit data in the presented model, EM (Expectation Maximization) algorithm was adopted to estimate the model parameters. It was proved that the EM algorithm was not only insensitive to initial guesses of the model parameters but also could achieve quick convergence. Further, combined with the degradation model and the failure threshold, the reliability curve under normal temperature storehouse was gained.

IEEM16-P-0278

Joint Optimization of Degradation-Based Burn-in, Quality, and Preventive Maintenance

Zhen CHEN, Yapin LI, Ershun PAN
Shanghai Jiao Tong University, China

Burn-in is an effective method to eliminate initial mortality and reduce field failure costs. As many products have been designed to be extremely reliable, traditional burn-in would almost not get a sufficient amount of failure data in a reasonable duration. If the failure associated with a degradation process, degradation-based burn-in can be implemented. Moreover, we hope the quality level of the burnt-in units is still high. On the other hand, an appropriate preventive maintenance policy can improve the operation efficiency of the product, extend the service life and reduce enormous losses brought by failures. Therefore, this research proposes a joint model of degradation-based burn-in, quality and preventive maintenance. The objective of the joint model is to minimize the expected cost per unit time by properly choosing the settings of burn-in and preventive maintenance interval simultaneously under the constraint of availability. A numerical example is presented to illustrate the proposed method.

IEEM16-P-0381

Critical Success Factors for Developing Building Maintenance Strategies: A Case of Namibia

Michael MUTINGI[1], Rudolf KALUMBU[1], Charles MBOHWA[2]
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[2]*University of Johannesburg, South Africa*

Critical success factors (CSFs) are factors that dictate the successful accomplishment of an organization's vision, mission and strategy, if performed exceptionally well. The aim of the current research was to develop a rank ordering of CSFs of building maintenance for the Part I municipalities in Namibia. A questionnaire survey and interviews were used to invite respondents (managers, supervisors and maintenance planners) to rate the importance of CSFs identified through literature review Factor analysis was used to reduce the ranked CSFs from 37 to 13 manageable factors, which includes: top management support, familiarity with the local building maintenance practice, and other maintenance related plans. The research has also identified components of the current maintenance management process that require improvement. These includes the maintenance policy, strategy, quality standards and resources; employee training, computerized maintenance management systems. A framework was then developed for the implementation of CSFs of building maintenance for the local Governments in Namibia.

IEEM16-P-0615

Selecting a Modeling Approach for Predicting Remnant Fatigue Life of Offshore Topside Piping

Arvind KEPRATE, R.M. Chandima RATNAYAKE
University of Stavanger, Norway

Setting an optimal inspection plan for fatigue critical offshore piping relies on accurately estimating its remnant fatigue life (RFL). Several modeling approaches, such as knowledge-based, model-based, data-driven, fusion techniques etc., have been used to build RFL models in the past. The aim of this paper is to review these approaches and thereby recommend the most favorable approach for building a probabilistic RFL model for offshore piping. Firstly, a brief discussion about the aforementioned approaches is presented. Thereafter, a comparison is made between these approaches. For instance, there is uncertainty in model-based approaches, due to the assumptions of the underlying physical model, which poses substantial limitations on this approach. Conversely, a data-driven approach exploits the monitored operational data associated with the condition of the piping system. Fusion technique combines the features of the former two approaches and is recommended to build a model for estimating the RFL of offshore piping.

Session	Technology and Knowledge Management 4
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 1
Chairs	Yang Yang ZHAO, *Norwegian Institute of Systems Engineering,* Chong GUAN, *SIM University*

IEEM16-P-0282

Knowledge Societies and Their Role in Sustainable Development

Ambica DATTAKUMAR[1], Guan CHONG[2], Lin MALONE[1], Ravi S. SHARMA[1], Jesus Felix VALENZUELA[3]
[1]*Nanyang Technological University, Singapore*
[2]*SIM University, Singapore*
[3]*Agency for Science, Technology and Research, Singapore*

Sustainable development requires the transformation of societies into knowledge societies. ICTs are increasingly becoming repositories of knowledge and information, which has implications for the field of knowledge management. In this paper, we attempt to conduct a preliminary analysis to identify the factors that influence the sustainability of knowledge societies. A Knowledge Societies Index (KSI) was developed based on nine variables. Results highlight a strong correlation between the development of knowledge societies and sustainability. ICT plays a key role in the acquisition of knowledge. The capturing, storage and interpretation of this knowledge are all key areas of knowledge management.

IEEM16-P-0226

Knowledge Roadmap Across Design and Engineering: An User-centric Didactic Approach

Arne Kjetil RUGAAS, Yang Yang ZHAO
University College of Southeast Norway, Norway

A divide between design and engineering in both knowledge management literature and industrial practices has received the renewed attention. The knowledge gap has caused extended usage of resources for tracking the correct information and verifying requirements during a system design or redesign process to date. The late-design changes, due to missing information or new requirements in developing a system, therefore cannot be resolved with agility through existing informational and knowledge management processes. This study tackles the knowledge sharing gap between the two critical knowledge owners-designers and project engineers for systems development. Based on extensive industrial interviews, we firstly captured the essence of the knowledge sharing gap, and then creatively used an user-centric didactic approach to convey their expected information flows into a roadmap for the intended system -the Design Roadmap.

IEEM16-P-0687

On the Estimation of Hospital Beds Occupancy After Hip Surgery

Sergio SOUSA, Cristina RODRIGUES, Eusebio NUNES
University of Minho, Portugal

For hospitals, the variability on demand (number of daily urgent admissions) and the variability in the Length of Stay (LoS) (bed occupancy) may affect the quality of service provided to patients and the effectiveness of the overall service. This paper studies the LoS of 238 patients who performed hip surgery in the orthopedic service of a Portuguese hospital in 2014. It uses variables available in electronic databases, such as Age, Gender, ASA classification; Surgical Apgar Score, Type of hip surgery; Weekday of the surgery; Starting hour of the surgery and Duration of surgery to predict LoS and provides a model that correctly indicate if a patient stays more than 7 days in 72.1% of the cases.

IEEM16-P-0663

Customization of the CAD Software in a Typical Drawing Office for a Power and Electricity Distribution Company in Zimbabwe

Wilson R. NYEMBA, Charles MBOHWA
University of Johannesburg, South Africa

Computer Aided Design (CAD) packages are normally bought off-the-shelf for a wide range of engineering disciplines. However, a single system cannot possibly meet requirements of different users as these packages are normally provided with basic primitives but no blocks for quick generations. A case study carried out at a power enterprise in Zimbabwe revealed delays in attending to faults and installations at their substations partly because of delays in the provision of working drawings. Although the company migrated from manual to CAD drawings, the techniques they employed resulted in duplications and delays. An in-house software development strategy was employed in this research to customize their AutoCAD software through an industrial engineering approach aimed at lowering man-hours by generating and storing symbols of their equipment for retrieval and use in future drawings, resulting in lead time reductions and integration with their maintenance management system to avoid duplication of tasks and information.

IEEM16-P-0684

Process Improvement and Utilization of Machines in the Production Area of a Shoe Manufacturing Company

Ma. Carole MARCELO, Gerlie AVILA, Monti CRUZ, Baldwin PRADO, M. M. NAVARRO
Technological Institute of the Philippines, Philippines

Process Improvement is an aspect of organizational development in which a series of actions are taken by a process owner or process analyst to identify, analyze and improve existing business processes within an organization for optimization and to meet new quotas or standards of quality. The shoe industry in Marikina City which is the shoe capital of the Philippines is lagging behind its neighboring countries in East and Southeast Asia in terms of shoe production. This paper aims to increase the productivity of a shoe manufacturing company by utilizing the machines in the production area, improving the process layout, and ensuring quality is present in every element of the shoe making process. Analysis tools are utilized to analyze the existing business process such as Ishikawa diagram, time and motion study, flow process chart, ISO flow process, statistical computation, process layout, and cost benefit analysis. The results show that the proposed layout machine will have an increase in production output by 13.11%. This paper recommends the following; (1) the improvement of time (12.54% faster) and distance (208.80% shorter) of each process giving way to a new layout. (2) Introduction of new machines that will speed up the production while maintaining the quality.

IEEM16-P-0332

A Robust Design Based Methodology for Investigation of Optimal Parameters' Combination in Ultrasonic Assisted Face Grinding

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[2]*University of Stavanger, Norway*

This manuscript presents the results of experimental investigations which have been carried out to investigate the optimal parameter combination that results in the minimum axial process force (PF) in ultrasonic assisted face grinding (UAFG). A diamond grinding tool (diamond drill) was used in these investigations. The UAFG is a hybrid machining process, which has been used for the machining of advanced ceramic materials. The application of ultrasonic assisted grinding (UAG) is still limited, inter alia, because of difficulties during the selection of values for input machining parameters, such as: cutting velocity, feed rate, frequency of vibrations, and mounting torque, which is applied during tool clamping. The ultrasonic assistance provides advantages for the process course if the appropriate combination of input parameters is set on a hybrid/computer numerical control (CNC) machine tool. The PFs on the Ultrasonic 20 linear machine tool are measured using the Kistler 9256C2 dynamometer, and the optimal process parameter combination is calculated using the engineering robust design approach (ERDA).

Session	Operations Research 5
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 2
Chairs	Lionel AMODEO, *Universite de Technologie de Troyes,* Ahmed EL-BOURI, *Sultan Qaboos University*

IEEM16-P-0172

A Hybrid Supplier Selection Model Considering Non-Homogeneous Group Decision Makers

Tuan Son NGUYEN, Sherif MOHAMED, Anisur RAHMAN
Griffith University, Australia

This research aims at developing a hybrid model for non-homogeneous group decision making in the supplier selection process to select a supplier that best satisfies the purchaser. The model uses the analytical hierarchy process (AHP) in determining the influence weightings of company function department (CFD), then the house of quality (HOQ), as an essential part of the quality function deployment (QFD) concept, is applied to transfer company function department (CFD) requirements to suppliers' attributes. Finally, the Linguistic Ordered Weighted Averaging (LOWA) operator is applied for aggregating the linguistic opinions of the non-homogeneous group. The importance weightings of CFD requirements, criteria and final suppliers score are calculated by applying a mathematical algorithm.

IEEM16-P-0421

A Score-Based Dispatching Rule for Job Shop Scheduling

Ahmed W. EL-BOURI
Sultan Qaboos University, Oman

The performance of dispatching rules tends to be state-dependent, and a rule that performs very well under a given set of shop floor conditions may not necessarily perform as well under different conditions. A new composite dispatching rule that scores jobs based on their priorities under five different dispatching rules is proposed. The score-based dispatching rule is evaluated by means of a comparative analysis in three categories of job shop problem and three levels of congestion. The results exhibit a statistically significant improvement in performance over other dispatching rules under elevated levels of shop floor congestion and machine utilization.

IEEM16-P-0465

Maintenance Optimization Considering Winterization Problem for the Power Supply System of Railway in Norway

Fuqing YUAN
University of Tromsø, Norway

Winterization problem hinders the development of high-speed train development and degrade the safety of railway in Norway. Power supply system is one of the major system in the railway infrastructure. The maintenance cost on the power supply system is high. This paper investigates the failure mechanisms on the overhead contact wire (OCW). The factors influencing each failure mechanisms are identified. In order to facilitate maintenance, the failure prediction methods are also discussed. The issues that could result to low performance of the prediction are discussed. A suggestion to classify the railway section according to the risk level is proposed.

IEEM16-P-0671

A Linear Programming Based Iterative Heuristic for the Recreational Vehicle Scheduling Problem

Sarang KULKARNI[1], Andreas ERNST[2], Abhiram RANADE[1], Mohan KRISHNAMOORTHY[2]
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[2]*Monash University, Australia*

In the recreational vehicle rental business, the problem of preparing a schedule for each vehicle in the fleet (by assigning accepted bookings to available vehicles over the planning horizon) is known as the recreational vehicle scheduling problem (RVSP). The problem belongs to the class of minimum cost multicommodity network flow problems which is known to be NP-hard. A formulation of the RVSP from literature is modified to reduce the size of the problem instance. We propose an iterative construction heuristic combined with an improvement heuristic based on the solution of the LP relaxation of the problem. The heuristic exploits the integrality property of the formulation and reduces infeasibility successively at each iteration. The approach is compared with a subgradient optimisation and with CPLEX using a real-life dataset. The heuristic outperforms the subgradient optimisation for most of the datasets while it produces results within 5% of optimality when compared with CPLEX.

IEEM16-P-0668

The One-Shot Decision Theory Based Production Planning Models

Xide ZHU, Peijun GUO
Yokohama National University, Japan

This paper considers that a company is planning to produce innovative products in an uncertain market environment. We build production planning models with the one-shot decision theory (OSDT) where the optimal production plan is obtained to correspond to some special scenarios. Since the OSDT based production planning model is a bi-level programming problem with a non-smooth lower level program which is difficult to be solved, we propose an efficient method with considering a smooth approximation function to solve it.

IEEM16-P-0701

Analysis of Visual Representation Techniques for Product Configuration Systems in Industrial Companies

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[2]*Graz University of Technology, Austria*

In recent years, there has been an increasing demand for customized products. Product configuration systems (PCS) are introduced as one of the most successful systems of artificial intelligent for providing customized products. One of the main challenges in PCSs projects are described in relation with knowledge representations and communications with domain experts. The results presented in the paper are therefore aimed to provide insight into the impact from using visual knowledge representations techniques in PCSs projects. The findings indicate that use of visual knowledge representations techniques in PCSs projects will result in improved quality of maintenance and development support for the knowledge base and improved quality of the communication with domain experts.

Session	Supply Chain Management 5
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 3
Chairs	TMA ARISAMADHI, *Bandung Institute of Technology,* Yan CHEN, *Macau University of Science and Technology*

IEEM16-P-0348

Inter-Organizational Trust and Knowledge Sharing Model Between Manufacturer and Supplier in the Automotive Industry

Fadillah RAMADHAN, T. M. A. ARISAMADHI
Bandung Institute of Technology, Indonesia

The relationship between manufacturer and supplier in the automotive industry involves process of knowledge sharing. Knowledge sharing is an important process that may improve manufacturer and supplier performances. In a co-opetition business environment, companies tend to limit knowledge sharing, if they regard their partners as potential competitors. Trust is used to reflect the level of co-opetition relationship. This study identified the influence of inter-organizational trust towards knowledge sharing, and identified factors affecting inter-organizational trust (participation, communication, influence strategy, power, opportunistic behavior, behavioral uncertainty, inter-personal trust). Additionally, this study identified factors affecting inter-personal trust (expertise, likability, and interaction). Data were collected from 97 manufacturer-supplier relationships in Indonesia. The results of this study, power and behavioral uncertainty have non-significant influence towards inter-organizational trust, as well as interaction towards inter-personal trust.

IEEM16-P-0428

Modeling and Evaluation of Overbooking Rules for Primary Health Care Clinic with Different Patient Behavior

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[2]*Macau University of Science and Technology, China*
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The performance of primary health care clinic can be impacted by both of patient behavior and appointment rules. In this paper, we compare and evaluate the level of patient service and clinic performance of different overbooking appointment rules under changing patient behavior. The focus is on the appropriate selection of overbooking rules based on panel characteristics. Analysis methodology involves simulation modeling and design-of-experiment based statistical analysis. Our experimental results demonstrate that the selection of overbooking rule does play an important role in the clinic performance, and different patient behavior leads to the different selection of best rules.

IEEM16-P-0446

Integrated Versus Non-Integrated Perspectives of Auditors Concerning the New ISO 9001 Revision

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The process of integration of management systems is being unfolded by a great deal of companies nowadays. A crucial feature of it relates with the audit function and the integrated perceptions of the auditors. This issue is of utmost importance if one takes into account the remarkable effort developed by ISO in the last revisions (2015) of the ISO 9001 and ISO 14001 standards aiming at the standards integration by adopting a common high level structure, identical core context, and common terms and common definitions. The available drafts of the new ISO 45001 standard suggest the same effort. This paper aims, within a global research study on ISO 9001:2015, to report the integrated versus non-integrated perspectives of auditors concerning the new ISO 9001 revision based on the results from a survey conducted among IRCA auditors. It is intended specifically to assess if the perceptions from the auditors holding several certifications are different of those from the auditors that hold solely the QMS certification. Results suggest that the auditors holding several certifications foreseen more benefits from this new revision, i.e., auditors with a wider integrated perspective rate systematically higher the different dimensions assessed in this survey.

IEEM16-P-0644

Fuzzy-AHP Approach for Warehouse Performance Measurement

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Warehouse performance evaluation is the measurement of efficient use of warehouse space, customer satisfaction level, quality of goods stored and transport, level of inventory and environmental friendly delivery. Managers and decision makers are keen to know very rapidly which decisions at what level need extra attention and have more impact on overall warehouse performance. In this paper, we propose a Fuzzy-AHP integrated approach that incorporates the linkage between the operational and strategic criteria to generate an overall warehouse performance measurement system. A numerical example illustrates the uses of the proposed model for Warehouse performance evaluation.

IEEM16-P-0667

Statistical Process Control Automation in the Final Inspection Process: An Industrial Case Study

Liliana GUERRA, Sergio SOUSA, Eusebio NUNES
University of Minho, Portugal

This case study arises from the need to make more robust and effective quality assurance procedures of the products by automating the final inspection process. The case study explains how the automation of the inspection process was performed in a company from the automotive sector. Knowledge, involvement and commitment of operators and respective managers should not be neglected because their reaction against the change procedures influence the success of any automation performed. The successful introduction of automation contributed to a more efficient process and from the pilot station to the remaining stations problem solving and continuous improvement was evidenced.

Session	Production Planning and Control 2
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 5
Chairs	Laith HADIDI, *King Fahd University of Petroleum and Minerals*, Seung Ki MOON, *Nanyang Technological University*

IEEM16-P-0043

An Optimization Model Integrated Production Scheduling and Preventive Maintenance for Group Production

Wenzhu LIAO, Xiufang ZHANG, Min JIANG
Chongqing University, China

A single-machine-based optimization model of production scheduling and preventive maintenance under group production is proposed. In order to minimize total completion time and maintenance cost, this model considers the deteriorating effect, besides similarity-dependent setup time and learning and forgetting effect. Moreover, a hybrid maintenance strategy is researched, in which preventive maintenance operation is performed considering failure rate threshold and minimal repair based on machine's age is performed considering unexpected failure. Finally, genetic algorithm is adopted to solve this integrated model. Through a case study, the computation results demonstrate that this optimization model could reduce maintenance cost and completion time more effective without maintenance loss.

IEEM16-P-0157

Reducing Schedule Nervousness in Production and Operations Under Non-Stationary Stochastic Demand: The Case of an Airline Catering Company

Narat HASACHOO, Ruedee MASUCHUN
King Mongkut's Institute of Technology Ladkrabang, Thailand

Schedule nervousness is a change in planned MPS that caused actual operations to be different and that will result in a disruption in the production and distribution system.Uncertainty in demand was proved to be one of its major causes. The airline catering industry is one of the most highly nervousness-sensitive industries since their future demand is not deterministic but rather considered as a random variable or referred to as non-stationary stochastic demand.This is because the exact order quantity depends on the passenger numbers which are only confirmed minutes prior to departure time.So the objectives of this paper are to compare effectiveness of the current planning policy for reducing an uncertainty in demand of the case study company with a well-known MILP for solving stochastic lot-sizing problem, Tarim and Kingsman's MILP. An obtained solution from both compare its probability of causing a negative closing inventory.

IEEM16-P-0054

Joint Optimization of Flowshop Sequence-Dependent Manufacturing Cell Scheduling and Preventive Maintenance

Hanxin FENG, Wen DA, Hao HUANG, Lifeng XI, Ershun PAN
Shanghai Jiao Tong University, China

Considering the effects of machine breakdown and preventative maintenance (PM)on production scheduling in flowshop manufacturing cells, this paper focuses on investi-gating the joint optimization problem of flowshop sequence-dependent manufacturing cell scheduling and PM. A joint model is proposed and it aims to find the optimal production sequence of job families and individual jobs within each family and the optimal PM decisions before each job such that the sum of tardiness cost of jobs, PM and minimal repair cost of machines is minimized. A genetic algorithm-based approach is developed to solve the joint problem. Elitism strategy and local search are applied. The numerical results reveal the potential benefits of the consideration of PM and the integration of production scheduling and PM. Further experiments show elitism strategy and local search are important for improving the performance of the pro-posed approach.

IEEM16-P-0209

Integrated Preventive Maintenance and Production Scheduling Optimization on Uniform Parallel Machines with Deterioration Effect

Wen DA, Hanxin FENG, Ershun PAN
Shanghai Jiao Tong University, China

Integrated preventive maintenance (PM) and production scheduling problem has become one of research hotspots, but few research discusses the topic under uniform parallel machine system with deterioration effect. In this article, both characteristics of uniform parallel machines, deterioration effect of machine and job are considered, flexible PM strategy is adopted and integrated bi-objective optimization model is proposed. To verify this model, a numerical example with two machines and 40 jobs is provided, and by using NSGA-II algorithm, a set of Pareto optimal solutions is obtained.

IEEM16-P-0288

The Planning and Documentation Problem of Emergent Changes

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Emergent changes are common in large engineering projects and in such dynamic project environments planning and documentation work are often deprioritized in favor of actionable decisions. Previous research has failed to look at the planning and documentation problem as a sociotechnical system as it relates to project managers' and engineer's practical work. In this article, a single case study approach is used to reveal how project managers and engineers plan and document emergent changes specifically from a construction point of view. It was found that the construction planning and documentation was in large performed as part of the safety planning of the emergent change, not as a task in and of itself. To improve the quality of planning and documentation it is suggested that be officially integrated as part of the safety planning.

IEEM16-P-0612

Investigating Production Planning and Control Challenges in the Semi-Process Industry, the Case of a Metal Parts Producer

Philipp SPENHOFF[1], Marco SEMINI[1], Daryl POWELL[2]
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[2]*University of Groningen, Netherlands*

Production planning and control (PPC) plays a vital role for the competitiveness of every company. Its application in the process industries still faces major problems and limitations. The process industries are currently facing an increasing trend in demand variability and uncertainty. Too little is known about the link between industry specific characteristics and matching PPC approaches. In this paper, we investigate the characteristics that pose critical challenges when applying PPC concepts in the semi-process industry. The results of our study show a conflict between flexibility-requiring and flexibility-limiting characteristics. Through the use of a literature review and case study we demonstrate the limitations of material requirements planning to address this new situation.

Session	Manufacturing Systems 3
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 6
Chairs	Avanish Kumar DUBEY, *Motilal Nehru National Institute of Technology Allahabad,* Arnesh TELUKDARIE, *University of Johannesburg*

IEEM16-P-0637

MES to ERP Integration: Rapid Deployment Toolset

Arnesh TELUKDARIE
University of Johannesburg, South Africa

Production facilities deliver value as subsets of larger corporate entities with a key enabler being systems, inclusive of Enterprise Resource Planning (ERP) and Manufacturing Systems. This research focuses on the development of an evaluation toolset for Manufacturing Execution Systems maturity, specifically determining a 'Business Units' maturity relative to a fully automated corporate process enablement. The methodology includes hierarchical segregation of the business together with focused, internationally referenced, questions, facilitating system maturity evaluation. The Likert association methodology facilitates data gathering. This research delivers a method and case study on an internationally benchmarked, express evaluation toolset, with capacity to conduct a Business Unit (BU) evaluation in minimum time. Key value adds of the toolset includes system prioritization on a business benefit and cost basis.

IEEM16-P-0026

Intelligent Modeling and Multi-Objective Optimization of Powder Mixed Electrical Discharge Diamond Grinding of MMC

Ashvarya AGRAWAL[1], Avanish Kumar DUBEY[2], Pankaj Kumar SHRIVASTAVA[3]
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[2]*Motilal Nehru National Institute of Technology, India*
[3]*AKS University, India*

Metal matrix composites (MMCs) poses machining challenges by conventional methods due to its superior mechanical properties. Advanced machining processes (AMPs) are considered to be efficient to machine these MMCs. Electrical discharge machining (EDM) is one of such AMP which is most popular in the current industrial paradigm to machine these advanced materials. But, EDM also inherit the limitations such as low material removal rate (MRR) and high tool wear rate (TWR). Powder mixed EDM (PMEDM) process may help to enhance the productivity of EDM in terms of MRR and TWR. In the present research, the machining performances of copper-iron-graphite MMC using PMEDM have been investigated. Response surface models (RSMs) for MRR and TWR have been developed. Further, a hybrid approach of grey relational analysis, RSM and genetic algorithm has been used for multi-objective optimization of MRR and TWR.

IEEM16-P-0261

Process Parameters Optimization for Multiple-Inputs-Multiple-Outputs Pulsed Green Laser Welding via Response Surface Methodology

Safwan ALTARAZI[1], Leen HIJAZI[1], Elke KAISER[2]
[1]*German Jordanian University, Jordan*
[2]*TRUMPF Laser Technology, Germany*

This study aims to optimally set the operational parameters of pulsed green laser welding with copper. Multi input parameters and critical-to-quality outputs were considered. The chosen inputs were power, pulse duration and pressured air flow, while the outputs were the maximum force handled by the welding joint and the penetration level of the laser weld. Design and analyses for single-response and two-response optimization were presented using response surface methodology, Analysis of variance (ANOVA), and overlaid contour plots. The results indicated that power and pulse duration have the most significant effect on both the maximum force handled and the penetration level. Air flow showed little to no effect on the force handled and critical effect on the penetration level.

IEEM16-P-0431

Inventory Management Models and Their Effects on Uncertain Demand

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This paper focuses on the use of inventory models to control the material flow and purchased inventory items in manufacturing companies. The objectives of this paper are to assess the effects of demand uncertainty on inventory management and to evaluate the difference on uncertain demand subject to demand controls as determined and the models used. Three inventory management models are studied; the Economic Order Quantity (EOQ), the Activity-Based Costing (ABC), and Just-in-time (JIT). The paper was a descriptive in nature and was conducted through the use of quantitative research methods. Survey questionnaire was compiled to gather primary data from five FMCG companies in manufacturing organisations. Survey data of 255 respondents from FMCG manufacturing companies was used in the analysis.

IEEM16-P-0230

Machine Reliability Modelling in Manufacturing: A Continuous-Time State-Dependent Heterogeneous Markov Chain Approach

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[2]*Tianwei New Energy Co, Ltd, China*

In practice, the maintenance schedule depends on the system states such as whether we have sufficient machines available for our workload or not. Therefore, in this Markov chain machine reliability model, we relaxed the fundamental assumption of classical reliability model that the up and down rates are fixed (machines are independent). The major contributions of this paper are as follows: (1) we developed a continuous-time heterogeneous Markov chain model with the linear and quadratic transition rate functions of system state to model a system with parallel machines; (2) we derived the mathematical framework and applied model reference adaptive search (MRAS) method to find the transaction rate function that best represents the system by minimizing the overall error in estimating the stationary probabilities of system states. Application case in solar panel industry shows that the resultant models are over 40% accuracy improvement comparing to that of the state-independent Markov chain model.

IEEM16-P-0294

Seru Loading with Worker-Operation Assignment in Single Period

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[2]*Doshisha University, Japan*

Seru production system, which can achieve flexibility and efficiency at the same time, is a new form of production organization developed in Japan, and seru is regarded as an ideal production mode for realizing mass customization. However, theoretical research for seru production is not sufficient enough to guide the production practice. In this paper, we will consider a seru loading problem with worker-operation assignment in a single period. A mathematical model is proposed dedicated for the problem, and then, a heuristic algorithm is designed to solve the proposed model. Finally, the practicality and effectiveness of the model and algorithm are verified by a numerical example.

Session	Decision Analysis and Methods 4
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 7
Chairs	Kaushik NAG, *American University of the Middle East,* Mangesh GHAROTE, *Tata Consultancy Services*

IEEM16-P-0473

A Fuzzy TOPSIS Approach in Multi-Criteria Decision Making for Supplier Selection in a Pharmaceutical Distributor

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

Supplier selection/evaluation is considered as a critical activity for establishing an effective supply chain. This is particularly relevant to situations where a large number of global suppliers are involved, as is in the case of a pharmaceutical set-up. The current study focuses on a multi-criteria decision making problem which includes both qualitative and quantitative criteria relevant to supplier selection for a pharmaceutical distributor. A range of alternative suppliers were evaluated based on a Fuzzy Technique for Order Preference to Similarity to Ideal Solution (TOPSIS) method considering seven attributes affecting the process of supplier selection. The attributes included some factors which could only be associated with the current case study due to some preferential requirements in the region. The Results indicated that the Fuzzy TOPSIS model can easily but effectively be implemented in such uncertain environments and has the potential to be replicated for other scenarios having similar dynamic operating environment.

IEEM16-P-0060

Excellence in Integrating Care into the Product Development Process: A Case Study of Nokia

Jukka MAJAVA, J. Ville ISOHERRANEN
University of Oulu, Finland

Excellence in product development results from integrating various stakeholders' requirements into a winning offering. Customer care has become increasingly important, as digitalization enables new business models and revenue streams for companies. The integration of care requirements must be enabled in the product development (PD) process beginning in the early concepting and development phases in order to ensure an excellent care experience. The traditional elements of care-spare parts, service tools, and support-must be coupled with advanced software update capabilities. Future cutting-edge products demand new self-support and repair capabilities that are enabled by the digitalization of care assets and low-cost distribution platforms. This study examines a case company's attempt (Nokia)to integrate the care dimension into its PD process-a topic that has not been widely addressed thus far. The findings show that a company can seamlessly integrate care requirements into a PD process already in the product concepting phase.

IEEM16-P-0605

A Combination Use of Bagging and Random Subspace with Memory Mechanism for Dynamic Financial Distress Prediction

Chong WU, Jiaming LIU
Harbin Institute of Technology, China

On account of great significance of financial distress prediction for corporations, it is essential to construct an effective prediction model for managers and investors. Traditional financial distress prediction methods design static models using samples within a period of time, but the static models are insensitive to changes, such as concept drift in financial distress. This paper proposed a dynamic prediction framework called multi-layer perceptron ensemble method with memory (MPLE-FM). To improve the prediction performance of the model, two widely used ensemble method, bagging and random subspace, are combined to perturb both the instance space and feature space of the data to get diversity among classifiers. Based on data from the Chinese listed companies' real data from 2001 to 2014, the results showed that the proposed method has a better prediction performance over the other four dynamic prediction methods.

IEEM16-P-0318

Collaborative Distribution - Application to the City of Yogyakarta, Indonesia

Anna Maria Sri ASIH, Wandhansari Sekar JATININGRUM, Bertha Maya SOPHA
Gadjah Mada University, Indonesia

Increasing of population leads to escalation of demand needs which results in busier logistics activitities. Collaborative strategy has become an alternative to manage these activities, depending on the conditions in a certain location. This paper applied collaborative distribution model to Yogyakarta city, in order to see whether the collaboration is beneficial. The performance of collaborative distribution model is limited to the efficiency of capital and transportation cost based on optimum routing selection. In general, collaborative strategy showed more savings in total cost than that for the noncollaborative one. However, building and land investment should be an important consideration especially if collaborative strategy requires distribution center's expansion.

IEEM16-P-0146

Minimal Cost Stable Workforce Allocation in Presence of Ties

Mangesh GHAROTE[1], Rahul PATIL[1], Sachin LODHA[2]
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[2]*TATA Consultancy Services, India*

In this paper, we address the problem of allocating workforce to software projects, considering bilateral (project managers' and employees') preferences and cost of allocation. Earlier research has addressed the workforce allocation to software projects as stable matching problem with strict preferences ranking. However, in practice, there are scenarios where project managers did not strictly rank the employees; therefore, there are ties in the preference list. We developed a stable matching with ties-based optimization model to create a minimum cost stable allocation. Our results suggest that a software firm can reduce allocation cost and improve the average preferences for both the workforce and the project managers in the presence of ties in the preference list.

IEEM16-P-0109

Rule-Based Discrete Event Simulation for Optimising Railway Hump Yard Operations

Harshad KHADILKAR, Sudhir Kumar SINHA
Tata Consultancy Services, India

This paper presents a simulation-based optimisation approach for planning railway hump yard operations. A hump yard is used for processing carriages (cars) brought by incoming trains, through a set of classification tracks, into newly formed outbound trains. There are specific constraints on the order in which each operation can be carried out, as well the standing order of cars in each outbound train. The set of decisions to be computed includes (i) the hump (processing) schedule of inbound trains, (ii) the assignment of cars to classification tracks, and (iii) the assembly schedule of outbound trains. The objective is to minimise the average dwell time of cars (the time spent from arrival at receiving tracks to departure). A simple set of rules is used to develop a discrete event simulator. The resulting objective function values vary between 5\% and 20\% of previously published optimisation formulations, depending on problem constraints. The execution time is between 3 and 5 minutes for a 42-day planning problem.

Session	Project Management 3
Date	6/12/2016
Time	13:30 - 15:00
Room	Mengwi 8
Chairs	Reza KIA, *Firoozkooh Branch, Islamic Azad University,* Ralph RIEDEL, *Chemnitz University of Technology*

IEEM16-P-0588

Solving a Multi-Objective Mathematical Model for a Multi-Skilled Project Scheduling Problem by CPLEX Solver

Reza KIA, Parisa SHAHNAZARI-SHAHREZAEI, Sina ZABIHI
Islamic Azad University, Iran

A Multi-Skilled Project Scheduling Problem (MSPSP) that is an extension of a Multi-Mode Resource-Constrained Project Scheduling Problem (MM-RCPSP) has been generally presented to schedule a project with staff members as resources. In MSPSP, each activity requires different skills and staff members have various skill levels too. This causes to encounter a huge number of modes while performing activities of a project. This research is focused on a special type of MSPSP known as Multi-Objective Multi-Skilled Project Scheduling Problem (MOMSPSP) which incorporates some new objectives in the MSPSP and develops a¬ multi-objective mixed-integer non-linear programming model for it. The problem is exactly solved for small-sized instances using CPLEX solver. the results are obtained by the CPLEX solver for small size is identified as the super solver for solving the propounded MOMSPSP.

IEEM16-P-0556

Determinants of On-Going Trust Within a Collaboration

Xiao-Li CHEN, Ralph RIEDEL, Anne GOETZE, Egon MÜLLER
Chemnitz University of Technology, Germany

In a collaboration, trust is of great importance for the substantial governance of the inter-organizational activities. In this paper, considering changes of collaboration situations, an on-going trust model is established for a better understanding of the dynamics of relationship. Determinants of the on-going trust condition are also gathered and structured in two clusters. Those are 'initial trust situation' and 'the experiences which have influence on the trust'. A general interpreting function is formulated, which attempts to reveal the impact of these determinants and to shed some light on the theory of collaboration management. An online survey based on the experience of organizations was further conducted for the analysis. In the end, the trust determinant set was confirmed to hold high reliable properties, and the impacts of these determinants have also been proved. All these are composed as a theoretical basis which helps to provide sound decision support for the strategies of collaboration.

IEEM16-P-0471

Why Construction Workers' Workplace Deviant Behavior Happens? The Effect of Psychological Ownership

Xing LIU, Xueqing WANG, Nini XIA
Tianjin University, China

Construction workers' Workplace Deviant Behavior(WDB) has significant impact on project success. However, existing researches on its occurrence mechanism are mainly focused on personal and organizational factors. Psychological ownership, which has been proved to be a critical variable affecting behavior decision making, has not been considered in the occurrence of construction workers' WDB. This paper devotes to figure out how psychological ownership affects construction workers' WDB in the context of construction industry, especially the effect degree of each dimension. Questionnaires are sent out to construction workers with more than five years of working experience. Data shows that, although varies in level of effect, four dimensions of psychological ownership, i.e., Territoriality, Accountability, Sense of Belongingness and Self-Identity, are negatively related to WDB, while Self-Efficacy has no influence.

IEEM16-P-0482

Scenario Selection Optimization in System Engineering Projects Under Uncertainty: A Multi-Objective Ant Colony Method Based on a Learning Mechanism

Majda LACHHAB[1], Thierry COUDERT[2], Cedrik BÉLER[1]
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This paper presents a multi-objective Ant Colony Optimization (MOACO) algorithm based on a learning mechanism (named MOACO-L) for the optimization of project scenario selection under uncertainty in a system engineering (SE) process. The objectives to minimize are the total cost of the project, its total duration and the global risk. Risk is considered as an uncertainty about task costs and task durations in the project graph. The learning mechanism aims to improve the MOACO algorithm for the selection of optimal project scenarios in a SE project by considering the uncertainties on the project objectives. The MOACO-L algorithm is then developed by taking into account ants' past experiences. The learning mechanism allows a better exploration of the search space and an improvement of the MOACO algorithm performance. To validate our approach, some experimental results are presented.

IEEM16-P-0533

An Approach for Improving Method and Model Application in Engineering Design Processes: Case Study of a German Plant Engineering Company

Christoph HOLLAUER[1], Peter RIEBL[2], L. BECERRIL[1], N. KATTNER[1], D. WEIDMANN[1], N. CHUCHOLOWSKI[1], Karl RUHLAND[2], Karl AMANN[3], Udo LINDEMANN[1]
[1]*Technical University of Munich, Germany*
[2]*BHS Corrugated, Germany*
[3]*Ostbayrische Technische Hochschule Amberg-Weiden, Germany*

This paper presents an approach to improve understanding regarding the current application of product models and design methods within a company's mechatronic product design process. The method consists of five steps, where information is acquired in interviews, analyzed regarding current state of understanding and application, immediate measures are derived and further measures are planned in a roadmapping approach. The approach has been developed with and partially evaluated in a case study in a german plant engineering company, focusing on the acquisition phase and implementation of immediate measures.

IEEM16-P-0115

The Need for Integration Between Organizational Project Management and Change Management

Julien POLLACK
The University of Sydney, Australia

Organizational project management focuses on the delivery of business objectives, using a multi-layered integration of portfolio, program, and project management. This is contrasted with change management, an approach to delivering changes in organizations based in a significantly different intellectual heritage. It is argued that although the differences between the philosophies underlying these disciplines can cause tension, an integrated approach involving project management and change management will be more effective in delivering organizational objectives than using either in isolation.

Session	Engineering Economy and Cost Analysis
Date	6/12/2016
Time	13:30 - 15:00
Room	VIP Room
Chairs	Elita AMRINA, *Andalas University,* Yves DE SMET, *Université libre de Bruxelles*

IEEM16-P-0360

Artificial Neural Networks in Activity Based Costing Optimization

Noppadol AMDEE[1], T. ARUNCHAI[2], K. SONTHIPERMPOON[3], Warawut PHANBOONMEE[4]
[1]*Muban Chombueng Rajabhat University, Thailand*
[2]*Rajamangala University of Technology Suvarnabhumi, Thailand*
[3]*Naresuan University, Thailand*
[4]*UK Engineering & Supply Co., Ltd., Thailand*

Activity-based costing (ABC) is a costing methodology that identifies activities in an organization and assigns the cost of the actual consumption of resources to each product and service in the activity. This model emphasizes indirect costs allocation than conventional cost accounting. Indirect costs are more difficult to accurately apply than direct costs, yet need to be accurately calculated and applied. However, manually driven ABC has been considered to be too expensive and difficult to implement for the small gains made in providing costing information. The application of neural networks, using Single Cost Drivers is demonstrated as being efficient and effective extensions to ABC. The new terminology is Single Drivers Activity Based Costing (SDABC). The findings of the study was that the extended SDABC methods is best applied to products with low turnover or those in a state of loss condition, and include the various production activities, providing the actual cost of production.

IEEM16-P-0507

Risk Assessment in Costing Systems Using Costing at Risk (CaR): An Application to the Coffee Production Cost

Victor Javier JIMÉNEZ, Paulo AFONSO
University of Minho, Portugal

Traditionally, researchers and practitioners have been focused on deterministic costing models without acknowledge and handle conveniently cost uncertainty. This paper presents and discusses a methodology for measuring the risk within costing systems: Costing at Risk (CaR) which, considering a predefined confidence level, takes into account the worst expected outcome in terms of cost in a certain period. For the determination of CaR, a six steps methodology is proposed. CaR permits to identify the components which most influence the variability of cost objects allowing the design of more effective strategies of risk mitigation. CaR has been used to analyze the risk of the production cost of the Colombian Coffee which is produced across the country in different conditions. Indeed, the patterns of variability of the three components of production cost vary significantly when the main "cafeteras" regions are compared.

IEEM16-P-0598

A Risk Addendum for Complex Risky Projects

Pradip K BHAUMIK
International Management Institute, India

Firms often take up projects involving new technology, a new genre of products or entirely new markets. Such projects carry inherently higher risk than the normal business operations of the firm and so require a higher return to justify investments in them. Finance theory has no clear guidelines regarding the additional discounting rate or the risk addendum to be used for such risky projects. This paper extends the application of the framework proposed in an earlier work to determine the appropriate risk addendum to complex projects with longer gestation period and irregular cash flows. It also introduces the concept of crossover risk level for better appraisal of large complex and risky projects.

IEEM16-P-0725

Supporting Product Platform Decisions with Lifecycle Costing

Sebastian MAISENBACHER, Kristin GOEVERT, Udo LINDEMANN, Markus MÖRTL
Technical University of Munich, Germany

Product program optimization gains increasing relevance in industrial practice, due to rising number of variants in the context of product individualization. The definition of a product platform for several products of the program is a promising measure to reduce internal variety for the company. However, decisions for the right platform concept are challenging. Therefore, this publication aims to present a platform and a lifecycle cost model, which are both integrated in a process model to develop and assess different platform concepts for a product program. The presented concept has been applied on an industrial use case to evaluate its applicability. The evaluation emphasizes the applicability of the model as it supported the decision for one platform concept.

IEEM16-P-0279

Reliability Analysis of Dynamic Reliability Blocks Through Conversion into Dynamic Bayesian Networks

Kanjing LI, Ren YI, Zheng MA
Beihang University, China

Recently, the dynamic Reliability Block Diagram (DRBD) with the characteristics of intuitiveness and visibility has been extensively employed in industrial fields, such as aerospace, military facilities, nuclear energy and chemical industry, etc. However, there exists a limitation in the past research that the complexity of the reliability calculation considering the additional modelling constructs, such as state dependency (SDEP) block, spare part (SPARE) block, load sharing (LSH) block and so on. To address the issue, this paper proposes the dynamic Bayesian networks (DBN) based on converting the DRBD into a DBN. Based on these rules, the constructs of DRBD can be mapped into DBN and easily analyzed leveraging the mature algorithms and tools. A case study of a multiprocessor distributed computing system is adopted to illustrate the conversion algorithm. The results show that this approach can signally increase the analytic efficiency of DRBD for critical large-scale system.

IEEM16-P-0158

Simulating Dynamic Vehicle Routing Problem Using Agent-Based Modeling and Simulation

Bertha Maya SOPHA, Afriana SIAGIAN, Anna Maria Sri ASIH
Gadjah Mada University, Indonesia

Changing demand trend (e-commerce business, timely delivery) has contributed to dynamism and complexity of routing problems. Despite its importance, Dynamic Vehicle Routing Problem (DVRP) has received little attention. Most of VRP works have been characterized by static and deterministic problem. To fill the gap, the present study aims at developing Agent-Based Modeling and Simulation (ABMS) to simulate DVRP by capturing dynamism and stochasticity. Urban freight transport serving sixty-two retailers at Yogyakarta city (Indonesia) is taken as a studied case. GIS data and Particle Swarm Optimization are embedded in ABMS to mimic retailers' location, road infrastructure in the real system and to evaluate optimal routes respectively. Experiments were conducted to evaluate the effect of the degree of dynamism (dod) on logistics performances. Results indicate a linear relationship between the dod and both travelled distance and lateness. For every 1% increase of the dod, the travelled distance would increase,on average, by 7%.

Session	Reliability and Maintenance Engineering 5
Date	6/12/2016
Time	13:30 - 15:00
Room	Pecatu 1
Chairs	Behzad GHODRATI, *Lulea University of Technology,* Asokan MULAYATH VARIYATH, *Memorial University*

IEEM16-P-0185

Railway Switches and Crossings Reliability Analysis

Behzad GHODRATI, Stephen FAMUREWA, Seyed Hadi HOSEINIE
Luleå University of Technology, Sweden

Switches and crossings (S&Cs) connect the rail network, guiding trains from one track to another and supporting path crossing. They are critical systems given the frequency of their functional failure and the consequences on the operation, cost and safety of railway transportation. Reliability studies are required to support the transport objective of providing dependable, sustainable and cost effective transportation. The main objective of this study is to assess the reliability characteristics of S&Cs based on field data collection. As field failure data have censored nature, commercial packages have not been satisfactory for processing them; therefore, the study uses a special statistical software package RDAT® (Reliability Data Analysis Tool). The availability of the studied switches and crossings is estimated based on the estimated reliability characteristics. This is useful information, as it helps the contractor plan and schedule maintenance. It also helps the asset owner to identify units whose performance is below the desired target and to make replacement decisions.

IEEM16-P-0587

Nonparametric Information Criterion for Change Point Problems

Asokan MULAYATH VARIYATH, Chithran Vadaverkkot VASUDEVAN
Memorial University, Canada

The identification of change points is often considered as a model selection problem and the most commonly used methods are the Akaike information criterion (AIC), Bayesian information criterion (BIC) and their modified versions. These methods rely on the parametric distribution of the characteristic of interest, and any deviation from the specified parametric model may lead to incorrect conclusions. We propose an empirical likelihood based information criterion for identifying changes in the process parameters. The main advantage of our method is that we do not need to specify a parametric distribution for the characteristic of interest. Our simulation studies indicate that our method is as good as existing methods when the distribution of the characteristic is known, and it outperforms existing methods when the parametric distribution is approximated or misspecified. We applied our proposed method in two real examples.

IEEM16-P-0123

A Maintenance Waste Risk Appraisal Model Based on Modified Failure Mode and Effect Analysis (FMEA)

Agung SUTRISNO[1], Indra GUNAWAN[2], Iwan VANANY[3], Hadi Akbarzadeh KHORSHIDI[4]
[1]*Sam Ratulangi University, Indonesia*
[2]*The University of Adelaide, Australia*
[3]*Institut Teknologi Sepuluh Nopember, Indonesia*
[4]*Monash University, Australia*

Establishment of an improved model for assessing criticality of waste in maintenance operation strongly supports the creation of sustainable manufacturing. However, contribution of previous maintenance engineering studies to above issue is very limited. If any, it is very few intended to create a model for ranking criticality of maintenance waste using risk management tool. In spite of the fact that utilization of risk appraisal tool has been introduced in earlier studies by modifying FMEA, some limitations are still existing and demanding for a better refinement. In this paper, an improved model for calculating the risk of maintenance waste using modification of FMEA is proposed. In evaluating risk criticality of maintenance waste, a new waste priority measure is presented via combining new additional dimensions extended from previous waste criticality evaluation models. In the new model, additional indices, the preventability and controllability scale of waste are included in an attempt to narrowing down limitations on using the detection indices only. An example on using the new waste reprioritization model for maintenance waste risk is provided. The proposed model offers an alternative perspective on evaluating the risk of maintenance waste and an improved model for maintenance waste alleviation.

IEEM16-P-0073

The Reliability Analysis of Repairable K-Out-of-N Systems with Component Lifetimes and Repair Time Subjected to Phase-Type Distribution

Wei WANG, Tong CHEN, Di PENG
Naval University of Engineering, China

This research investigates a k-out-of-n system in which the lifetime of operational and standby components, the repair time follow continuous phase-type (PH) distribution, instead of exponential distribution or others typical distributions. The proposed paper provides an analytic reliability model that is more suitable to characterize the real situation. The stationary distribution is built by using matrix analytic methods; and several reliability measures of interest are obtained, such as the system stationary availability, system up period, mean time between failures (MTBF) and mean number of failures per unit time (MNF). Finally, a numerical example is presented which implements the applicability and calculability of the model and demonstrate how system reliability measures are influenced by parameter k when n is fixed.

IEEM16-P-0006

Preventive Maintenance Operations Based on Weighted Similarity Coefficient

Abdelhakim ABDELHADI[1], Tamara KHREIS[2]
[1]*Prince Sultan Univesity, Saudi Arabia*
[2]*Ministry of Education, Jordan*

In this paper a methodology for the application of group technology to preventive maintenance strategy based on weighted similarity coefficients is introduced. In this methodology machines are grouped into clusters of virtual cells based on the predicted severity of failure they can encounter. These cells are used to come up with an efficient maintenance strategy such as to prioritize the execution of the preventive maintenance to certain types of machines. Numerical example is presented to illustrate the procedure.

IEEM16-P-0072

Analysis on Reliability Model for Warm Standby System with a Repairman Taking Multiple Vacations Based on Phase-Type Distribution

Fang LI[1], Dongliang YIN[2], Bin HU[1]
[1]*Naval Research Center for Warship Equipment Integrated Logistic Support, China*
[2]*Naval University of Engineering, China*

Considering maintenance resources assignments of the large-scale complex equipment, the policy that single repairman has multiple vacations is utilized to analyze a warm standby repairable system. The former models that the known conditions are usually assumed to follow exponential distribution or other typical distributions have many constraint conditions. It is assumed that the online component lifetime, standby components lifetime, repair time and repairman vacation time are subject to different continuous Phase-type (PH) distribution, respectively. The reliability model with high versatile is acquired. The reliability features, such as system reliability function, system stationary availability, stationary failure frequency and mean time between failures (MTBF), are provided by the model. Finally, the applicability of the model is implemented by numerical application, and the influences of standby components counts and vacations or non-vacation of a repairman on the system reliability laws are demonstrated.

Session	Poster – Big Data & Analytics
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0250

A Study for Big-Data (Hadoop) Application in Semiconductor Manufacturing

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[2]*Shanghai Jiao Tong University, China*

The semiconductor industry as one of the world's most automated and advanced manufacturing produces a huge variety of data every day. How to maximize the usage of these data is what we want to discuss in this paper. A big-data platform and its applications for semiconductor manufacturing based on Hadoop framework are proposed. Hadoop is a distributed data storage and computing solution with related low hardware cost and high system reliability. It is a great significance to conducting Hadoop platform into semiconductor manufacturing that improve effectiveness and reduce production cost. To realize the aim, we illustrate two applications of statistics methods, such as PCA (Principal Component Analysis) and SVM (Support Vector Machine). PCA can be used to optimize KPI (Key Performance Indicator) enactment through the correlation between the parameters. These KPI can provide effective monitor of process anomalies. SVM is a machine learning method is useful to build a semiconductor IKL (Intelligent Knowledge Library) to store and apply engineering lesson learns based on super large amount of data. Engineers can fulfil quick safety checking based on the mode setting by SVM.

IEEM16-P-0327

Key Issues of Incorporating Social Network Effects in Product Portfolio Planning

Roger JIAO[1], Feng ZHOU[1], Jun DU[2]
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Recent advances in social media have profound technical and economic implications for innovative product design. This papers reviews the emerging trends of incorporating social network effects in product design, with a particular focus on the interface of marketing and engineering design, namely product portfolio planning. Key issues are examined in order to understand how peer influence of one's social networks affects one's preference and choice behavior towards product adoption.

IEEM16-P-0499

Critical Issues of Applying Machine Learning to Condition Monitoring for Failure Diagnosis

Fuqing YUAN
University of Tromsø, Norway

Machine learning is a hot topic recently. For condition monitoring, the machine learning is mainly used to improve the failure diagnosis accuracy, as the machine learning can provide flexible decision function. This paper firstly discusses the advantage and disadvantage of the state of art condition monitoring methods. It figures out the machine learning techniques follow a general procedure and can be unified into a general framework. Later on, it figures out some key issues of applying machine learning to condition monitoring. Two examples are given to demonstrate the advantage and disadvantage of machine learning.

Session	Poster – Decision Analysis and Methods
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0105

The Optimal Entry Point for Corporate Social Responsibility of Sustainable Business in the Food Industry - The TBL Model

Shu Yen HSU, Chiao Chen CHANG, Tyrone T. LIN
National Dong Hwa University, Taiwan

This study intends to import the triple bottom line (TBL) model. In light of sustainable business process, in which the movement of the Global 100 Index affects economic benefits, corporations must include environmental and social costs at the optimal time based on the best economic benefits that match the corresponding Global 100 Index. The food industry must exercise corporate social and environmental protection responsibilities through energy saving and carbon reduction to seek sustainable corporate business. This study finds the threshold value from the expected Global 100 Index value, and based on the value-matching and smooth-pasting conditions, provides corporations with the optimal entry point to incorporate the environmental and social costs respectively. This study builds corporate sustainable business value, provides relevant decision-making information for the feasibility of corporate sustainable business process, enhances the food industry's value chain, and makes sustainable business an important activity in the food industry.

IEEM16-P-0164

Multi Criteria Decision Making with Evidential Reasoning Under Uncertainty

Farzaneh AHMADZADEH
Mälardalen University, Sweden

Many decision problems have more than one objective that need to be dealt with simultaneously. Moreover, because of the qualitative nature of the most of real world problem it is an inevitable activity and very important to interpret and present the uncertain information for making effective decision. The Evidential Reasoning (ER) approach which is one of the latest development within multi criteria decision making (MCDM) seems to be the best fit to synthesize both qualitative and quantitative data under uncertainty. To support this claim, two case studies were tested to illustrate the application of ER for prioritization and ranking of decision alternative to support decision process even with uncertain information. The importance of having a better structured decision process is essential for the success of any organization, so it can be applied widely in most of real world problem dealing with making effective decision.

IEEM16-P-0223

Effects of Incentive Time Point on Cooperation

Yan WANG[1], Yan-Mei LI[2]
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Cooperative behavior enhances an organization's ability to reach goals. The present study investigated whether and how prepaid incentives and promised incentives influenced cooperation differently among organization members in an experiment. Results showed that promised incentives appear more effective in terms of cooperative behavior than prepaid incentives, and the perception of benefit is a mediator in the relationship between the incentive time point and cooperative choices. The psychological mechanism underlying these two types of incentives was discussed.

IEEM16-P-0339

Environmental Sustainability: Multi-Criteria Decision Analysis for Resource Recovery from Organic Fraction of Municipal Solid Waste

Samson MASEBINU[1], Esther AKINLABI[1], Edison MUZENDA[1], Charles MBOHWA[1], Akinwale ABOYADE[1], Thabo MAHLATSI[2]
[1]*University of Johannesburg, South Africa*
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Landfills within the City of Johannesburg (CoJ) are running out of airspace. To slow down airspace consumption rate, waste discharged at these landfills must be minimised, and where possible recover useful resources. A multi-criteria decision tool, the Analytical Hierarchy Process (AHP) was employed to appropriate technologies for fruit and vegetables waste discharge at Robinson Deep landfill. The goal of the approach is environmental sustainability. Pairwise comparison of four criteria and four technology alternatives were investigated. Data used were retrieved from a research group and consultations with waste to energy experts. Of the four technology alternatives, anaerobic digestion (AD) is the most preferred. Incineration technology has 49.42% preference to AD because it is perceived to reduce the bulkiness of waste discharged at the landfill. Composting has 25.24% preference to AD and it is believed to encourage home management of waste. Consistency ratio for all pairwise comparison was less than 0.1.

IEEM16-P-0518

Identification of Modular Platform Potential in Complex Product Portfolios Using Data Analytics

Günther SCHUH, Michael RIESENER, Casimir ORTLIEB, J. KOCH
RWTH Aachen University, Germany

The trend of product individualization results in a growing product variety while at the same time the globalized competition forces companies to react on the severe cost rivalry. An increasing number of companies develop new or adapt existing modular product platforms for their product portfolio as an approach in order to tackle these challenges. The structure of modular platforms thereby plays a fundamental role for the efficiency of product realization and hence the profit for the company. Customer requirements, their functional realizations as well as technical solutions must be analyzed for portfolio products to provide a good overview of potential modular platform candidates. Using data analytics in the early planning stages supports the process of gaining transparency, understanding how product attributes are related and generates important knowledge for the following stages of modular platform development. A comprehensive approach helps to optimize the scope of modular platforms and shows the allocation of suitable product candidates for the modularization process based on decisive criterions.

IEEM16-P-0539

Analysis of Transnational Joint Venture Decision Evaluation on Aesthetic Medicine: Extended Binomial Options Pricing Model

Hui-Tzu YEN, Tyrone T. LIN
National Dong Hwa University, Taiwan

This study is to explore and assess the investment decision-making of the aesthetic medicine industry in light of uncertain revenues and project investment risks when handling multinational joint ventures. The net present value method is employs to analyze the different strategies used in each decision node of two stages by adopting the state cash flow value and the extended binomial opinions; the potential value analysis, which results from delayed project value, is then assessed. The option values of each node of the two stages are determined and the respective feasible node strategy options under conditions of different risks are assessed. It has developed a mathematical model that provides an integrated concept in project value. This will hopefully provide the aesthetic medicine industry operators with an appropriate decision-making model that generates the optimal project strategies when facing their own unique risks, feasibility analysis functionality, and a reference for the maximum financial benefit.

IEEM16-P-0681

Prediction of Trust in Scripted Dialogs Using Neuro-Fuzzy Method

Halimahtun MOHD KHALID[1], Wei Shiung LIEW[2], Martin HELANDER[1], Chu Kiong LOO[2]
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Design of effective communication dialogs can help to determine trust between humans. This paper reports an experimental study to explore and predict trust using two different scripted dialogs. The first dialog represented a business scenario, while the second was a fire rescue. Trust was measured using subjective psychological criteria of Ability, Benevolence and Integrity which were embedded in the dialog. These were correlated with objective physiological features of human facial expressions, voiced speech and camera-based heart rate. Using neuro-fuzzy method, the subjective trust data was analyzed separately. The results showed that subjective measures of Benevolence and Integrity for fire rescue scenario could predict trust better than the business scenario. The power of prediction was almost identical for the Ability measure. The findings suggest that trust is associated with the type of scenario, and that both subjective and objective measures are important in predicting trust.

IEEM16-P-0744

Technology Assessement Based on Growth Functions for Prediction of Future Development Trends and the Maximum Achieveable Potential

Michael FRIES, Markus LIENKAMP
Technical University Munich, Germany

A company's ability to find the most profitable technology is based on a precise forecast of achievement potential. Technology Management (TM) uses forecasting models to analyze the future potential, e.g. the Gartner Hype Cycle, Arthur D. Little's technology lifecycle or McKinsey's S-curve model. All these methods are useful for qualitative analysis in the planning of strategic Research and Development (R&D) expenses. In a new approach, exponential and logistic growth functions are used to identify and quantify characteristic stages of technology development. Datasets from different industry sectors are analyzed, as the number of active Facebook users worldwide, the tensile yield point of flat bar steel, the number of transistors per unit area on integrated circuits and the fuel efficiency per dimension of passenger cars. The methodology can help to answer key entrepreneurial questions such as the search for alternatives to applied technologies and identifying the risk of substitu-tion technology.

Session	Poster – E-Business and E-Commerce
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0018

A Selection Framework of E-Business Model by Assessing Organizational E-Readiness

Kayvan MOHITMAFI, Payam HANAFIZADEH
Allameh Tabataba'i University, Iran

This study intends to provide a decision making framework that helps organizations to select appropriate e-business model (EBM) based on their "organizational e-readiness assessment" (OERA). For this purpose, it's made using five dimensions as major criteria of EBMs by extracting the literature. By allocating some related indicators of OERA to selected dimensions, a qualitative framework was developed to assess level of organization readiness in each dimension. For determining the standard level of generic EBMs, it's used five known classifications of EBMs -including 50 generic EBMs- in the literature qualitatively. Finally, by comparing the assessment result and standard level of classified EBMs, it can propose proper EBM(s) to managers. Additionally, because of using e-readiness indicators in this framework, managers can use it for assessing e-business readiness of their organizations.

Session	Poster – Engineering Economy and Cost Analysis
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0159

An Assessment Method of Aviation Equipment Affordability Based on AHP

Wei WANG, Jing LYU, Xiao Cui LI, Yin Ping REN
Beihang University, China

This paper establishes an evaluation system of aviation equipment affordability at four levels: the target level, the criterion level, the integrated parameter level and the basic parameter level. It decomposes the final target into several elementary parameters which can be estimated. Analyzing the importance of each level index by using the analytic hierarchy process, and calculating the weight of the index. Weighting sum of the basic parameters after standardization and getting the final parameters: AD (Affordability Degree) which response the level of affordability. Finally, verifying the evaluation method by an example.

IEEM16-P-0352

Efficiency Change in Companies Participating in the Rural Appliance Rebate Program of China

Shuo ZHANG, Yongzhong WU, Wenhui ZHOU
South China University of Technology, China

The Rural Appliance Rebate Program (RAR) starting at the end of 2010 was part of the efforts of Chinese government to boost up domestic consumption during global economic downturn. While the RAR program's positive effects on macro economics have been well documented, the impacts of such a governmental subsidy program on the companies and the industry are unknown. This paper investigates whether the RAR program has any impacts on the productivity efficiency of the home appliance companies. The results of empirically implementing the data envelopment analysis (DEA) approach indicate that home appliance companies experienced reduction of scale efficiency after participating in the program. Malmquist Indices (MI) were calculated and further showed that twelve out of the fifteen studied companies experienced decline of technical efficiency change (Effch), indicating that the RAR program have hindered the technical progress of the industry.

Session	Poster – Engineering Education and Training
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0057

The Mediator Role of Psychological Capital: A Study Among Authentic Leadership, Work Engagement, and Psychological Capital

Xiaonan ZHONG, Xin LI, Tong LIU, Yi-Wen CHEN
Chinese Academy of Sciences, China

The study explored how authentic leadership (AL) affected employees' work engagement (WE) both directly and through the mediating role of employees' Psychological Capital (PsyCap). Using a correlation research design, the authors collected valid responses from 304 employees across organizations through a paper survey in Beijing (China). The results showed both authentic leadership and PsyCap positively related to work engagement of employee, and authentic leadership also positively related to PsyCap. A mediation analysis with the use of a boots trapping technique revealed that Psychological Capital mediates the relationship between authentic leadership and work engagement. Our study recommends that organizations could conduct more training programs on authentic leadership development to stimulate leaders to become more authentic, and provides Psychological Capital orientation to employees, to improve employee's work engagement as result in the positively improving the organization performance.

Session	Poster – Facilities Planning and Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0571

Layout Design for Large Scale Problems with a Hybridized Clustering Based Heuristic Method

Maryam SAHRAGARD, Mahdi BASHIRI
Shahed University, Iran

In this paper we develop a new efficient heuristic method for facility layout problems. This heuristic method contains two phases. In the first phase, a clustering method based on the SOFM is used for clustering of data in similar groups and in the second phase, an exact solution approach is applied for designing of a layout in each cluster. As an alternative solution, the ALDEP algorithm is used for layout design of each cluster. For validity checking of the proposed approach, layout of small instances are designed by the ALDEP as well as the proposed method to be compared. While for large instances we use the mathematical programming to find the optimal layout design. The results are compared with the results of the proposed approach. Numerical analysis confirms that the proposed two phase approach has better efficiency comparing to the classic single phase approach in both quality and computational time.

Session	Poster – Healthcare Systems and Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0133

Use of Lean Management Philosophy in Health Sector: A VSM Based Case Study

Katarzyna ANTOSZ[1], Dorota STADNICKA[1], R.M. Chandima RATNAYAKE[2]
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[2]*University of Stavanger, Norway*

Lean management philosophy (LMP), which arose from the discrete manufacturing industry, is currently being adapted to service-providing organizations. The healthcare organizations currently need to improve productivity, especially in the area ofthe identification and elimination of waste. This manuscript presents a case study carried out in a cardiology clinic. A 'family of services' has been identified based on the medical procedures and related set of tests, which are used to treat specific symptoms. The value stream mapping (VSM) method has been used to analyze the 'family of services'. The activities that have been involved in a particular service have been identified, and a current state value stream map (CS-VSM) has been developed. Then, time wastage,in relation to patients' waiting for tests, has been calculated and the problems have been identified and analyzed. Finally, the proposal of a future state value stream map (FS-VSM) has been presented.

IEEM16-P-0406

Applying Microsoft Kinect for Windows to Develop a Stroke Rehabilitation System

Keng-Chieh YANG[1], Chia-Hui HUANG[2], Cyuan-Fong LE[2]
[1]*Hwa Hsia University of Technology, Taiwan*
[2]*National Taipei College of Business, Taiwan*

This study develops a Stroke Rehabilitation System for stroke patients. Patients can stay at home to use this system. The design of this system is based on WHO ICF concept to develop the system and included Barthel scale for patient's evaluation. The programs design by Microsoft C# programming language to control Microsoft Kinect System. The results demonstrate that our system can easy to implement in patient's home. We collect patient's daily rehabilitation data and record it to the database. The data can be statistically analyze and drop a bar chart for visually watch. The results can upload to local hospital Medical Cloud for doctor's reference. We also demonstrate the system and provide sample code for reference.

Session	Poster – Human Factors
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0034

Evaluating Human Resource Competitiveness Based on an Improved TOPSIS Method: The Case of Automotive Industry

Han HAO, Shijia ZHAO, Zongwei LIU, Fuquan ZHAO
Tsinghua University, China

Human resource plays an essential role in the sustainable development of modern industry, especially the talent-intensive industries. Evaluating the human resource competitiveness is the basis for quantifying industrial competitiveness and shaping development strategies. In this study, an improved Technique for Order Preferences by Similarity to an Ideal Solution (TOPSIS) method is developed to evaluate the national human resource competitiveness by using the case of automotive industry. The new approach averts information loss effectively by combining subjective and objective weights, which reflect both the experience of experts and information of the data. Empirical results show that the proposed method is a viable, systematic approach in solving the problem. It is found that the factors of R&D expenditure, granted patents and published papers are the major factors determining national human resource competitiveness.

IEEM16-P-0089

Influence of Work-Family Conflict on Job Involvement and Organizational Commitment: The Moderating Effect of Perceived Supervisor Support and the Mediating Effect of Job Satisfaction

Chenchen LIU, Xin LI, Tong LIU, Yi-Wen CHEN
Chinese Academy of Sciences, China

The study aims to explore the influence of work-family conflicts on job involvement and organizational commitment, we also investigated the moderating effect of perceived supervisor support and the mediating effect of job satisfaction. 558 employees from small and middle size enterprise participated in our research, they came from 19 organizations including Eight different regions such as Beijing, Shenyang and Hangzhou. By hierarchical regression and bootstrapping, our hypotheses have been supported. Results showed that perceived supervisor support moderated the effect of work-family conflicts on job satisfaction. When perceived supervisor support is low, work-family conflicts negatively predicted job satisfaction; however, when perceived supervisor support is high, work-family conflicts had no effect on job satisfaction. We also supported the moderated mediation model, job satisfaction mediated the interaction of work-family conflicts and perceived supervisor support on job involvement and organizational commitment.

IEEM16-P-0121

The Impact of Work-Family Interface on Turnover Intention of IT R&D Personnel: A Mediator Role of Psychological Contract

Zhiyong ZHANG, Tong LIU, Yi-Wen CHEN
Chinese Academy of Sciences, China

Taking the group of IT R&D personnel as the research subject, we investigated 267 employees through the questionnaire of work-family conflict, work-family promotion, psychological contract and turnover intention. The results showed: 1) Work-family conflict negatively affects psychological contract, and positively affects turnover intention; 2) Work-family promotion positively affects psychological contract, and negatively affects turnover intention; 3) Psychological contract partly mediates the effect of work-family conflict and promotion on turnover intention. This study filled the gaps of theoretical research, and provided realistic suggestions to the enterprise how to reduce turnover rate.

IEEM16-P-0144

Effect of Height on Sense of Power

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This study proves that as the height of a person increases, his/her sense of power also increases. Moreover, in a population with heavy weight and high socioeconomic status, the height of a person significantly affects his/her sense of power. Findings have confirmed the concept emphasized by embodied cognition theory, i.e., genitive dependence on one's body, which indicates that the psychological characteristics of an individual should be organically combined with his/her biological characteristics in future studies.

IEEM16-P-0275

Development of Affective Modeling for Toilet Seat Comfort

Sunghwan PARK[1], Y. L. RHIE[1], Joong Hee LEE[1], Minjee KIM[1], Kyung-Jun LEE[1], Injae LEE[2], Myung Hwan YUN[1]
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The resource transfer problem (RTP) is a generic framework for integrated scheduling and routing problems, which allows for modeling and solving complex scheduling and rich vehicle routing problems as well as their hybrids in a unified way. Many constraints and specific requirements arising in scheduling and routing applications are covered by the RTP. Basically, the problem consists in scheduling a set of activities that have to be performed at different locations in a network. The activities can be executed in alternative modes, using different amounts of resources. The resources can be transferred between the locations and may require sequence-dependent changeovers between consecutive activities. Moreover, generalized precedence relations between the activities have to be taken into account. For solving the RTP we propose a time-oriented branch-and bound algorithm exploiting constraint-propagation techniques to reduce the search spaces. We report on computational experience on a set of integrated supply chain scheduling and routing problems.

IEEM16-P-0359

Understanding Characteristics of User-Generated Content as a Source of Extracting User Value

G. W. KIM, Yongmin KIM, Jun Soo HAN, Y. L. RHIE, Myung Hwan YUN
Seoul National University, South Korea

This study aims to identify and categorize the characteristics of user-generated content to obtain a profound understanding on the user data, and actively utilize the data in extracting user values. Based on literature review, characteristics of online reviews and photos on Social Network Services (SNS) were investigated to evaluate five categories for online reviews (interactive, imprecise, cultural, biased, and ambivalent), and four categories for SNS photos (affirmative, condensed, informative, and archival). These categories were reclassified on the three axes representing individual-social, explicit-implicit, and pleasant-unpleasant, which are well known dimensions of user-generated value. As a preliminary study, this categorization is expected to act as a stepping stone in understanding the user-generated content. It will also help Human-Computer Interaction researchers to select and use data consistent with the research purpose, and could be served as the indexes for measuring the characteristics of the data generated in social media and online websites.

IEEM16-P-0362

Identifying the Structure of Perceived Luxuriousness in Real and Web-Based Model House

Yong Min KIM, Myung Bin CHOI, Sung Hee AHN, Donggun PARK, Jin Woo OH, Myung Hwan YUN
Seoul National University, South Korea

In this study, we investigated the difference of luxuriousness between real model house and web-based model house. Living room as the most important residential space was targeted as an evaluation object. 6 living rooms and 9 elements contained in each living room were evaluated in terms of luxuriousness. Through independent samples t-test, we could examine that there were statistically significant difference in all elements in living rooms for both evaluations of real and web-based. Also we discovered elements that influence the luxuriousness of living room by multiple linear regression analysis. As a result, influential interior elements were extracted differently within two evaluation environments. From this points we concluded that independent strategies can be developed for web-based model house to enhance the luxuriousness, which has been widely utilized before people visit the real model house in terms of managerial point of view.

IEEM16-P-0436

Integrating Human Factors and Ergonomics in a Participatory Program for Improvements of Work Systems: An Effectiveness Study

Helia FONSECA, Nuno SANTOS, Isabel LOUREIRO, Pedro AREZES
University of Minho, Portugal

The aim of this study was to analyze the effectiveness of the implementation of a constructive measure defined through a participatory ergonomic program taking into account an ergonomic evaluation and workers' perception about risk factors related to task performance. A case study was conducted on a workstation of a textile industry. Through the participatory program implementation, a prototype was designed with workers contributions. A questionnaire was made to assess the level of pain/discomfort felt by workers before and after prototype implementation. Results demonstrate a significant improvement regarding task performance indicating a workload decrease, suggesting that Workers' satisfaction has considerably increased.

IEEM16-P-0554

Difference Thresholds of Multi-Axis Whole-Body Vibration

Andi WIJAYA[1], Orjan JOHANSSON[2]
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A laboratory study was conducted to investigate the effects of lateral and horizontal vibration on the difference threshold of vertical vibration. Twelve male subjects sat on a rigid seat and were exposed to four different vibration conditions (pure vertical vibration; combination of horizontal and vertical vibration; combination of lateral and vertical vibration; combination of horizontal, lateral and vertical vibration). Vertical vibration for four conditions was 5 Hz sinusoidal with a magnitude of 1 ms-2 r.m.s. Horizontal and lateral vibration for the last three conditions were sinusoidal with magnitude 0.5 ms-2 r.m.s. and contained ten frequencies (1 to 8 Hz in third-octave band step). The frequency-weighted acceleration of the ten frequencies was equal. Results showed that horizontal and lateral vibrations have different effects on the difference threshold of vertical vibration. The combination of vertical and horizontal vibration gave a significantly lower difference threshold of vertical vibration than the combination of vertical and lateral vibration.

Session	Poster – Information Processing and Engineering
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0041

Monthly Electricity Demand Forecasting by GANN

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The information of electricity demand forecasting is a base for energy generation enterprise to develop electricity supply system. The purpose of this study is to develop a monthly electricity forecasting model in order to predict electricity demand for energy management. The proposed approach to monthly electricity demand time series forecasting model, describes the trend of the electricity demand series and is solved by a proposed GANN which is integrated by a neural network algorithm with optimal parameters obtained from a genetic algorithm. Electricity demand data in United States is applied.

IEEM16-P-0064

Flexible Vehicle Scheduling for Urban Last Mile Logistics: The Emerging Technology of Shared Reception Box

Shuzhu ZHANG, Carman Ka Man LEE
The Hong Kong Polytechnic University, Hong Kong SAR

Urban Last Mile Logistics (ULML) has been taking an increasingly important role alongside the development of e-commerce. The common delivery mode in the ULML is the Attended Home Delivery (AHD). However, such a delivery mode lacks flexibility, which means customers have to be waiting at home during certain time periods. Apart from AHD, another promising delivery mode is becoming available, which is the Shared Reception Box (SRB). SRB can release customers from time constraints and compensate the inflexibility of AHD so as to provide a satisfactory delivery. The theoretical research about the application of SRB is still rare, not to mention the integration of AHD and SRB. With this consideration, this paper aims to investigate this emerging technology and propose a mathematical model analyzing the integration effect of AHD and SRB in order to improve the overall efficiency of ULML.

IEEM16-P-0228

Managing Routing Information for Optimal Vehicle Refueling in Transportation Networks

Shieu-Hong LIN
Biola University, United States

Managing routing information is an important aspect of point-to-point delivery by motor carriers. In this paper, we describe the data structures and algorithms used for implementing a system that can effectively maintain the routing and refueling information dynamically to minimize the fuel cost of point-to-point delivery by motor vehicles. Given a transportation network of n vertices, the system can maintain and update the critical routing information using quadratic space of n and cubic time of n. Given any starting point and an initial fuel level, the system can then on the fly determine an optimal refueling plan in quadratic time of n based on the established routing information.

Session	Poster – Intelligent Systems
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0053

Using Answer Set Programming in an Order-Picking System with Cellular Transport Vehicles

Steffen SCHIEWECK, Gabriele KERN-ISBERNER, Michael TEN HOMPEL
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Cellular transport systems are a field of research which has received some attention in the last few years. As a recently established topic, a large share of the current research is directed at fundamental topics dealing with the system's design and construction. Answer set programming, on the other hand, has been established in the early 90s and received steadily rising attention from thereon. In the presented paper, we aim to unite the topics of cellular transport systems and answer set programming to build a valuable fusion. By using answer set programming, the vehicles are given the autonomy to decide which driving task to fulfill next and to which picking station a corresponding customer order is assigned to. The approach is evaluated using a simulation and proves to be superior to a conventional first-come-first-served approach.

IEEM16-P-0573

Dynamic Analysis of Customer Needs Using Fuzzy Markov Chain and Fuzzy Weighted Average Methods

C.K. KWONG, Huimin JIANG, Ridvan AYDIN
The Hong Kong Polytechnic University, China

Quality function deployment (QFD) is a well-known method of developing customer-oriented products for satisfying customer needs (CNs). One important process of QFD is to determine importance weights of CNs. However, it is also important to estimate the future importance of CNs because of the existence of the time interval between determining importance weights of CNs and the launch of new products. In this paper, an approach based on fuzzy Markov chain and fuzzy weighted average methods is proposed to determine both present and future importance weights of CNs. A case study of a packing machine design is used to illustrate the applicability of the proposed approach.

Session	Poster – Manufacturing Systems
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0102

Experimental and Numerical Studies on the Effects of Heating Frequency in the Thixoforming Process for the 2D Aluminum Alloy Semi-Solid State

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This paper presents a study of frequency effects on the heating induction process for aluminum alloys. Our objectives are to deal with the more general induction heating issues in the semi-solid metal forming by taking into account the conditions of radiation and convection during the heating combined with cooling process at the surface of samples, hence the spatial-temporal variation of temperature on the whole sample volume. The Lab experiment for a cylinder aluminum alloy and numerical approaches for the physical model of a 2D heat transfer equation with the boundary conditions of convection and radiation were carried on. It is interesting to find that with a smaller rank of heating frequency 21– 24KHz on the aluminum alloy, the distribution of the temperature is very homogenous on all samples from the center to surface areas, i.e. on the whole heated volume. We also observed that the quality of our samples after the induction heating process was very good and the 'foot elephant' pattern did not happen.

IEEM16-P-0134

The Influence of Cutting Parameters on Residual Stress Distribution During Turning of 20Cr2Ni4 Steel

Qianru WU[1], Jiping LU[1], Xianping CHEN[2], Sicheng JIAO[1]
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[2]*Beijing Institute of Astronautical Systems Engineering, China*

A series of orthogonal experiments have been carried out to study the effect of different rake angles, cutting depths and spindle speeds on residual stress distribution during turning of 20Cr2Ni4 steel. Four characteristic values are selected from the typical residual stress distribution profile: surface residual stress, the depth of tensile stress, the maximum residual compressive stress and the depth of residual stress. The residual stress by turning were measured by X-ray diffraction method. In order to get the distribution of residual stress along depth direction, the specimens need to be etched layer by layer. From this investigation, it could be suggested that during turning of 20Cr2Ni4 steel, using the cutting parameters that low rake angle (5 degrees), large cutting depth (0.3 mm) and medium spindle speed (200 r/min) will result in low residual stress of parts.

IEEM16-P-0260

A Method for Configuration Design of Reconfigurable Machine Tool

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Reconfigurable Machine Tool (RMT) has been recognized as effective equipment for dealing with the dynamic manufacturing requirements. For the problem how to decide RMT optimal configuration for requirement, we propose a method including both the function model and the decision-making stages. At first, Living System Theory is used to establish the function model, in which the integration of basic modules is archived as the elements to describe the RMT configuration. And Degree of Freedom is used to express the relative motion among the modules as the constraint for selection of feasible configurations. Then a decision model for configuration is constructed, while the economic cost and reconfigurability are used as the indexes. According to the decision model, the configuration with appropriate trade-off among indexes is decided from the feasible configurations, which is RMT optimal configuration for the requirement. The efficacy of this method is illustrated through a RMT configuration design example.

IEEM16-P-0323

Oil & Gas Industry Perception of Modularization Barriers and Impacts

Mauro MANCINI[1], Guido J. L. MICHELI[1], Agnese TRAVAGLINI[1], Giacomo GILARDONE[2]
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Modularization is a complex strategy characterized by both technical and managerial decisions. This paper aims at understanding practitioners' perceptions about two of the most important elements to be taken into account in a proper decision-making process, i.e. barriers to and impacts of modularization. The adopted methodology is the analysis of a number of questionnaires distributed during two of the most important international conferences regarding the Oil & Gas industry. The analysis of the answers provides interesting insights on the topic and useful guidelines that could be considered during the evaluation phase of a modular project. For example, the analysis enlightens that Modularization, while increasing the effort needed during the design and engineering phase, decreases the execution phase costs also thanks to a reduction of the amount of the site-related works.

Session	Poster – Operations Research
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0232

A Study on Analyzing and Modeling Dynamic Random Access Memory Power Under Burn-in Test Condition

Chang-Ki HAN, Ilkyung YOON, Hyun-Sung LIM, Sung-Mun KANG, Jajun KIM, Jae Woo RU, Hong-Sun HWANG, Sangjae RHEE, Kang-Yong CHO, Gyo-Young JIN
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During burn-in of DRAM (Dynamic Random Access Memory), power consumption has become a significant consideration on the capabilities of test environment with the growing quantity. Under burn-in test condition, each electrical current is categorized as operational characteristics. In this paper, we first present quantitative power consumption and its formulas under burn-in condition. Each current is categorized as operational characteristics, and components of power consumption are extracted by simultaneous equations with experimental results. Power reduction schemes show the possibility of power down without loss of Burn-in effectiveness.

IEEM16-P-0262

Dynamic Energy Portfolio Optimization Model for Electricity System and Heating System

Chen LI, Fajie WEI, Shan LU, Junwei ZENG
Beihang University, China

In this paper we develop an optimization model for investigating the community electricity system behavior and policy implications of the usage of different energy facilities under the goal of reducing cost. There are four energy sources in this model: combined heat and power (CHP), wind turbine, electrical grid and electricity storage. When considering the dynamic demand requirements and energy price, we found that, to minimize the total cost, the storage discharge at high price time and charge during low price time. Also, the storage can discharge when there is not enough wind and the demand is at peak. However, the sum of charge is larger than that of discharge because of the electricity loss of storage device.

IEEM16-P-0335

Genetic Algorithm for Generalized Resource Constrained Multi Project Scheduling Problem Integrated with Closed Loop Supply Chain Planning

Shadan GHOLIZADEH TAYYAR, Jacques LAMOTHE, Lionel DUPONT
Ecole des Mines d'Albi-Carmaux, France

This work considers a Generalized Resource Constrained Multi Project Scheduling Problem integrated with a supply chain planning model. In the model, the projects incorporate a set of activities interrelated by four types of precedence relations with positive/negative time-lags, which require two types of resources to be accomplished. The resources are considered in renewable and non-renewable types. The renewable resources come into being assigned to the activities with a limited initial availability. However, additional limited units of the resources are supposed to be rented, in order to catch up deadline of activities which hold high lateness penalty costs. The non-renewable resources of the projects are supplied by a supply chain. The model defines a production-transportation plan for supply of these resources to the projects worksites just in times. The model is solved by applying a genetic algorithm on a case from a French project called CRIBA.

IEEM16-P-0354

Implicit Modelling for Manpower Scheduling with Part-Time Workers

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

In labor-intensive industries such as services industry, utilization of precious manpower resources can make the difference in terms of profitability and meeting customer and/or project demands. Employing part-time workers on top of full-time workers is not uncommon in Singapore and the number of part-time workers is gradually increasing in the recent few years. From the modelling point of view, although set covering model proposed by Dantzig is able to incorporate part-time and full-time workers, the problem size can become very large, and this creates intractability. In this paper, an implicit manpower scheduling model with part-time workers is proposed. The implicit model is able to achieve optimal solution with a much reduced computation time as compared to the set-covering formulation, based on computational experiment on various distribution pattern of required staffing level with increasing complexity and problem size.

IEEM16-P-0447

Robust Resource Investment Problem with Time-Dependent Resource Cost and Tardiness Penalty

Asem HATTAB, Mohamed HAOUARI
Qatar University, Qatar

In this paper, the classical Resource Investment Problem (RIP) is extended to consider time-depended resource cost instead of time-independent resource cost. The problem is named as the Resource Investment Problem with Time-Dependent Resource Cost and Tardiness Penalty (RIP-TDRC). The objective of the problem is to minimize the sum of the resources cost and the tardiness cost. Two versions of this problem are addressed in this paper, the deterministic version and the stochastic version. A simulation-optimization based algorithm which combines mathematical formulation solution with simulation is proposed to find an optimal solution. The performance of the proposed algorithm and the effect of some problem parameters on the solution are assessed through computational experiments.

IEEM16-P-0592

Solving the Cutting-Stock Problem by Using the Sequential Quadratic Programming Optimization Method

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In operations research, the cutting-stock problem is an important issue in the manufacturing of textile, leather, paper, ship building, and sheet metal industries. This problem arranges the specific profiles on the material with minimum material wasted. It can increase the utility rate and reduce the cost of the stock. For example in the leather industry, the stock has irregular profiles, and the base material may also be irregular when using the remainders of the last cut. In this paper, the problem is formulated as a constrained optimization problem and solved by the Sequential Quadratic Programming (SQP) method. A global optimization algorithm is also proposed to avoid the local minimum point, which is helpful for the multi-stock problem.

Session	Poster – Production Planning and Control
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0104

Bioelectrical Impedance Analysis for Estimating Marbling Score of Live Beef Cattle in Japan

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To establish an estimation method of beef marbling score for beef production management, we have investigated correlations among bioelectrical impedance properties in the sirloin part, the content of crude fat in the ribulose part, and the beef marbling standard (BMS) number. The measurement was conducted with 28 Japanese Black Beef Cattle before one-month slaughter treatment. We adopted the four-electrode method robustly to measure the bioelectrical impedance properties. The needle electrodes inserted into the four points: 100, 125, 225, 250[mm] in a line from the last lumbar vertebra. The extracellular resistance Rex, the intracellular resistance Rin, and the cellular membrane capacitance Cm calculated using the measured data. As the result, the correlations observed between Rin, the BMS number ($r = 0.61$,RSME = ±20.6, $P < 0.01$) and between Rin, the content of crude fat ($r = 0.71$,RSME = ±19.32, $P < 0.01$). The results revealed that the bioelectrical impedance analysis has potential impact to estimate the BMS number, which would be helpful for beef production management industries.

IEEM16-P-0441

Single-Machine Production Scheduling Integrated Preventive Maintenance Planning for Minimizing Makespan and Flow Time

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This paper studies single-machine scheduling with preventative maintenance with fixed maintenance cycles or flexible maintenance cycles. Both makespan and total flow time, two common objectives in production planning, are used to evaluate the integrated production and maintenance schedules. Four formulations based on the bin packing problem are provides for the two schemes and two objectives. Heuristic or exact-solution approaches are developed to attack the computational challenges for large instances with jobs that are difficult to pack. Numerical experiments demonstrate the effectiveness of the development algorithm and suggest that flexible maintenance could significant improve the two objectives when jobs cannot fill maintenance cycles well.

IEEM16-P-0491

Managing Unforeseen Events in Production Scheduling and Control

Emrah ARICA[1], Peter FALSTER[2], Hans-Henrik HVOLBY[3], Jan Ola STRANDHAGEN[4], Kim FRASER[5]
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[5]*University of South Australia, Australia*

The production planning and control process is performed within complex and dynamic organizations made up of customer expectations, equipment, materials, people, information, and technologies. Changes in both internal and external factors can create a variety of unforeseen events, which make initial plans unfeasible or obsolete during production execution. How to effectively handle the unscheduled events and take corrective actions still remains a central question to academics and practitioners. In this paper, we explore this issue through a review of the relevant literature and an in-depth field study. The paper proposes a framework for characterizing and classifying the events and event handling process.

Session	Poster – Project Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0344

Interaction Capability, Process Quality, and Outsourcing Success: A Vendor Perspective in Offshore IT Outsourcing

Yogi WIBISONO, Rajesri GOVINDARAJU, Dradjad IRIANTO, Iman SUDIRMAN
Bandung Institute of Technology, Indonesia

Nowadays the competition in IT offshoring is fierce along with the rapid growth of IT offshoring. Some of Indonesian IT vendors succeed in acquiring IT projects from clients abroad, but some of them are not successful in delivering the project. Some previous studies have included interaction capability as the determinant of IT outsourcing success, but the concept of interaction is considered as one dimension. This study will explore dimensions of interaction capability including its determinants. Based on the result of semi-structured interview with the representative of Indonesia's leading offshore IT outsourcing company, the interaction between the company and client is very important for the success of software development. Our results show that communication and coordination are the main dimensions of interaction capability. The supporting determinants of interaction capability include human resources management and technology. The inhibiting determinants of interaction capability include cultural distance and temporal distance.

IEEM16-P-0437

Fostering Innovation in Public Procurement Through Public Private Partnerships

Nunzia CARBONARA, Roberta PELLEGRINO
Politecnico of Bari, Italy

This paper aims at providing answers to the following key research questions: Which are the PPP features that favor innovation? How properly structure a PPP in order to foster innovation? With this aim, drawing upon the main streams of studies on innovation, we develop a conceptual framework that identifies the PPP features that can influence the innovativeness. Second, we define how these PPP features have to be structured in order to foster innovation.

IEEM16-P-0496

Social Innovation, Research and Community Engagement: Managing Interdisciplinary Projects for Societal Change

Nickey JANSE VAN RENSBURG, Johan MEYER, Hannelie NEL
University of Johannesburg, South Africa

A transformative research paradigm is rooted in knowledge mobilization processes involving close collaboration between researchers and the community. A formalized approach to managing multi-stakeholder participation and community engagement in a science and technology research environment is presented. Design science research methodology is applied with a systems thinking approach to implement an integrated research, development and project management network at a tertiary education institution. The network is presented as a Research and Projects Office that enables a projects-based approach to facilitate interdisciplinary and community-driven research for social change through technology development.

IEEM16-P-0516

It's Not the Plan, It's the Process of Planning

Julien POLLACK
The University of Sydney, Australia

This paper argues that team building, the development of shared goals and visions, knowledge sharing and team cognition, trust, and relational norms have a significant impact on project success. However, team building in general is given only cursory discussion in the normative literature on project management. In comparison, project planning has also been linked to project success, and is given a preeminent place in project management practice guides. This paper discusses the contribution that team building makes to planning, before questioning whether some of the influence that planning has been found to have on success should have been attributed to team building instead. The paper then calls for an increased balance in the project management literature, to account for the impact that team building has on successful project implementation.

Session	Poster – Quality Control and Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0188

Supplier Management in Photomask Field

Kelly CHEN, Eric GUO, Sammy CHEN, Sherry ZHU
Semiconductor Manufactory International Corporation, China

Many industries such as photomask field are putting more and more emphasis on enhancing their core market competitiveness for the moment and they may achieve this goal through efficient supplier management because nowadays suppliers have become indispensable partners of enterprises for long-term development and interest. Thereby, enterprises ought to pay more attention to supplier management and improve suppliers' competence. The paper involves three aspects to illuminate how photomask industries manage suppliers with high efficiency.

IEEM16-P-0409

A Study on the Control Charts Based on Quality Loss Function

Suyi LI[1], Wenjia WANG[2]
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Loss functions have been well studied for decades. Some researchers use loss function to design control charts economically, but few have used loss function to construct control charts directly. We propose a new class of control charts based on the concept of quality loss function. Our charts can be used for both univariate and multivariate processes, and they are more sensitive than Shewhart control chart. Another advantage is, the loss function charts can link quality performance to cost, so that different processes' performance can be compared on the same scale.

IEEM16-P-0560

Acceptance Sampling Plans Based on Truncated Life Tests for LOG-EIG Distribution

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In the article, the plans of acceptance sampling for log-EIG distribution are established while the lifetime test is truncated at the pre-assigned time. The smallest size of sample to guarantee the provided median lifetime, the operating characteristic functional value of the plans and the risk of the producer are given. An algorithm is offered for building the plans. The outcomes are illustrated with tables and examples.

IEEM16-P-0568

Equipment Assessment Methodology and Automatic Management System in Automotive Semiconductor Manufacturing

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With the speedy developing of automotive market, the demand of automotive electronics semiconductor becomes more tremendous. Traditional semi-automatical equipment management method became unsuitable in semiconductor manufacturing. This paper tries to explain how to set up a high efficiency and accuracy assessment methodology on equipment performance to come out best tools on automotive semiconductor manufacturing. And this paper also show the systematical control of this methodology and obvious benefits compared with traditional methods.

IEEM16-P-0617

A General Framework for Multiple Responses Optimization Based on Bayesian Posterior Predictive Method

Suyi LI[1], Wenjia WANG[2]
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[2]*China Association for Quality, China*

Response surface methodology (RSM) has been widely used in practice, which can optimize single response versus several factors. Naturally people are not only interested in single response optimization, but also multiple responses optimization. In this paper we propose a general framework for multiple responses optimization using Bayesian posterior predictive method. This method can account for the effects of variances, the correlation among the responses, and the model parameter uncertainty. We develop our approach as a guideline for the practitioners, and give an example to illustrate it.

Session	Poster – Reliability and Maintanence Engineering
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0063

Time-Varying Response Surface Method for High-Temperature Structural Reliability Analysis Using Copula

Jian-Chun ZHANG, Xiao-Bing MA, Yu ZHAO
Beihang University, China

For the high-temperature structure, there exists correlation between the thermal stress and thermal intensity in most cases because of the two-sided effects of temperature. This paper proposes a time-varying response surface method considering correlation between the structural response value and structural response threshold based on Copula models. Firstly, the time-varying model of structural response value is developed by incorporating the interaction between basic variables and time variable into the quadratic response surface method; Secondly, the time-varying model of structural response threshold is determined based on the intermediate variable of temperature; Thirdly, the proper Copula function is selected using simulation data; Finally, the structural reliability estimation method is given when basic variables are distributed normally. The result of case study indicates that the negative correlation leads to the decrease of reliability, and with the increase of thermal stress, the difference of reliability between the correlative and independent situations becomes larger.

IEEM16-P-0079

Residual Life Estimation Fusing Life Data and Expert Informaiton

Hao CHEN, Bo GUO, Xiang JIA, Ping JIANG
National University of Defense Technology, China

A method fusing life data and expert information was proposed to estimate residual life of some kinds of single machine on satellite platform, which solved the problem that performance degradation information of these products could not be detected real-time and the life data collected were almost no-failure data. Firstly, expert information about reliability was transformed into prior distributions of parameters. Then life data were fused with expert information to determine posterior distribution of parameters. When ranges of parameters were determined, the residual life probability density distribution could be obtained. Besides, this paper took GPS receivers on the satellite platform as example, residual life estimation was given based on the method proposed in this paper. Lastly, a simulation method and a comparison with other methods were provided to prove the presented method effectiveness.

IEEM16-P-0171

Research on the Task Allocation Model for Equipment Joint Support Demands

Di ZHOU[1], Baocheng LIU[2], Yishu XU[1], Lin MA[1]
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In equipment joint support, support tasks generated by different equipment share the resource of the support sites. Compared to conventional support system, more categories of support objects leads to a sharp increase in the number and randomness of support tasks. This makes the progress of some support activities affected by the resource occupation of other activities. In other words, the availability of equipment are affected. Using the net structure which is different from the conventional tree support organization, this paper presents a support task allocation model based on the set time and actual time of tasks, considering the real-time occupation of support sites. In this model, the sites to perform varied tasks and resources used by tasks would be allocated. Finally, the feasibility of the model is verified with a numerical example by Monte Carlo simulation on some aspects such as the availability of equipment.

IEEM16-P-0198

Multi-Failure Mode Reliability Evaluation Based on Virtual Sample Method

Junchao DONG, Chuanri LI, Huan DU, Xingyue YANG
Beihang University, China

Quantitative accelerated test was divided into two accelerating modes which are accelerated stress level and accelerated the use-rate. In the traditional statistical method, the use-rate and the stress level of the product under normal conditions are set to certain values and then the service life of the product is extrapolated according to the acceleration model. But in fact both of them are variables which obey the specific distribution. The traditional analytical method is difficult to calculate the reliability of the product which has many variables. In this paper, the use time of different stress levels is used as a variable and using the virtual sample method to calculate the reliability of the product which is under the multiple stresses. The reliability of multi-failure mode is calculated by using the competitive failure model. The validity of the method is verified by a case.

IEEM16-P-0210

The Determination Method on Products Sample Size Under the Condition of Bayesian Sequential Testing

Yunyan XING, Ping JIANG, Zhijun CHENG
National University of Defense Technology, China

In reliability engineering, especially in the context of reliability test design, it is important to determine how many product samples should be put into field test to evaluate product reliability level or verify whether the product reliability satisfy the predefined requirement in the development contract. In this paper, the determination method on sample size under the condition of Bayesian sequential testing is proposed. According to the sequential posterior odd testing (SPOT) method, the calculation on overall probability of decisions is firstly given out. Then the determination program of sample size used to test is presented by controlling probability level of correct decision-making. Finally, we make the determination of sample size on the mean of normal distribution under the condition of Bayesian sequential testing as an example to demonstrate the proposed determination process of sample size. The comparisons with classical methods are made to prove the effectiveness of the proposed method.

IEEM16-P-0302

Joint Optimization of LORA and Spares Inventory with Fuzzy Parameters

Weikang XUE, Boping XIAO, Dongdong LI, Lin MA
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Level of repair analysis (LORA) and multi-echelon technique for recoverable item control (METRIC) type methods are widely used to solve the downtime costs of complex equipment. In this paper, a joint optimal model of LORA and spares inventory for cases of fuzzy failure rate is constructed, and fuzzy parameters are implemented to deal with these uncertain factors to make optimal decisions. Taking the best cost-effectiveness ratio as criterion, expected number of backorder (EBO) as objective function and cost as constraint, a multi-echelon, multi-indenture (MEMI) optimization model based on fuzzy sets is built, and a convex optimization algorithm of multi-variable with fuzzy parameters is also proposed. Our provided method is proved to be credible and effective according to the numerical example and simulation result in the paper.

IEEM16-P-0541

Lean Maintenance Excellence in the Container Handling Industry: A Case Study

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Arab Academy for Science, Technology and Maritime Transport, Egypt

Maintenance management is a critical factor for any organization aiming to maintain its global competitive advantage. Several methodologies are presented in the literature to optimize maintenance process. Lean maintenance (LM) and maintenance excellence (ME) are considered the most practical tools to improve maintenance process. This paper aims to highlight the importance of each approach and integrate them into one framework. The development of lean maintenance excellence framework is investigated for use in one of Multinational Container Terminals in Egypt. Reverse failure mode and effect analysis (reverse-FMEA) a relatively new lean tool introduced in year 2007 is tested in addition to a traditional Plan-Do-Check-Act (PDCA) cycle to deploy LM methodology. The implication of the proposed framework enabled reduction of tractors preventive maintenance cost per one hour of operation by 73% ($14,842.58 per year) and identification of the reason for 27.7% of engine breakdowns in tractors during the period May 2015 - May 2016.

IEEM16-P-0552

Research on Reliability Assessment of Space Electronic Products Based on Integration of Highly Accelerated Life Test and Accelerated Degradation Test

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Space electronic products usually should meet the mission requirements of long life and low cost. Because of insufficient failure data, it is hard to assess the reliability precisely by using traditional reliability testing and statistical method. In this paper, a method of reliability assessment based on integration of highly accelerated life testing (HALT) and accelerated degradation testing (ADT) is proposed. Firstly, based on performance analysis of electronic products, the degradation of performance is modeled. Moreover, the data of drift performance is extracted, fitted and fused into the observation data in ADT. Lastly, the reliability assessment for electronic products is studied based on degradation data. This research provides an effective way for accelerated reliability testing of space electronic products, and it has been applied into practice.

IEEM16-P-0557

A Study of Availability-Based Warranty Policy

Chun SU, Xiaolin WANG
Southeast University, China

This paper proposes an availability-based warranty policy for complex industrial equipments. Under this policy, the manufacturer will not only provide free repairs or replacements upon failures, but also ensure that the operational availability over the warranty period meets a negotiated level. Within the warranty period, imperfect preventive maintenance (PM) activities are performed to reduce equipment's failures. Moreover, two types of learning effects on maintenance activities, namely, 'repetition learning' and 'failure learning', are considered simultaneously. The PM schedule is optimized cycle by cycle. Within each PM cycle, the optimal PM interval is determined by minimizing the warranty cost rate over the current cycle with an availability constraint. Numerical examples are provided to illustrate the proposed warranty policy.

IEEM16-P-0614

Reliability Modeling Method for Dependent Competing Failure System

Chunlei BAI[1], Chuanri LI[1], Junchao DONG[1], Peng LI[2]
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[2]*Chinese Academy of Sciences, China*

This paper studies a reliability analysis method for a system which experiences two dependent competing failure processes, including a random degradation process and a random shock process. Whether the soft failure or the hard failure take place, the system will fail. In our model, the arriving shocks can cause damage on degradation process, and the random shock process can be influenced by degradation process too. Thus, these two failure process are dependent. In present research on dependent competing failure, most academics consider that every shock can cause damage on the degradation. However, when shock loads are smaller than the tolerance of system, the shock process will not affect the degradation process. Taking this into consideration, we divide the random shocks into three "zones" according to their magnitudes, damage zone, fatal zone, and safety zone, based on different effects on the system's failure behavior. In addition, Monte Carlo simulation is used to estimate the system reliability. Finally, we use an application case to explain this method. The result shows that the model we proposed is capable to describe the reliability of a dependent competing failure system.

IEEM16-P-0633

A Survey of Condition-Based Maintenance Modeling of Multi-Component Systems

Rui WANG, Nan CHEN
National University of Singapore, Singapore

This paper surveys the recent developments on condition-based maintenance (CBM) modeling of multi-component systems. The emphasis is on the deterioration modeling and maintenance policies of this problem. An analysis of important factors which may influence maintenance decisions is also given. CBM is known as a modern and effective maintenance technique which is based on the information collected from condition monitoring process. Multi-component maintenance in the context of CBM is a relatively new topic and is becoming popular in the literature. This paper aims to cover the most commonly used ideas in the modeling multi-component CBM, to classify and compare the policies discussed in existing literature, as well as to provide useful information for current state and challenges of this topic.

IEEM16-P-0691

Fault Tree Analysis of Oil and Gas Distillation Tower and Application of Bayesian Networks

Alireza NASSAJ, Javad BARABADY
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Fault tree analysis (FTA) have been used meritoriously in risk and reliability engineering. In recent years application of Bayesian Network (BN), is proposed as an alternative for FTA calculations. Oil and Gas (O&G) industry is risky and the financial, environmental or human loss could be very high. Distillation towers (DTs) are sensitive systems and have key functions in oil and gas process systems. This paper conducts a FTA for a DT as a case study and next maps the fault tree (FT) to a BN then, results of them is compared.

Session	Poster – Safety, Security and Risk Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0177

An Efficient Data Leakage Prevention Framework for Semiconductor Industry

Sherry ZHU, Eric GUO, Max LU, Anna YUE
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When IC production enters into the nanometer generation, more and more semiconductor design and manufacture companies have taken a lot of effort in information security area to prevent company information security. But data leakage is a problem still far from been solved, despite its long history to the early days of computer system. Therefore, protection for these sensitive and confidential data gains great attention from foundry's top management, administrators and IT managers. This paper attempts to analysis data protection requirements in IC foundry and to integrate current DLP (Data leakage prevention) approaches to build an efficient data leakage prevention framework to protect IC field sensitive data safety.

IEEM16-P-0205

A Study on the Relationship Between the Moral Self-Concept and the Cyber Aggression Behavior of College Students

Wenqi CHEN[1], Yan-Mei LI[2]
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[2]*Chinese Academy of Sciences, China*

A pilot and a formal study were conducted to explore the relationship between moral self-concept and cyber aggression behavior. Results indicate that the tendency of an individual to exhibit overt cyber aggression behaviors can be predicted based on social and individual moral self levels. The tendency to exhibit overt cyber aggression behaviors is low when social and individual moral self levels are high. Individual moral self level can be used to predict the tendency of an individual to display relational cyber aggression behaviors. The tendency to exhibit relational cyber aggression behaviors is low when individual moral self level is high. The function of moral self in predicting cyber aggression behaviors is discussed.

IEEM16-P-0240

Characterization and Damage Identification of Acoustic Emission Signal in Tensile Process of the Material of High-Speed Train Gearbox Shell

Yibo AI, Chang SUN, Hao CUI, Weidong ZHANG
University of Science and Technology Beijing, China

In operating conditions, real time non-destructive testing (NDT) is needed for the identification of tensile damage process of high-speed train gearbox shell. This paper focuses on the application of an acoustic emission (AE) method to study tensile damage. First, tensile tests with AE monitoring were employed to collect AE signals and tensile damage data. Second, feature extraction was performed to obtain feature vectors to characterize the process of tensile damage. Then, Support Vector Machines (SVM) and Weighted Support Vector Machines (WSVM) were used to identify different tensile damage stages of the material of high-speed train gearbox shell.

IEEM16-P-0414

An Investigation on the Relationship Between Control Self-Assessment, Cloud Security, and Cloud-Related Business Performance - Using Partial Least Squares

Cheuk Hang AU[1], Walter S. L. FUNG[2], Aaron TSES[1]
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[2]*The Hong Kong Polytechnic University, Hong Kong SAR*

In the light of the rapidly changing and benefits brought by cloud computing, the study is to find the critical factors that may hinder the benefits of cloud adoption, with respective measures proposed. It was found that control self-assessment (CSA) can enhance the IS security and improve business value delivery. A research model between CSA, cloud security (CS) and cloud-related business performance (CBP) are proposed, tested by distributing surveys to collect raw data, and afterward analyzed by Partial Least Square (PLS). The results can contribute to cloud adoption with practical measures suggestions.

IEEM16-P-0503

Safety Measurement for the Road Transport in Northern Norway in Wintertime

Fuqing YUAN, Jinmei LU
University of Tromsø, Norway

Northern Norway has adverse geographical and weather condition in wintertime for road transport. Accidents occurs frequently in some areas and the safety of the transport in these areas has been a big concern. This paper analyze the reasons of the accidents and explore the economic and effective method to reduce the accidents. Considering the existing installed system preventing the accidents and the specialty of the geographical condition, this paper suggests developing highly integrated and automatic intelligent system to monitor the road surface and the driver behavior.

IEEM16-P-0647

An IOT-Based System to Prevent Injuries in Assembly Line Production Systems

Maria Grazia GNONI[1], Valerio ELIA[1], Paolo BRAGATTO[2]
[1]*University of Salento, Italy*
[2]*INAIL National Workers' Compensation Authority, Italy*

Smart Objects (SOs) are products that can exchange information about themselves and the environment due to IOT (Internet of Things) technologies. SOs use IOT technologies for increasing features of traditional objects by communicating and sharing knowledge with the environment. Few pilot applications are currently developed for preventing accidents at workplace. In this study, a preliminary analysis about potentialities of these technologies for preventing accidents at workplace. Next, a prototype solution designed to prevent injuries at semi-automatic assembly line systems is described in detail.

Session	Poster – Servicce Innovation and Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0291

The Impact of Compensation Structure of Salespeople on Team Performance and Turnover Rate: the Moderated-Mediating Effect of Knowledge Sharing Behavior

Yuanyuan LAI, Jifan REN
Harbin Institute of Technology Shenzhen, China

In this article, we present a theory of sales people compensation structures to provide insights into why it impacts team performance and turnover rate through the mediating role of team members' knowledge sharing behavior. In addition, we explore whether market turbulence mitigates or exacerbates the motivation of sales people to carry out knowledge sharing behavior with different compensation structure. Based on previous research, we propose that salary-based compensation structure positively influences salespeople's knowledge sharing behavior whereas commission-based compensation structure negatively influences sales people knowledge sharing behavior. Additionally, Knowledge sharing behavior of sales people will enhance team performance significantly and decrease team members' turnover intention. This research has some implications for both academics and managerial use.

IEEM16-P-0382

Towards Improving Public Procurement Process Through Lean Principles: A Case of the Agricultural Engineering Division, Ministry of Agriculture, Water and Forestry, Namibia

Felix NDINAMWENE[1], Michael MUTINGI[1], Charles MBOHWA[2], Herbert MAPFAIRA[3]
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[2]*University of Johannesburg, South Africa*
[3]*University of Botswana, Botswana*

Public administration is one of the major contracting bodies for Namibia's agricultural industry. This study makes a critical analysis of Namibia's public procurement process, based on a case study carried out at the Ministry of Agriculture, Water and Forestry. The research was done in three phase: direct discussion with the head of department and staff, document analysis and semi-structure interviews with stakeholders. A detailed study was carried out on a single procurement of a farm machine in order to value-stream map the public procurement process. Value stream mapping enabled the optimisation of the entire public procurement by reducing the number of sequential sub-processes from 19 steps in 48 weeks to 12 steps in 26 weeks and restructure the whole process.

IEEM16-P-0400

Hotel's Online Booking Segementation for Heterogenous Customers

Zhaowei MIAO, Ting WEI, Yongquan LAN
Xiamen University, China

The online reservation system (ORS) is widely used in the hospitality industries. This paper studies the hotel's optimal pricing policies for two types of contracts: booking without prepayment and booking with prepayment. The hotel adopts these two contracts to segment heterogenous customers through the ORS. We get the hotel's three possible pricing strategies and the corresponding payoffs. It is found that the hotel can segment the customers effectively if it employs two types booking contracts by proper pricing strategies. Through comparison, the results show that when the variable operational cost is high, the hotel will conduct the second contract; otherwise, the hotel will conduct the first contract.

IEEM16-P-0673

Visualization of the Mobility Patterns in the Bike-Sharing Transport Systems in Mexico City

Luis A. MONCAYO-MARTINEZ, Adrian RAMIREZ-NAFARRATE
Instituto Tecnologico Autonomo de Mexico (ITAM), Mexico

This paper provides an analysis of mobility data of the bike sharing system in Mexico City from the year 2010 to 2015. Based on about 18 million trips, it is possible to compute the mean time of a trip and the number of trips from and to a single station. The 444 stations were classified according to the average number of input and output bikes using a Pareto chart. The patterns of mobility between the stations are shown graphically; thus, some clusters are identified based on the number of arrivals and departures. Finally, the number of input and output for some stations is plotted in ten-minute intervals for weekdays and weekends. Therefore, it is known the flow of bikes in stations per time interval per day. These patterns are applied to predict the behavior of a particular station to define policies to improve the bike system program. An R script, available to the public, is programmed to manage the amount of data and to carry on the analysis.

IEEM16-P-0733

The Important Impact Factors of Entrepreneurial Motivation for College Students

Jen-Chia CHANG[1], Feng-Ming SUI[2], Hsi-Chi HSIAO[3], Po-Ying CHIANG[1]
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[2]*Hwa Hsia University of Technology, Taiwan*
[3]*Cheng Shiu University, Taiwan*

Almost every university of science and technology is currently implementing entrepreneurial education, but the outcome varies. The reason for this is that students taking the courses have varied background factors, resulting in differed intensities of entrepreneurial motivation (EM). The purpose of this study is to explore the entrepreneurial self-efficacy (ESE), creative tendency (CT), and EM, prediction of first-year students from a university of science and technology with different background variables. In addition, whether ESE and CT can enhance EM was predicted. Research conclusions: family business, entrepreneurial intentions, entrepreneurial potential, pre-entrepreneurship training, and risk-taking have a significantly positive impact on ESE, CT, and EM; entrepreneur competition has a significantly positive impact on CT and EM; entrepreneurial intentions, entrepreneurial potential, and risk-taking on EM reach the significant standard; entrepreneurial intentions, risk-taking, ESE, and CT reach the significant standard on entrepreneurial motivation.

Session	Poster – Supply Chain Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0096

Matching Successful Supply Chain Configuration Practices of Best Performer Suppliers with Clients' Wishes: Guidelines for the Italian Engineered Valve Suppliers of the Oil & Gas Sector

Guido J. L. MICHELI, Enrico CAGNO, Gianlorenzo PADOVANI
Politecnico di Milano, Italy

This research, anchoring on supply chain configuration data of Italian best performer valve suppliers, achieved from previous published studies, aims to provide a new competitive boost to Italian engineered valve suppliers within the EPC (Engineering, Procurement and Construction) supply chain of the Oil & Gas sector. This research, through the matching of the most effective and significant supply chain configuration practices enabled by best performer valve suppliers with EPC clients' wishes towards the improvement of the valve value chain, provides actionable guidelines to increase the supply chain competitiveness of suppliers of the valve industry. This paper offers a practical support to valve suppliers that need to effectively and rapidly reconfigure their supply chain and gain a new competitive edge. Moreover, the proposed research methodology can be a theoretical base to improve the supplier base of other EPC supply chains.

IEEM16-P-0202

Earthquake Disaster Emergency Supply Chain Performance Evaluation Based on Triangular Fuzzy Numbers

Fumin DENG[1], Xiaoyun ZHANG[1], Xuedong LIANG[1], Chao BAO[2], Zhaoxia GUO[1]
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[2]*Sichuan Aerospace Industry Group Co. Ltd, China*

Because of the uncertainty and complexity of geological disasters, fuzzy comprehensive analysis can be illuminating when applied to earthquake disaster supply chain performance evaluations. To address the uncertainties in disaster emergency supply chains, this paper establishes a novel supply chain performance evaluation method, the FAHP(Fuzzy analytic hierarchy process) based on triangular fuzzy numbers. First, a supply chain performance evaluation system is built that considers supply chain reliability, emergency preparedness and operational effects. Then, to overcome the defects in traditional analytic hierarchy processes (AHP), triangular fuzzy numbers are used to develop a new performance evaluation method –the TFAHP(Triangular fuzzy analytic hierarchy process). This model not only overcomes the shortcomings of traditional weight calculations, but also introduces group decision-making, making the TFAHP of more practical significance for emergency supply chain performance evaluations.

IEEM16-P-0396

A Method of Predicting Demand for Aircraft Follow-up Spare Based on Discrete Particle Swarm Optimization Algorithm and RBF Neural Network

Dongdong LI[1], Boping XIAO[1], Haiping HUANG[2], Aoqing WANG[2]
[1]*Beihang University, China,* [2]*China National Aero-Technology Import and Export Corporation, China*

The traditional method to predict the demand of aircraft follow-up spare has some problems including being short of adapting to the noise data. It leads to local optimum easily and low accuracy of prediction. So a method based on discrete particle swarm optimization and RBF neural network to predict demand for aircraft follow-up spare is put forward. Firstly, the data of the aircraft follow-up spare is reduced by discrete particle swarm optimization algorithm to get the key factors affecting the demand of spare. Then the RBF neural network is built on the key factors to predict the demand of spare. The experimental results show that this method can ensure the rationality of the input parameters and provide a new way of the neural network to predict the demand of the aircraft follow-up spare.

IEEM16-P-0600

Analysis of a Pharmaceutical Reverse Supply Chain Based on Unwanted Medications Categories in Household

Meina HUA, Huajun TANG, Zilin WU
Macau University of Science and Technology, China

Improper disposal of unwanted medications can be very costly and harmful to the environment and people's health. To facilitate safe disposal and remove excessive household storage of medicines, this paper proposes an integrated reverse supply chain (RSC) model with a pharmaceutical company, a recycler, retailers, customers and government. We investigates the impact of different categories of unwanted medications and government's subsidy, penalty and publicity investment on the RSC profit and the collection rate of expired medications. The numerical results show that with the growth of the percentage of unexpired medications, the collection rate of expired medications remains unchanged, whereas the profit of entire RSC increases. Governments' regulations and supervision have a crucial influence on the decision-making of pharmaceutical RSC. There exists a trade-off between government's subsidies, penalties and publicity investment to collect expired medications.

IEEM16-P-0706

A Comprehensive Closed Loop Supply Chain Model; Environmental, Technology and Energy Concerns

Amirhesam SOUFALI[1], Mahdi BASHIRI[2]
[1]*University of Tehran North Branch, Iran ,* [2]*Shahed University, Iran*

Decision on end-of-life product recovery options is affected by many factors; related to amount usage of appropriate raw materials, energy, environmental factors and etc. This paper provides a model that is different from previous ones in its inclusion of all environmental effective parameters such as raw materials, clean technology, emission, energy, and waste simultaneously. Because of, supplying standard raw material, increasing using clean technology, decreasing amount of emission, optimizing used energy, recycling, and appropriate disposal products methods are required for used goods without damaging the environment by designing an efficient closed-loop supply chain (CLSC) network that as mentioned before, are simultaneously considered in the proposed model. We present a holistic modeling approach for a multiple-objective green CLSC network. The results confirm that by selecting appropriate raw materials, using clean technology and optimizing used energy can minimize manufacturing costs, in addition, they decline disposal products to cause environmental pollution.

IEEM16-P-0714

Robust Optimization for Lean Supply Chain Design Under Disruptive Risk

Thi Hong Dang NGUYEN, Thien-My DAO
École de Technologie Supérieure, Canada

This paper aims at presenting the new 2-stage framework of Robust Optimization for Lean Supply Chain design under uncertainty by using the so-called Dual Lean Filter. First, we formulate one quantitative model of Fat Supply Chain in stable circumstance based on the six-performance drivers of Chopra and Meindl, (2013). Then, we propose one novel procedure called Forward Lean Filter in order to transform Fat Supply Chain into Lean Supply Chain. Afterwards, in second phase, we investigate the Lean Supply Chain model under disruptive risk, in which Reverse Lean Filter is introduced to prevent the Lean system from returning Fat form under threats. Both stages are optimized by one meta-heuristics namely priority-based Genetic Algorithm. All aforementioned processes are illustrated in one numerical supply chain under the risk of disruption its key distribution center.

Session	Poster –System Modeling and Simulation
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0256

Analysis of Critical Infrastructure Operation Process Including Operating Environment Threats

Krzysztof KOŁOWROCKI, Joanna SOSZYŃSKA-BUDNY
Gdynia Maritime University, Poland

The operation process of the critical infrastructure is considered and its operation states are introduced. The semi-Markov process is used to construct a general probabilistic model of the critical infrastructure operation process. To build this model, the vector of probabilities of the critical infrastructure operation process staying at the initial operation states, the matrix of probabilities of the critical infrastructure operation process transitions between the operation states and the matrix of conditional distribution functions of the critical infrastructure operation process conditional sojourn times at the operation states are defined. Further, considering a significant influence of the critical infrastructure operating environment threats on its operation process and safety, more precise and convergent to reality model of the critical infrastructure operation process related to critical infrastructure operating environment threats is built.

IEEM16-P-0259

Identification of Port Oil Piping Transportation System Operation Process Including Operating Environment Threats

Krzysztof KOŁOWROCKI, Joanna SOSZYŃSKA-BUDNY
Gdynia Maritime University, Poland

The semi-Markov general probabilistic model of the critical infrastructure operation process without considering operating environment threats is applied to the identification of the port oil piping transportation system operation process. Further, considering a sgnificant influence of the critical infrastructure operating environment threats on its operation process and safety, more precise and convergent to reality model of the critical infrastructure operation process related to critical infrastructure operating environment threats is aplied to this piping system operation process identification. The results of both models are compared and discussed.

IEEM16-P-0460

An Investment Allocation Model for Quality Improvement to Reduce Component Variances at Manufacturer and Supplier Side to Maximize the Return on Investment

Cucuk Nur ROSYIDI[1], Ibnu PAMUNGKAS[1], Wakhid Ahmad JAUHARI[1], Bambang SUHARDI[1], Kunihiro HAMADA[2]
[1]*Sebelas Maret University, Indonesia*
[2]*Hiroshima University, Japan*

Today's Challenge for many manufacturing companies is how to improve product quality and reduce the production cost of the products offered in the market. Quality improvement must be performed by a company to maintain its product's competitiveness in the market. Quality improvement and cost reduction can be performed by allocating investments to reduce the value of the variance in the component of a product. The company will provide a target variance of assembled products that must be achieved with a minimum allocation of investment. The allocation also considers the ability of the machine and selected suppliers to reduce the variance. In this paper, we develop an optimization model to allocate investment provided by manufacturer to reduce component variances at the manufacturer and suppliers side. The objective function of the model is to maximize The Return on Investment (ROI).

IEEM16-P-0583

The Optimization Model of Transport Routes Taking into Account the State of Roads and Road Traffic Congestions

Dmitriy ANUFRIEV[1], Olga SHIKULSKAYA[1], Timur ESMAGAMBETOV[2], Mikhail SHIKULSKIY[3]
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[3]*Astrakhan State Technical University, Russian Federation*

The paper refers to the transport logistics optimization problem solving taking into account the roads state and road traffic congestions. The logistics acts as the hidden resource providing the companies competitive advantage. The investigated papers claim that the route of freight delivery is estimated by the distance passed by a vehicle, but the set of other factors influencing delivery time isn't considered. For the purpose of taking note of these factors the authors have introduced new concepts, have developed the mathematical model allowing to optimize the organization of freight delivery taking into account distance, the probable speed of the vehicle depending on the road quality, transport stream intensity, weather conditions.

IEEM16-P-0596

A Variable-Fidelity Modeling Method Based on Self-Organizing Maps Spatial Reduction

Ping JIANG, Leshi SHU, Xiangzheng MENG, Qi ZHOU, Jiexiang HU, Junnan XU
Huazhong University of Science & Technology, China

Variable-fidelity (VF) approximation models are wildly used to replace computational expensive simulation models in complex engineering designs. In this paper, a design space reduction variable-fidelity metamodeling (DSR-VFM) approach is proposed. In the proposed DSR-VFM, addition scaling Kriging (ASK) is chosen as the approximation model and self-organizing maps (SOM) is adopt to reduce the design space and select the key areas. Then new sample points are selected though the maximum distance method within the key areas and added to the sample set to update the approximate model. A numerical case and the modeling of the drag coefficient of an aircraft are utilized to verify the applicability of the proposed approach.

Session	Poster –Technology & Knowledge Management
Date	6/12/2016
Time	15:30 – 17:00
Room	Pecatu 2

IEEM16-P-0083

Exploring Anxiety in Ignoring Read Messages of Line-Comparison in Four Stages of Romance Relationship

Y. J. LIU, Chih Chieh HSU
Chaoyang University of Technology, Taiwan

Line, a kind of Instant Messenger, has become one of the popular communication tools for modern people. "Ignoring read messages" which means the recipients keep silent after they read the messages sent by the senders have caused poor communication between romantic lovers and further led the devastation of their romantic relationships. This study forms a unique framework representing the factors affecting anxiety in romantic relationships in a setting of "ignoring read messages" in Line and compares the model in the four stages of romance relationship individually: acquaintance, build-up, continuation and deterioration. It is found that ruminative thought has positive impacts on anxiety though four stages. Self-esteem only has a significant impact on the first stage, but gradually deteriorates over the other three stages. Interpretation bias only has significant impacts on the first and second stage but not third and fourth stage.

IEEM16-P-0224

Researcher Qualitative Change by Governmental Support in Japan

Kazuya TANAKA, Ichiro SAKATA
The University of Tokyo, Japan

To promote academic research in Japan, the government of Japan acts a crucial role to support the research. Recently it has been focusing on projects-based support for research development of cutting-edge researchers. Our research is trying to reveal the effectiveness of their projects from qualitative perspective. We examined several case studies including "Funding Program for World-Leading Innovative R&D on Science and Technology" (FIRST Program), using bibliometric approach with academic papers and patents. Through research for these case-studies, we reveal that their researchers change their research output with different research interest, and we evaluate these qualitative change reflects how research group is formulated in terms of laboratory organizational and management perspective.

IEEM16-P-0448

Communication Constraints and Motivations in the Context of Knowledge Sharing: A Systematic Literature Review

Trifandi LASALEWO[1], Subagyo [1], Budi HARTONO[2], Hari Agung YUNIARTO[1]
[1]*Universitas Gadjah Mada, Indonesia*
[2]*Gadjah Mada University, Indonesia*

Innovation and product development activities in firms in almost all countries rely on the product development teams comprised of across functions. The members of product development team are those coming from various backgrounds, across departments and across areas of science. In many product development projects, team members do not always collaborate as expected due to differences in views and poor communication. This Systematic Literature Review explored what factors that inhibit and motivate product development teams in their communication to share knowledge. From the review of 34 relevant articles, this paper presents five factors which inhibit the team members to communicate (functional diversity, homophily, knowledge hoarding, organizational culture, centralization) and five factors which motivate the team members to communicate (reward system, organizational culture, trust, colocated, technology).

IEEM16-P-0459

Development and Implementation Strategy for the of Product Configuration Systems in Engineer-to-Order Companies

Katrin KRISTJANSDOTTIR, Sara SHAFIEE, Lars HVAM
Technical University of Denmark, Denmark

This paper will address how to develop a strategy when developing and implementing product configuration systems (PCSs) in engineer-to-order (ETO) companies. PCSs are often gradually implemented especially where there are complex products and processes in order to break down the overall project and reduce risk. This highlights the importance of having an overall strategy to guide the long-term development and implementation of PCSs In this paper, guideline for making the strategy are provided and supplemented with examples based on a case study. The guideline includes the main objectives for the development and implementation process, PCSs to be used to support the sales and /or the engineering processes, more uniform IT support for making product configurations, combining output from different PCSs and finally integrations that includes both internal and external IT systems. Based on this an overview of how PCSs can support the overall configuration process can be generated.

IEEM16-P-0653

ERP System Usage and Panoptic Control: The Role of Perceived Organizational Support

Bayu Andika RAMADHANA, Rajesri GOVINDARAJU, Yogi WIBISONO
Bandung Institute of Technology, Indonesia

Enterprise Resource Planning (ERP) system provides a facility for the integration of business functions within the organisation. Previous studies proved that the potential benefits that can be obtained from ERP system had not been achieved. ERP system impacts at the individual level such as improved control becomes one of the success dimensions of ERP implementation. The purpose of this study is to develop a model that can improve the control exerted by the ERP system due to the information visibility provided by system. Two factors related to perceived organizational support, namely tecnical support and managerial support were modeled as the antecedents. Improvement in panoptic control were elaborated into three different dimensions. Empirical study was conducted using a survey involving 229 samples of ERP users. The results show that technical and managerial support influence ERP system usage, while ERP system usage also has a significant effect on dimensions of panoptic control.

IEEM16-P-0679

Design Knowledge Modeling of Complex Products Based on the Living Systems Theory

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For the features of complex product design knowledge, this study suggests a way of complex product design knowledge modeling based on Living systems theory. First, an in-depth analysis of the different levels defined in the LST and the functions of the twenty subsystems in the LST is performed. The structure and process parameters are also analyzed. This is done based on the common features of complex products and living systems. Then, a mapping model of the LST and complex products is created. This model is then used in the modeling of the design knowledge of complex products, including the various layers, functionalities, and structural and process parameters of the complex product in question. Finally, a case is studied to elaborate the implementation of the presented method and validate the effectiveness and practicability.

IEEM16-P-0688

Study on Cross-Domain Knowledge Inspired Innovation Design

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[2]*China Institute of Marine Technology & Economy, China*

Nowadays, knowledge based innovation design has been an essential technique to enhance enterprise's competitiveness. Nowadays, the main method to realize the innovation design is Structured Innovation (such as TRIZ) and Heuristic Innovation (such as biological inspired design). The former prefer to address specific issues through processes and tools, the latter is used to stimulate people's creativity, but how to provide the right information to designers? The problem is complex and it has become a research hotspot. Therefore, this paper proposed a methodology which is used to find the useful information from cross domain knowledge and then recommend the information to designers. In detail, we collect and process different domain literatures first, and then represent the data in matrix models. Finally, K-means clustering analysis is used to detect outlier documents, which will be recommended to designers. At last, a JAVA system-product innovation design supporting system was developed to validate the methodology.

IEEM16-P-0709

Social Innovation Activities in Japanese Firms: A Pilot Study with Text Mining

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Nowadays, people are aware that many of the social changes and problems facing humanity cannot be solved by economic development or technological change alone. In recent years, many researchers have called for more attention to be given to social demand and social change. Although the concept of social innovation is still vague, solving social challenges through social innovation is considered to be important. At the same time, researches have been conducted on the importance of social enterprises and social entrepreneurs as players in social innovation. In addition to these researches, the roles and activities of firms in promoting social innovation should be focused on. This paper explores Japanese firms' social innovation activities by analyzing newspaper articles. The results show that firms tend to undertake social innovation by connecting their regular or core businesses with social innovation activities rather than building an innovative way to create social innovation.

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Police	110
Search & Rescue	111, 115, 151
Main Emergency	112
Fire Department	113
Ambulance	118

Assistance

Tourist Assistance Centre	+62 (0) 361 224111
Tourist Police Nusa Dua	+62 (0) 361 7442622

Transport Services

Blue Bird Taxi	+62 (0) 361 701111

Credit Cards

Master Card	+62 (0) 21 5790 0325
Visa Card	+62 (0) 21 574 7484
American Express	+62 (0) 21 3435 8881
Diner's Club International	+62 (0) 361 270 868

Conference Hotels

Bali Nusa Dua Hotel	+62 (0) 361 849 8833
Grand Whiz Hotel Nusa Dua	+62 (0) 361 849 8020
Amaris Hotel Pratama Nusa Dua	+62 (0) 361 849 6333
Mercure Hotel	+62 (0) 361 846 7000

Commuting to BNDCC

Bali Nusa Dua Convention Center, Indonesia

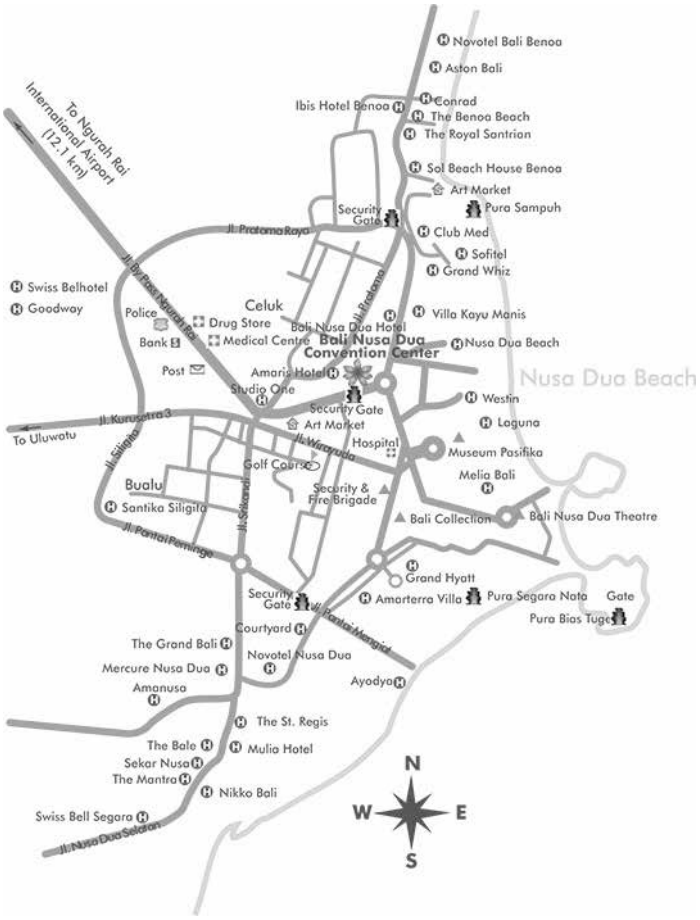
Conference Venue
Bali Nusa Dua Convention Center
Kawasan Terpadu ITDC Block NW/1
Nusa Dua 80363 Bali Indonesia
Tel: +62 361 773000

By Taxi:
The convention center is 20 minutes away from the International Airport by taxi.

Taxis are essential for getting around. The most reputable taxi company is the Bluebird Taxi Group, which can be recognised by the blue cars and the logo 'Bluebird Group' on the windscreen. Drivers speak reasonable English and use the meter at all times.

Blue Bird Taxi: +62 361 701111

Blue Bird Group also has a mobile app that sends a taxi to your location. With the help of this application, taxi reservations in Bali can easily be made.



Waterblow
"Water Blow", nestled within the Nusa Dua Beach, is a rock formation where waves collide onto the rock wall and creates giant splashes as if the water is "blowing up". As a must-see tourist attraction, "Water Blow" and its surroundings form a quaint yet impressive sight to behold. The uniqueness of "Water Blow" is that on the cliff, facing the Indian Ocean, there is a large narrowing gap. When a wave rolls in and impacts the cliff, it is caught in the gap and gets slammed into the top. From a distance, it will appear like a huge white foam dancing to the top. As larger and faster waves approach, the higher waves tower over the cliff. It is easy to get wet if one is not careful!

Bali Collection
As the largest Mall in Nusa Dua, Bali Collection is a shopping, dining and entertainment complex, spanning an impressive eight hectares. The Bali Collection is home to a variety of tenants, from international and national luxury fashion brands to exotic traditional handicraft and souvenir outlets. The exterior showcases uniquely Balinese architectural features. In addition to shopping, there are numerous spa and massage outlets, as well as international and local cuisine on offer to cater to any and every need. **If you happen to be a guest staying at one of the hotels in the Nusa Dua areas, a special free shuttle bus service is provided to add to the shopping convenience.**

Pacifica Museum
The Pacifica Museum features works from more than 200 artists from 25 countries, 350 paintings, and 250 historical objects. It is highly recommended for anyone interested in the art of Bali, Southeast Asia and the South Pacific region. Visiting the Pacifica Museum will also enhance one's appreciation of art through the various techniques, inspirations and tools that are on display throughout the exhibits. All in all, the Museum represents a cultural melting pot where the aesthetics of various cultures and peoples come together under one roof to create a splendid experience for all visitors.

The Bay
The Bay promises to offer an excellent oceanfront culinary experience. Located right between the 'twin' peninsulas that gave Nusa Dua its name, the collection serves as a convenient yet exclusive venue where one can eat and play throughout the day. There are 6 high quality establishments that offer unique tantalizing cuisines to cater to various taste buds. In addition to food, there are also many fun activities that you, your friends and family can enjoy, creating a complete package of enjoyment that delights the senses.

Local Restaurants (Approx 10mins Drive)

Balinese Dishes

Ulam Resto
Address: Jl. Nusa Dua, Benoa, Kuta Sel., Kabupaten Badung, Bali 80361, Indonesia
Phone:+62 361 771590

Bumbu Bali Resto
Address: Jl. Pratama, Tanjung Benoa, Kuta Selatan, Kuta Sel., Kabupaten Badung, Bali 80361, Indonesia
Phone:+62 361 774502

Seafood Dishes

Nelayan Restro
Address: Jalan By Pass Ngurah Rai No.88X, Nusa Dua, Kuta Sel., Kabupaten Badung, Bali, Indonesia
Phone:+62 361 778305

Bubu Resto
Address: Jalan Raya Nusa Dua Selatan, Nusa Dua, Kuta Selatan, Benoa, Kuta Sel., Kabupaten Badung, Bali 80361, Indonesia
Phone:+62 361 776529

Experience Bali

One of the most famous island in Indonesia, Bali is known for its beautiful beaches, breathtaking mountain scenery, vibrant culture, warm friendly people and spectacular resorts. As one of the most popular tourist destinations in the world, Bali, also known as the land of the gods, appeals through its natural beauty of volcanoes and terraced rice fields that exude peace and serenity. The Balinese civilization is what makes the island different from other destination with its culture still as what it was, growing along with the globalization. Housed within the island and its inhabitants is a special vibe, an authentic essence that is difficult to describe, which has touched and inspired visitors from all over the world since decades. It has something to do with the Balinese themselves and their warm and welcoming character.

Uluwatu

Due to its tranquility, natural beauty and variety of cultural shows on offer, Uluwatu is a favorite tourist attraction in Bali. If you go to even higher grounds nearby the Uluwatu temple itself, you will be rewarded with breathtaking view and sunsets. The temple, perched at the steep cliff of 70 meters above the Indian Ocean, is itself a majestic structure, constructed and expanded since the 11th Century.

Kuta

Being Bali's most famous tourist area, especially among the young, The 5km stretch of beach is ideal for activities such as surfing, sunbathing or simply watching people go by while you enjoy the sunset. It is easier to find regular performances of Balinese music and dance in Kuta, staged specially for tourists, than anywhere else in Bali. Some performances are staged nightly.

Tanah Lot

The most renowned and one of Bali's most important sea temples would be the Tanah Lot temple. The temple sanctuary at Tanah Lot is perched on a large rock in the middle of the sea and only accessible at low tide when you can cross over and walk to the base of the temple, making it so unique. It is most popular for its serenity and cultural significance as it is associated with the Balinese mythology as one of the seven temples that form a ring in the southwest of Bali.

Pura Ulun Danu Bratan

Also known as Bali's temple by the lake, this famous temple rests serenely at the edge of Lake Bratan. Do remember to bring a camera to capture the picturesque image of the beautifully structured temple along with its reflections on the clear lake.

Ubud

Known as the cultural center of Bali, Ubud is all about tranquility, culture and natural landscapes. The rice fields surrounding Ubud use an ancient water irrigation system known locally as "Subak" and are some of the best to be seen in Bali. Ubud has the atmosphere of a traditional village, with panoramic views of green paddies, perched among the terraced rice fields that climb up the foothills of Bali's central.

Sukawati Market

Sukawati Market is a well-known traditional art market situated in the village of Sukawati, Gianyar regency. The market sells traditional Balinese clothing, batik and crafts at affordable prices, and is a good place to practice your bargaining skills.

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UNIVERSITAS GADJAH MADA

Yogyakarta – Indonesia http://ugm.ac.id/en

Universitas Gadjah Mada (UGM) is the oldest and the largest state university in Indonesia. Established on December 19, 1949; it currently has 18 faculties, 69 undergraduate programs, 24 diploma programs and one Graduate School, and around 50,000 students.

The University is situated in the Special Region of Yogyakarta, which is widely known as the center of Javanese culture as well as the center of education of Indonesia. The vibrant city of Yogyakarta, which focuses its development on three inseparable pillars: education, culture, and tourism, has provided a stimulating academic environment among the students and scholars.

FIGURES

Name	**Universitas Gadjah Mada**	
Address	Bulaksumur, Yogyakarta 55281- INDONESIA t: +62-274-562011, 588688 f: +62-274-565223, 901936 e: setr@ugm.ac.id w: http://www.ugm.ac.id	
Establishment	December 19, 1949	
Faculties		18
Graduate School		1
Vocational School		1
Programs:		201
- Diploma	24	
- Undergraduate	69	
- Masters/Specialists	75	
- Doctorate	33	
Students		50,000
International students (out of 54 countries)		822
Faculty members		2,273
- PhD	721	
- Masters/Specialists	1,192	
- First degree	360	
Employees		2,240
Graduates		197,076
- Diploma	28,271	
- Bachelor degree	127,559	
- Masters/Specialists	40,218	
- PhD	1,029	
Total area		3,570,000 m2
Total buildings		502,109 m2

INDUSTRIAL ENGINEERING

The Industrial Engineering (IE) Program aims at providing solid knowledge and skills to students for understanding, analyzing, and improving complex, socio-technical systems within the systems thinking approach. Three sets of quantitative methods are embedded within the academic curricula: **'operations research', 'human factors engineering', and 'production engineering'**.

IE at UGM offers bachelor, masters, and Ph.D. (by research) degrees. The undergraduate program has been consistently considered among the most competitive one within the university attracting top-notch potential students from all around the country. The postgraduate program provides various opportunities, including: fast-track, scholarships, and double degree programs with leading international universities.

Advanced research by faculty members which gives a special emphasize on complex systems within the Indonesian context, includes:

- Risk and complexity analysis of project systems;
- Concurrent product development and management.
- Physical and cognitive ergonomics within industrial and military settings;

INDUSTRIAL ENGINEERING
UNIVERSITAS GADJAH MADA

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Contributions are welcome from researchers, educators, managers and students. The contributions may be conceptual, theoretical, or empirical. Four types of manuscripts are considered for publication: Research Articles, Technology Management Research Notes, Focus on Practice Papers, and Book Reviews.

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