Industrial Engineering and Engineering Management (IEEM), 2012 IEEE International Conference on

Date 10-13 Dec. 2012

Filter Results

Displaying Results **1 - 25** of **245** Show: 25

Search within results: Search

Select All Results

AUTHOR

Search for Author

- Rausand, Marvin (4)
- Li, Huaqing (3)
- Xue Qing (3)
- Santos, Marcos (3)
- Abelha, Antonio (3)
- Helo, Petri (3)
- Machado, Jose (3)
- Jimoh, A. A. (2)
- Chu, A. (2)
- Tashiro, Hisato (2)
- Huang, C. J. (2)
- Sakata, Ichiro (2)
- Hao, Yuwen (2)
- Park, Yu-Seop (2)
- Kant, R. (2)
- Zhang, Allan N. (2)
- Gang Zhao (2)
- Yin Qiqi (2)
- Kholopane, P. A. (2)
- Geneste, L. (2)
- Olanrewaju, O. A. (2)
- Wang Guoxin (2)
- Shamsuzzoha, Ahm (2)
- Zhang Kan (2)
- Reinhart, G. (2)

AFFILIATION

[Front cover]
Publication Year: 2012, Page(s): c1
© | PDF (977 KB)

[Copyright notice]
Publication Year: 2012, Page(s): 1
© | PDF (40 KB)

Organizers & committees
Publication Year: 2012, Page(s):1 - 2
© | PDF (260 KB)

Table of contents
Publication Year: 2012, Page(s):i - xxx
© | PDF (625 KB)

Performance management in the elementary and secondary schools' information unit in Taiwan: Using the balanced scorecard and the fuzzy analytic hierarchy process
Liang, Y.H.
Publication Year: 2012, Page(s):1 - 5
© | Abstract | PDF (1651 KB) | HTML

An analysis framework for urban construction decision-making based on symbiosis
Chunying Huang ; Xiaoming Wang
Publication Year: 2012, Page(s):6 - 10
© | Abstract | PDF (1482 KB) | HTML

The combination of lean thinking and systems thinking in the design of manufacturing systems
Hofmann, P. ; Powell, D.
Publication Year: 2012, Page(s):56 - 60
© | Abstract | PDF (1595 KB) | HTML

Design and implementation of a Lean Six Sigma framework for process improvement: A case study
Shahada, T.M. ; Alsyouf, I.
Publication Year: 2012, Page(s):80 - 84
© | Abstract | PDF (2194 KB) | HTML

In-service inspection of static mechanical equipment on offshore oil and gas production plants: A decision support framework
Seneviratne, A.M.N.D.B. ; Ratnayake, R.M.C.

1 2 3 4 5

Need Full-Text?
See if your organization qualifies for a FREE TRIAL

IEEE Access
The Journal for rapid open access publishing

Would you give your child a cell phone?
Comment Now on this controversial topic in IEEE Access.

5 Yr Old
© Copyright IEEE Access 2014
Comment
The journal for rapid open access publishing.
IEEE

Proceedings Available

The proceedings of this conference will be available for purchase through Curran Associates.

Industrial Engineering and Engineering Management (IEEM), 2012 IEEE International Conference on

Print **Purchase at Partner**

USB **Purchase at Partner**

Quick Links

2012 IEEE International Conference on
Industrial Engineering and Engineering Management

IEEM2012

10 to 13 December 2012, Hong Kong
Hong Kong Convention and Exhibition Centre

www.IEEM.org

Organized by

IEEE Technology Management Council Singapore Chapter

IEEE Singapore Section

IEEE Systems, Man, & Cybernetics Society Hong Kong Chapter

IEEE Catalog Number: CFP12IEI-ART
ISBN: 978-1-4673-2945-3
ISSN: 2157-362X

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved. © Copyright 2012 by IEEE.

WELCOME MESSAGE BY CONFERENCE CHAIRS

After the continuous success of previous IEEM conferences, the organizing committee of IEEM2012 is pleased to welcome you to the 2012 IEEE International Conference on Industrial Engineering and Engineering Management in Hong Kong.

IEEM2012 received almost 1000 submissions and each paper was sent to 3-5 reviewers, and acceptance decisions were made based on at least two consistent recommendations. Our rigorous review process has helped to maintain a high standard as for the past IEEM conferences.

The organising committee would like to take this opportunity to thank all the technical programme committee and the reviewers for their contribution towards the review process. We are also grateful to all authors for their interest and participation.

Hong Kong is a vibrant and wonderfully diverse country. We wish all delegates a fruitful conference and a pleasant stay in Hong Kong.

General Chair

Daniel Berg, University of Miami, USA

Organizing Chairs

Min Xie, City University of Hong Kong, Hong Kong
Roger Jiao, Georgia Institute of Technology, USA

Program Chairs

Sam Kwong, City University of Hong Kong, Hong Kong
Szu Hui Ng, National University of Singapore, Singapore

ORGANIZERS & COMMITTEES

General Chair
Daniel Berg
University of Miami, USA
Organizing Chairs
Min Xie
City University of Hong Kong, Hong Kong
Roger Jiao
Georgia Institute of Technology, USA
Program Chairs
Sam Kwong
City University of Hong Kong, Hong Kong
Szu Hui Ng
National University of Singapore, Singapore

Committee members
Kah Hin Chai (Publication)
National University of Singapore, Singapore
Carman Lee (Publicity)
Hong Kong Polytechnic University, Hong Kong
Hanxiong Li (International Liaison)
City University of Hong Kong, Hong Kong
Anil Verma (Financial)
Singapore Polytechnic, Singapore
Songlin Chen
Nanyang Technological University, Singapore
Edwin Cheung
Hong Kong Institute of Vocational Education, Hong Kong
Jason Choi
Hong Kong Polytechnic University, Hong Kong
Richard Fung
City University of Hong Kong, Hong Kong
Walter Fung
City University of Hong Kong, Hong Kong
Tritos Laosirihongthong
Thammasat University, Thailand
Zhaotong Lian
University of Macau, Macau
James Liu
Hong Kong Polytechnic University, Hong Kong
Hongyi Sun
City University of Hong Kong, Hong Kong

Technical Program Committee
Michel Aldanondo
University of Toulouse Mines Albi, France
Luciana Alencar
Federal University of Pernambuco, Brazil
Teresa Alvarez
University of Valladolid, Spain
Mehdi Amiri-Aref
Mazandaran University of Science and Technology, Iran
Pedro Arezes
University of Minho, Portugal
Pradip Kumar Bala
Indian Institutes of Technology, India
Ana Paula Barroso
UNIDEMI, FCT-UNL, Portugal
Rajendra Belokar
PEC University of Technology, India
Arijit Bhattacharya
Dublin City University, Ireland
Paul Chang
National Changhua University of Education, Taiwan
Cheng-Wu Chen
National Kaohsiung Marine University, Taiwan
Mu-Chen Chen
National Chiao Tung University, Taiwan
Shin-Guang Chen
Tungnan University, Taiwan
Chuang-Chun Chiou
Dayeh University, Taiwan
Jui-Sheng Chou
National Taiwan University of Science and Technology, Taiwan
Stefan Creemers
IESEG School of Management, France
Yves De Smet
Université libre de Bruxelles, Belgium
Maman Djauhari
University of Technology Malaysia, Malaysia
Valerio Elia
University of Salento, Italy
Chao Fang
City University of Hong Kong, Hong Kong
Laurent Geneste
University of Toulouse ENIT-LGP, France
Maria Grazia Gnoni
University of Salento, Italy
Antonio Grilo
Universidade Nova de Lisboa, Portugal
Guillermo Gutierrez-Alcaraz
Instituto Tecnológico de Morelia, Mexico
Md. Mamun Habib
American International University-Bangladesh, Bangladesh
Rika Ampuh Hadiguna
Andalas University, Indonesia
Siana Halim
Petra Christian University, Indonesia
Takashi Hasuike
Osaka University, Japan
Jishnu Hazra
Indian Institute of Management Bangalore, India
Qingpei Hu
Chinese Academy of Science, China
Chi-Cheng Huang
Aletheia University, Taiwan
Chin-Yu Huang
National Tsing Hua University, Taiwan
Shinji Inoue
Tottori University, Japan
Raja Jayaraman
Khalifa University of Science, Technology & Research, UAE
Minghai Jiao
Northeastern University, China
Yuya Kajikawa
University of Tokyo, Japan
Chompoonoot Kasemset
Chiang Mai University, Thailand
Song-Kyoo Kim
Asian Institute of Management, Philippines
Niak Wu Koh
Dell, Singapore
Chien-Liang Kuo
Chinese Culture University, Taiwan
R. J. Kuo
National Taiwan University of Science and Technology, Taiwan

ORGANIZERS & COMMITTEES

C.K. Kwong
Hong Kong Polytechnic University, Hong Kong
M. Amri Lajis
Universiti Tun Hussein Onn Malaysia,
Ka Wing Lau
Hong Kong Polytechnic University, Hong Kong
Jun-Der Leu
National Central University, Taiwan
Chen-Ju Lin
Yuan Ze University, Taiwan
Chu-Ti Lin
National Chiayi University, Taiwan
Jia-Hua Lin
Liberty Mutual Research Institute for Safety, USA
Tyrone T. Lin
National Dong Hwa University, Taiwan
Weidong Lin
Temasek Polytechnic, Singapore
Bor-Shong Liu
St. John's University, Taiwan
Mei-Chen Lo
National United University, Taiwan
Huitian Lu
South Dakota State University, USA
Rammohan Maikala
Liberty Mutual Research Institute for Safety, USA
Renata Maciel de Melo
Federal University of Pernambuco (UFPE), Brazil
Harekrishna Misra
Institute of Rural Management Anand, India
Lars Moench
University of Hagen, Germany
Keisuke Murakami
National Institute of Informatics, Japan
Ville Ojanen
Lappeenranta University of Technology, Finland
Mohamed k. Omar
Nottingham University Business School, Malaysia
Taezoon Park
Nanyang Technological University, Singapore
Jennifer Percival
University of Ontario Institute of Technology, Canada
Leon Pretorius
University of Pretoria, South Africa
Suksan Prombanpong
King Mongkut's University of Technology Thonburi, Thailand
Kit Fai Pun
University of the West Indies, Trinidad and Tobago
T Radha Ramanan
National Institute of Technology Calicut, India
Suk-Chul Rim
Ajou University, South Korea
Mohapatra S S
National Institute of Technology, India
Rashed Sahraeian
Shahed University, Iran
Tomoko Saiki
Tokyo Institute of Technology, Japan
Ichiro Sakata
University of Tokyo, Japan
Ilias Santouridis
Technological Educational Institute of Larissa, Greece
Kiyoshi Sawada
University of Marketing and Distribution Sciences, Japan
Mahmood Shafiee
Chalmers University of Technology, Sweden
AHM Shamsuzzoha
University of Vaasa, Finland
Ali Siadat
Arts et Métiers ParisTech, France
Nachiappan Subramanian
University of Nottingham Ningbo, China
Syafiie Syafiie
University Putra Malaysia, Malaysia
Vivian Tam
University of Western Sydney, Australia
Pei-Lee Teh
Monash University, Malaysia
Purit Thanakijkasem
King Mongkut's University of Technology Thonburi, Thailand
Ramayah Thurasamy
Universiti Sains Malaysia, Malaysia
Norbert Trautmann
University of Bern, Switzerland
Wen-Hsien Tsai
National Central University, Taiwan
Ming-Lang Tseng
Lung Hwa University of Science and Technology, Taiwan
Yuan-Jye Tseng
Yuan Ze University, Taiwan
Enrico Vezzetti
Politecnico di Torino , Italy
Junqiang Wang
Northwestern Polytechnical University, China
Min Wang
Chaoyang University of Technology, Taiwan
Shengyong Wang
University of Akron, USA
Yonggui Wang
University of International Business and Economics, China
Seng Fat Wong
University of Macau, Macau
Yanqiu Xiao
Zhengzhou University of Light Industry, China
Bingwen Yan
Cape Peninsula University of Technology, South Africa
Hsu-Hao Yang
National Chinyi University of Technology, Taiwan
QZ Yang
Circular Economy Research Centre, China
Min Yao
Zhejiang University, China
Chui Young Yoon
Korea National University of Transportation, South Korea
Suhaiza Zailani
Universiti Sains Malaysia, Malaysia
Allan Nengsheng Zhang
Singapore Institute of Manufacturing Technology, Singapore
Cai Wen Zhang
Sun Yat-sen University, China
Linda Zhang
IESEG School of Management, France

Table of Contents

Decision Analysis & Methods (1)

Performance Management in the Elementary and Secondary Schools' Information Unit in Taiwan: Using the Balanced Scorecard and the Fuzzy Analytic Hierarchy Process 1
Yi-Hui LIANG

An Analysis Framework for Urban Construction Decision-making Based on Symbiosis 6
Chunying HUANG, Xiaoming WANG

Establishing A New Preliminary Evaluation Criteria System Model for Green Restaurants 11
Ching-Yu LIEN, Bor Min TSAI, Hsin-Yen WU

A Multi-Criteria Decision Support Model for TV Series Selection 16
Cigdem KADAIFCI, Ilker TOPCU, Umut ASAN

A Matching Procedure for Goal-oriented Productivity Improvements 21
Thomas CZUMANSKI, Jonina JONSSON, Hermann LODDING

Ranking of Problematic Equipment using Six Big Losses and Analytic Hierarchy Process 26
Ratapol WUDHIKARN

A Real Options Analysis with CVA on Optimal Decision of Regulatory Capital for the Basel Capital Accord III 31
Tyrone T. LIN, H. J. CHEN

Decision Analysis & Methods (2)

A Methodology for Product Line Design with Consideration of Supplier Selection 36
S.F. DENG, C.K. KWONG, Xinggang LUO, H.M. JIANG

Does Delighting Customers to Inspire Loyalty Moderated by Lodging Motivation?- A Case Study on Five-Star Hotels in Mid-Taiwan 41
Yung-Hsin CHEN, Xia WANG, Shuo-Chang TSAI, Ingrid TENG

Objective Product Family Design Analysis Using Self-Organization Map 46
Ningrong LEI, Seung Ki MOON

Evaluations on and Suggestions for the Sustainable Development of Shaanxi 51
Shuyan GONG, Weili XIA

The Combination of Lean Thinking and Systems Thinking in the Design of Manufacturing Systems 56
Pascal HOFMANN, Daryl POWELL

Portfolio Decision Analysis in Vague Domains 61
Tobias FASTH, Aron LARSSON

A Decision-making Model on Concession Period of Public Rental Housing BOT Project 66
Jingjing ZHU, Guangmou WU

Decision Analysis & Methods (3)

Business Feasibility Methodology for Introducing New Developed Local Food Product 71
Wasawat NAKKIEW, Jaruwan WANNAGOAT, Wassanai WATTANUTCHARIYA, Anirut CHAIJARUWANICH

An Investigation of Robust Optimal Design Using Artificial Neural Network and Genetic Algorithm 75
Kiatkajohn WORAPRADYA, Purit THANAKIJKASEM

Design and Implementation of a Lean Six Sigma Framework for Process Improvement: a Case Study 80
Tarak SHAHADA, Imad ALSYOUF

In-Service Inspection of Static Mechanical Equipment on Offshore Oil and Gas Production Plants: A Decision Support Framework 85
A.M.N.D.B. SENEVIRATNE, R.M. Chandima RATNAYAKE

Customer-Driven Conceptual Design for Mid-sized Passenger Aircraft 91
S.Y. HAN, Hae-Jin CHOI

Hybrid Fuzzy AHP-GA Approach to Supplier Selection and Order Allocation in SMEs Manufacturing Networks 96
Nan LI, Guiovanni JULES, Mozafar SAADAT

Evaluation Model For the Sustainable Use of Information Technology 101
Patricia MARTINS, Antonio GRILO

Operations Research (1)

A Study on Adaptive Particle Swarm Optimization (APSO) for Solving Bi-level Job-shop Scheduling Problem 106
Chompoonoot KASEMSET

Optimization of the Annual Planning of Targeted Offers in Direct Marketing 111
Fabrice TALLA NOBIBON, Stephanie DELANOTE, Roel LEUS

An Algorithm for the Sugar Cane Loading Station Location Problem 116
Wirekha KHAMJAN, Supachai PATHUMNAKUL, Kullapapruk PIEWTHONGNGAM

A Variable Neighborhood Search Approach for Multiple Resources Constrained Parallel Machine Scheduling Problem 121
Zhengliang HOU, Xiuping GUO, Xiuli GUO

A Mixed Integer Programming Formulation for Single Batch Processing Machine with Incompatible Job Families 126
Mohamed K. OMAR, Yasothei SUPPIAH

Generating and Ordering of Transport Alternatives in Inter-Modal Logistics in the Presence of Cost, Time, and Emission Conflicts 131
Maria KALININA, Aron LARSSON, Leif OLSSON

An Optimization Model for Removal of Zinc from Industrial Wastewater 136
Farah ASSADIAN, Pari BEIRAMI

Operations Research (2)

Improving Business Process Performance Without Increasing Cost 141
Shin-Guang CHEN

Clustering and Hub Selection for a Large Scale Delivery Problem 146
Suyan TENG, Edmund CHAN, Gabriel SIOW

A Local-Search Based Algorithm for the Escherization Problem 151
Shinji IMAHORI, Shohei SAKAI

Minimizing Total Tardiness in NFSSP with SDSTs and RDs by Using Hybrid Differential Evolution Algorithm 156
Bin QIAN, Zuocheng LI, Rong HU, Xiaohong ZHU

Sequential Testing Policies for Complex Systems Under Precedence Constraints 161
Roel LEUS, Wenchao WEI, Kris COOLEN

Incorporating Local Search in Heuristics for Dynamic and Stochastic Maritime Pick-up and Delivery Problems 166
Gregorio TIRADO, Lars Magnus HVATTUM

A Markov Decision-Making Model for Emergency Medical Resource Allocation with Multi-Category Injuries 171
Hongyun XIA, Yiping JIANG, Lindu ZHAO, Micheal HERTY

Operations Research (3)

Solving Euclidean Minimal Spanning Tree Problem Using a New Meta-heuristic Approach: Imperialist Competitive Algorithm (ICA) 176
S.Mohsen HOSSEINI, Abdullah KHALED, Mingzhou JIN

A New Construction Heuristic Algorithm for the Rectilinear Block Packing Problem: A Bridge between the Best-Fit and Bottom-Left Algorithms 182
Yannan HU, Hideki HASHIMOTO, Shinji IMAHORI, Mutsunori YAGIURA

Vehicle Refueling Planning for Point-to-Point Delivery by Motor Carriers 187
Shieu-Hong LIN

Reformulation of Lawler's Algorithm by Auxiliary-information Dynamic Programming in a Minimax-cost Scheduling Problem 192
Eiji MIZUTANI

An Optimization Approach of Product Design with Consumer Preference Uncertainty 197
Jing DU, Xiaoming HU, Qiang LU, Suxiu XU

A Hybrid Algorithm for the Pickup and Delivery Problem with Time Windows: A Case Study at a Fresh Milk Plant 202
Mengjuan XU, Lindu ZHAO

Enhanced Group Genetic Algorithm for the Heterogeneous Fixed Fleet Vehicle Routing Problem 207
Michael MUTINGI, Charles MBOHWA

Inventory Systems with Power Demand, Deterioration and Backlogged Shortages 212
Joaquin SICILIA-RODRIGUEZ, Manuel GONZALEZ-DE LA ROSA, Jaime FEBLES-ACOSTA

Supply Chain Management (1)

Identify Critical Success Factor of Knowledge Management in Supply Chain : Fuzzy DEMATEL Approach 217
Sachin PATIL, R. KANT

A Predictive Model For Supply Chain Management Implementation Using AHP Methodology 222
Shrikant GORANE, R. KANT

Predicting the Success Possibility of Implementing Information Sharing in Supply Chain Using Consistent Fuzzy Preference Relationship 227
R. KANT, Akshay PUJARA

Myopic Multi-Period Mean-Variance Inventory Policy for Fashion Products 232
Tsan-Ming CHOI

Managing Health Care Perishable Apparel Products using Quick Response Program 236
Hau Ling CHAN, Tsan-Ming CHOI, Chi Leung HUI, Sau Fun NG

Application of the Supply Chain Concept for Educational Services 241
Chiu Liang GAN, Ek Peng CHEW, Loo Hay LEE

A Reverse Logistics Decision Model in Green Manufacturing Supply Chains 246
Tyrone T. LIN, Y.S. LU

Supply Chain Management (2)

A Thinking Framework for Managing Complexity in the Supply Chain 251
Seyda SERDARASAN

Capacitated Multi-Item Dynamic Lotsizing with Random Demand 256
Horst TEMPELMEIER

Developing a Genetic Algorithm to Optimise an International Supply Chain under (s, S) policy 261
Wei XU, Dongping SONG, Michael ROE

Micro-organizational Supply Chain Management Influential Factors: A Case Study 267
Nayanapriya GUNAWARDHANA, Takao ENKAWA, Sadami SUZUKI

Quantifying Supply Chain Disruption Risk Using VaR 272
Allan Nengsheng ZHANG, S.M. WAGNER, Mark GOH, M. TERHORST, B. MA

Incentive Contracts between Fourth-party and Third-party Logistics Providers based on Performance Measurement with Intellectual Capital 278
Qin ZHU, Richard Y. K. FUNG

Supply Chain Management (3)

Container Pre-marshalling Problem: A Review and Solution Framework 283
Mohamed GHEITH, Amr ELTAWIL, Nermine HARRAZ

Multi-Depot Vehicle Routing Problem with Time Windows Using Hybrid Metaheuristic Algorithm 288
Seyed Farid GHANNADPOUR, Amin JAMILI

A Three Echelons Supply Chain Network Design in a Fuzzy Environment Considering Inequality Constraints 293
Mahdi BASHIRI, Mahtab SHERAFATI

The Study of Tiered Pricing Model in Three-echelon Reverse Supply Chain 298
Fuwen LI, Ruizhu HAN

Coordinating a Supply Chain for a Newsvendor-Type Product with Sales Effort Effects 303
Yao Yu WANG, Jian-Cai WANG

Strategic Design of the Construction Supply Chain: A Case of Building Projects in Iran 308
Mohammad Reza SAFAIAN, Hossein MORADINASAB

Matching of Intermodal Freight Transports Using Optimization in a Decision Support System 313
Leif OLSSON, Aron LARSSON

A Classification and Review of Recent Models for Solving the Vehicle Routing Problem and a Proposed New Problem Framework 318
Alyaa ABDEL-HALIM, Amr ELTAWIL

Quality Control & Management (1)

Critical Success Factors for Six Sigma Deployment: Is a Centralized Deployment Structure Better Than a Re-integrated Deployment Structure? 323
Alan KEELEY, Corro VAN WAVEREN, Kai-Ying CHAN

A Method for Product Quality Management Throughout Its Life Cycle 329
Dinh Son NGUYEN

A Generalized Linear Test Model to Monitor AR(1) Autocorrelated Polynomial Profiles 334
M. KERAMATPOUR, S.T.A. NIAKI, Amirhossein AMIRI

Identifying the Time of a Step Change in the Mean of a Two-Stage Process 339
Amirhossein AMIRI, S. ZOLFAGHARI, Ali ASGARI

An Empirical Study of Critical Success Factors for Statistical Process Control Implementation: A Second-Order Factor Analysis 343
Jafri MOHD ROHANI, Sha'ri MOHD YUSOF, Ismail MOHAMAD

Product Driven Quality Control 347
Samuel BASSETTO, Adeline MOTTE

Quality Management for Leadership 352
Masayoshi USHIKUBO, Hisato TASHIRO, Nobuzumi FUJII, Ichiro SAKATA

Quality Control & Management (2)

Nonparametric Design of Phase I X Control Charts with or without Sensitizing Run Rules 357
Giovanna CAPIZZI, Guido MASAROTTO

DMAIC Methodology for Fold Defect Reduction in the Optical Blank Industry 362
Mohamed K. OMAR, Hock Kheng SIM, Geok Ching LIM

Evaluating Intensity of Human Factors in TQM Using Analytical Network Process (ANP) Approach 367
Sandeep GROVER

Field Data Analysis in Truck Production - a Case Study 372
Ralph RIEDEL, Egon MUELLER

Barriers in Total Productive Maintenance Implementation in a Semiconductor Manufacturing Firm: A Case Study 377
Kam-Choi NG, Gerald Guan Gan GOH, Uchenna Cyril EZE

On Detection of Spatiotemporal Clustering 382
Chen-ju LIN, Yen-ting CHEN

The Role of Leadership Competencies for Implementing ISO 9000 386
Kem RAMDASS

Engineering Economy and Cost Analysis

Application of Robust Design Technique in SME Project Finance: A Case Study to Calculate Optimum Set-Points 391
R.M. Chandima RATNAYAKE, Harsha JAYATILAKA

Strategic Fit in Value Added Networks of Electric Vehicle Production 396
Achim KAMPKER, Peter BURGGRAF, Carsten NEE

Demand Response Mechanism and Simulation Research of Cold Storage Air Conditioner Supporting Consumption of the Onshore Wind Power 401
Yu CHENG, Su AN

Managing the Economic Performance of Research-driven Initiatives in the Field of Transdisciplinary Research 406
Florian G. H. BEHNCKE, Martina WICKEL, Udo LINDEMANN

The Optimal Allocation of the Investment Capital for R&D Projects at the Commercial Stage with the Kelly Criterion 411
Gyutai KIM

Research on Life Cycle Management of Nuclear Power Plant equipment based on Economic Analysis 418
Kai-kai GU, Jiang GUO, Ming-shu FAN, Ke-fei ZHANG, Lei SHI

Injection Mold Replacement Analysis in Automotive Industry 423
Tanasak SUWANNABOOL, Daricha SUTIVONG

Service Provision, Subsidies and Revenue Maximization in Multitier Communities 428
Hailing ZHU, Mbuyu SUMBWANYAMBE, Andre L NEL

Production Planning & Control (1)

Constructing Generic Processes based on Tree Unification for Process Family Planning 433
Linda ZHANG

Batch Optimization Algorithm for Autoclave Curing of Fiber-Reinforced Composites 438
Tobias PHILIPP, Thorsten KLEIN, Gunther REINHART

Approach for an RFID-based Situational Shop Floor Control 444
Philipp ENGELHARDT, Gunther REINHART

21st Century Operational Excellence: Addressing the Similarities and Differences between Lean Production, Agility and QRM 449
Daryl POWELL, Jan Ola STRANDHAGEN

Operations Scheduling in Make-and-Pack Production: Schedule Construction and GA-based Priority-Rule Generation Procedures 454
Philipp BAUMANN, Norbert TRAUTMANN

Modeling the Master Production Scheduling System with Downgraded Products for a TFT-LCD Module Factory 459
Chun-Cheng LIN, Jia-Rong KANG, Wan-Yu LIU, Shu-Hsing CHUNG, Kai-Shin CHOU

Production Planning & Control (2)

New Entropy Weight-Based TOPSIS for Evaluation of Multi-objective Job-Shop Scheduling Solutions 464
Junqiang WANG, Jian CHEN, Ting QU, George HUANG, Yingfeng ZHANG, Shudong SUN

An Artificial Immune Based Algorithm for Parallel-machine Scheduling with Preference of Machines 469
Ching-Jen HUANG, Li-Man LIAO

A Multi-Agent Based Rescheduling Framework for Mixed-Model Assembly Line Balancing 474
Li-Man LIAO, Ching-Jen HUANG

A Finite Economic Production Quantity Model with Two Imperfect Modules 479
Dah-Chuan GONG, Gary C. LIN, Kai-Xun ZHUANG, Pei-Han LEE

The Significance of Serendipity in New Market Creation 483
Akihiko NAGAI, Takayuki ITO

Combined Economic and Emission Dispatch Using Harmony Search and Genetic Algorithm 488
Yun-Chia LIANG, Josue CUEVAS

Production Planning & Control (3)

Research on Dynamic Dispatching Rule for Semiconductor Assembly Production Line 493
Chang LIU, Hai-Zan CHEN, Yuan RONG, Jun ZHU

A Data Envelopment Analysis Approach to Resource Efficiency Evaluation 498
Jenny XU, Siddharth GOUTAM, Xun XU, Shane XIE

Simulation Aided Disturbance Management in One-of-a-kind Production on the Assembly Site 503
Robert WANDT, Axel FRIEDEWALD, Hermann LÖDDING

Solving the Problem of Product-Conversion in Semiconductor Assembly and Test Manufacturing System by a Novel Heuristic Scheduling Algorithm 508
Li-li YAO, Hai-bo SHI, Chang LIU

Deterministic Joint Replenishment Problem with Multiple Restriction: A Lagrangian Relaxation Approach 513
Amit Kumar GUPTA, R R K SHARMA

Optimization of Manufacturing Planning and Control Systems in Highly Dynamic Environments using Bernoulli Theorem 518
Johannes MAPOKGOLE, Tengen THOMAS

A Multi-Crop Production Planning Model for Hydroponic Systems With Nutrient Mix Reusability 523
Haniel CHUA, Francis RAMIREZ, Kyle SY, Dennis CRUZ

Bi-objective Simulated Annealing and Adaptive Memory Procedure Approaches to Solve a Hybrid Flow Shop Scheduling Problem with Unrelated Parallel Machines 528
Hmid MOHAMMADI, Rashed SAHRAEIAN

Manufacturing Systems (1)

A Multi-objective Biogeography-based Optimization for Mixed-model Two-sided Assembly Line Balancing with a Learning Effect 533
Ronnachai SIROVETNUKUL, Uamporn JANSAME, Parames CHUTIMA

The Study Wood Furniture Which Made of Fast Growing Wood Specie of Azadirachta exceisa (Jack) Jacobs. for Wood Industrial Standard by Finite Element and Design Analysis of Experiments 539
Sakkarin CHOODOUNG, Chalermpon BUTTARD

Analysis of Assembly Sequence for Effective Assembly Plan of Wooden Furniture 544
Sakkarin CHOODOUNG, Uttapol SMUTKUPT

Robustness of Assemble-to-Order Systems against Unexpected Events 548
Henri TOKOLA, Esko NIEMI

The Role of Total Productive Maintenance in Manufacturing Firms: A Review 553
Kam-Choi NG, Gerald Guan Gan GOH, Uchenna Cyril EZE

Critical Success Factors for MES Implementation in China 558
Huasheng YANG, Li ZHENG, Yi HUANG

How Dose Product Innovation Help New Firm Growth: The Moderating Effects of Knowledge from Demand Side and Business Environment 563
Chaoqun ZHANG, Xiaobo WU

Manufacturing Systems (2)

Reconfigurable Mixed Model Assembly Line Design in a Dynamic Production Environment 568
Dida DAMAYANTI, Isa Setiasyah TOHA

Deconstructing Emerging Business Ecosystems: Explorations of the Chinese Electric Vehicle Industry 573
Tianjiao SHANG, Yongjiang SHI

A New Decision Making Approach for the Formation of Holonic Agent-based Manufacturing Networks 578
Guiovanni JULES, Mozafar SAADAT, Nan LI

The Hybrid Manufacturing Cell: Determining Key Parameters in the Integration of Powder Bed Fusion with High Speed Milling 583
Vegard BROTAN, Klas Magnus BOVIE

Linking Strategic Goals with Operational Performance: An Integrated Approach 588
Antonio ALMEIDA, Daniel POLITZE, Alvaro CALDAS, Americo AZEVEDO

Performance Modeling of Reconfigurable Manufacturing System for Different Dispatching Strategies Under Exception 593
Faisal HASAN, P.K JAIN, Dinesh KUMAR

Reactive Scheduling for Non-disruptive Job Processing Against Machine Breakdowns 597
Wan-Ling LI, Muhammed Hafidz FAZLI, Tomohiro MURATA

Manufacturing Systems (3)

The Robust Scheduling Solutions for Parallel Machine Systems Under an Uncertain Environment 602
Xuanhao ZHOU, Yong-Zai LU

Study on the Layered Predictive Control Algorithm for the Main Steam Temperature of Ultra-supercritical Units 607
Shihe CHEN, Wenkai HU, Xin LI

Optimization of Power Station Boiler Coal Mill Output Based on the Particle Swarm Algorithm 612
Yanjun FANG, Xiaojie QIN, Yuan FANG

Lean Manufacturing in Textile Industry of Pakistan 617
Ali Husnain RABBANI, Muhammad ASIM

Scheduling a BPM with Incompatible Job-Families and Dynamic Job-Arrivals 622
Muthu MATHIRAJAN, M VIMALARANI

Characteristic Simulation of High Pressure Common Rail Pipe 627
Jiping LU, Fan HONGLI, Wang LIANHONG, Song HAO, Pan YONG

Integration of Sustainability and Mass Customization: Proposal of a Framework to Map Research Open Issues 632
Golboo POURABDOLLAHIAN, Mahnoosh ZEBARDAST, Marco TAISCH

Deciphering Business Ecosystem Capabilities of the Emerging Electric Vehicle Industry 638
Tianjiao SHANG, Feifan CHANG, Yongjiang SHI

Technology and Knowledge Management (1)

Effective Wi-Fi Setting User Experience Design by Using Systematic Innovation Method 643
Song-Kyoo KIM

Making Mergers More Effective Through Technology Management 647
Murali Krishna KUPPILI, Ramachandra ARYASRI

A Study on the Job Satisfaction of Governmental Labor Inspectors in Taiwan 652
Fu-Man HSIEH, Yichun YU, Y.C. LIN, P.-J. TSAI

Interpretive Structural Model of Key Performance Indicators for Sustainable Manufacturing Evaluation in Automotive Companies 656
Elita AMRINA, Sha'ri MOHD YUSOF

How to Use the Big Data to the Technology Planning: A Data-Driven Technology Roadmapping Using ARM 661
Youngjung GEUM, Hyeonjeong LEE, Yongtae PARK

E-service Concept Design in Recombinative Innovation: A Morphology Analysis Approach 666
Jieun KIM, Yongtae PARK

Technology and Knowledge Management (2)

Locating the Key Competitors: A New Tool for Technology Manager 671
Chung-Huei KUAN, Mu-Hsuan HUANG, Dar-Zen CHEN

Leadership as a Determinant of Product Innovation: a Systematic Review of the Literature 677
Tharnpas SATTAYARAKSA, Sakun BOON-ITT

A Knowledge Service Framework for Product-design Activities 683
Si CHEN, Yan YAN, Wang ZHAO, Wang GUOXIN, Zhao YIJING

Capability Development - No Path, Response to Competition: The Cross-case of Google, Ericsson, Microsoft and Nokia 689
Mait RUNGI, Alar KOLK

Analysis Individual Tacit Knowledge Toward Innovation 694
Augustina ASIH RUMANTI, Iwan Inrawan WIRATMADJA, Trifenaus Prabu HIDAYAT

The Mediating Role of Absorptive Capacity between Financial Slack and Performance 698
Antonio VERDU, Lirios ALOS-SIMO, Jose Maria GOMEZ-GRAS, Maria Jose ALARCON-GARCIA

Technology and Knowledge Management (3)

Technology Evaluation Practices in Universities Technology Transfer Offices 703
Fernando ROMERO, Antanio ROCHA

Knowledge Visualization in Product Development using Trade-Off Curves 708
Maksim MAKSIMOVIC, Ahmed AL-ASHAAB, Robert SULOWSKI, Essam SHEHAB

Impact of Enterprise Strategic Flexibility on Innovation Performance: Based on Dual Perspective of Proactive and Reactive 712
Zhigang FAN, Dongmei FAN, Sun YUAN

Care Apparel Design Reuse System: Design and Implementation 717
Bibo YANG, Lei AI

Patent-based Indicators for Analyzing the Wind Power Markets 722
Matti KARVONEN, Rahul KAPOOR, Tuomo KASSI

The Role of Funding Source for Commercializing University Patents: Network Analysis on Technology - Industry Linkage Patterns 727
Yongrae CHO, Sanghoon LEE, Wonjoon KIM

Knowledge Management and Learning Organization: Linking Knowledge-based System to Service Delivery Processes 732
Wen-Jung CHANG, Christina TAY

A STEP-based Product Knowledge Model for One-of-a-kind Production 737
Bomiao LI, Shane XIE, Xun XU

Reliability and Maintenance Engineering (1)

Optimal Maintenance Service Contract for Equipments with Availability Target 742
Bermawi ISKANDAR, Hennie HUSNIAH

Specification of Change Points of Failure Rate or Intensity Function: A Non-parametric Approach 747
Renyan JIANG

Reliability Analysis Based on Jump Diffusion Models for an Open Source Cloud Computing 752
Yoshinobu TAMURA, Hirona MIYAHARA, Shigeru YAMADA

Quantification of Organizational Influences on Failure Rate: A Bayesian Approach 757
Hui JIN, Marvin RAUSAND, Ali MOSLEH, Stein HAUGEN

Failure Rate Prediction in Various Life Cycle Phases: A Framework for Updating 762
Maryam RAHIMI, Marvin RAUSAND

Optimal Transmission Lines Assignment in a Multi-source Multi-sink Computer Network 767
Yun ZHANG, ZhengGuo XU, JianGang LU, YouXian SUN

Simulation Evaluation of State-based Preventive Maintenance for a Machine with Multiple Quality States 772
Chao QI, Hongwei WANG, Sivakumar APPA IYER

Reliability and Maintenance Engineering (2)

Remaining Lifetime Assessment of a Deteriorating System Operating Under Permanent Effect of Fluctuant Environment 777
Elias KHOURY, Estelle DELOUX, Antoine GRALL, Christophe BERENGUER

Thermooxidation Degradation and Life Prediction of Nitrile Butadiene Rubber Based on Kinetics Model 782
Kun ZHANG, Jinyong YAO, Tongmin JIANG

Probabilistic Modeling of Solder Joint Thermal Fatigue with Bayesian Method 787
Limei XIE, Ying CHEN, Rui KANG

Reliability-Based Structural Design: A Case Study of Car Wheels 792
Yitao LIU, Feng ZHOU, Roger JIAO

Reliability Assessment and Analysis of Incorporating Fault Tolerance into Service-oriented Architectural Systems 797
Kuan-Li PENG, Chin-Yu HUANG

Blade-based Maintenance Policy of Offshore Wind Turbine with the Presence of Covariate under Random Shock 802
Wenjin ZHU, Mitra FOULADIRAD, Christophe BERENGUER

Project Management (1)

An Integer-Programming Approach to Benefit-Maximal Selection and Scheduling of Resource-Constrained Projects 807
Gianluca BRANDINU, Norbert TRAUTMANN

An Investigation into the Relationship between Project Management Maturity and Project Performance in the Telecommunications Industry in Zimbabwe 812
Tapiwa MURAMBIWA, Marie-Louise BARRY

Unlocking Critical Success Factors and Criteria in Capital Projects – A Perspective From the South African Petrochemical Industry 817
Marie-Louise BARRY, Danver JACOBS

Responding to an Ageing Workforce and the Implications for Engineering Management 822
Julien POLLACK

Risk Crash: a New Approach to Quantify the Relationship Between Risk of Delay and Project Duration 827
Tommaso SALVAGNINI, Giorgio LOCATELLI, Mauro MANCINI, Edoardo CESA BIANCHI

Role Development for Interdisciplinary Collaboration Support in Biomimetics 832
Manuela Iulia PARVAN, Hendrik OEPKE, Katharina KAISER, Udo LINDEMANN

A New Event-based MILP Model for the Resource-constrained Project Scheduling Problem with Variable Intensity Activities (RCPSVP) 837
Alain HAIT, Georges BAYDOUN

Resource Constrained Project Scheduling Problem: A DEA based Genetic Algorithm 842
Behzad ASHTIANI, Fatemeh PAIDAR, Amir Masoud HOSSEINMARDI, Esmaeil NAJAFI TROJANI

Intelligent Systems (1)

Intelligent Systems based in Hospital Database Malfunction Scenarios 846
Paulo SILVA, Cesar QUINTAS, Pedro GONCALVES, Gabriel PONTES, Manuel SANTOS, Antonio ABELHA, Jose MACHADO

Monitoring Intelligent System for the Intensive Care Unit using RFID and Multi-Agent Systems 851
Rui RODRIGUES, Pedro GONCALVES, Luis Miguel MIRANDA, Carlos Filipe PORTELA, Manuel SANTOS, Jose NEVES, Antonio ABELHA, Jose MACHADO

Image Analysis for Pig Recognition Based on Size and Weight 856
Apirachai WONGSRIWORAPHON, Supachai PATHUMNAKUL , Banchar ARNONKIJPANICH

Ontology-Based Context Model of Turret 861
Qiqi YIN, Qing XUE, Minxia LIU, Kan ZHANG

An Artificial Neural Network Approach for Estimating Suitable Ratio of Filling Fat in Animal Feed Production 866
Mongkon ITTIPHALIN, Supachai PATHUMNAKUL , Kullapapruk PIEWTHONGNGAM, S. HOMDEE

Rule Extraction Using Firefly Optimization: Application to Banking 869
Naveen NEKURI, Ravi VADLAMANI, Raghavendra Rao C, Sarath K.N.V.D

Intelligent Systems (2)

An AI-based System for Telecommunication Network Planning 874
Kin POON, Andrej CHU, Anis OUALI

An Efficient Approach for Updating the Structure for Mining Frequent Patterns 879
Show-Jane YEN, Yue-Shi LEE, Jia-Yuan GU

Architecture of Knowledgeable Manufacturing System and Knowledge Representation Methods 884
Youlong LV, Wei QIN, Jie ZHANG

An Intelligent System for Production Resources Planning in Hong Kong Garment Industry 889
Kar Hang Carmen LEE, K.L. CHOY, Kris, M Y LAW, G.T.S. HO

Buyer-Supplier Predicting Offers in Supply Contract Negotiation Using Neural Network 894
Yusraini MUHARNI, Chao OU-YANG, Chun Ching LEE

Safety, Security and Risk Management (1)

Addressing IT Security in Practice: Key Responsibilities, Competencies and Implications on Related Bodies of Knowledge 899
Younes BENSLIMANE, Ankit PATEL, Bouchaib BAHLI, Zijiang YANG

Hybridization of Statistical and Cognitive Experience Feedback to Perform Risk Assessment. Application to Aircraft Deconstruction 904
Eric VILLENEUVE, Cedrick BELER, François PERES, Laurent GENESTE

A Study of Fire Evacuation from an Industrial Building Using Simulex 909
Diana FREITAS, Pedro AREZES

Noise Risk Assessment of Taiwan High Speed Rail 913
Kang-Ting TSAI, Y. T. HUANG, Min-Der LIN

The Effect of Maintenance Seen From Different Perspectives on Major Accident Risk 917
Peter OKOH, Stein HAUGEN

Study on Classification of Safety-related Organizational Factors in a Nuclear Power Plant 922
Dai LICAO, Pengcheng LI, Huang SHUDONG, Zhao MING

Quantitative Research of Risk Relationships of Sewage Treatment Plants Based on Concession Operation 927
Hui SUN, Yanhong LU

Theoretical Research on Crossflow Pollution in Short Distance and Continuous Road Tunnels 932
Pai XU, Shu-ping JIANG, Zhi LIN, Jian-zhong CHEN

Poster Session 1

Integration of Supply Chains via Vertical Merger and Acquisition: Mechanism and Policy 937
Haiyan YAN, Wenbin ZHAO, Bo XU

Enabling of Sustainable Supply Chain Management with Lean Thinking - A Comparative Study of Manufacturers in Kyoto Protocol Signatory Countries 942
Stuart SO, Hongyi SUN

The Impact of Information Technology on Supply Chain Management Capabilities: A Resource-Based View 947
Yi- Fen SU

A Heuristic Method based on Genetic Algorithm for Storage Location Assignment in a Pick-and-Pass Warehousing System with Multiple Pickers 952
Po-Hsun SHIH, Jason Chao-Hsien PAN, Ming-Hung WU

Value Stream Mapping Analysis for Improving the Harvesting and Transport Processes of Cotton 957
Yulin LI, Shuping YI

Decision to Refurbished Products Based on Cost-benefit of Remanufacturing Model in Closed Loop Supply Chain 961
Yan LIANG, Joseph CHEN

Effects of Information Transparency on Supply Chain Quality Management 966
JIng Hua XIAO, Zhao Lin CHENG, Cai Wen ZHANG, Kang XIE

Towards Better Supply Chain Visibility - the Design and Implementation of a Supply Chain System S-ConTrol to Support an Operational HQ in Singapore 971
Wen Jing YAN, Puay Siew TAN, Niak Wu KOH, Tan YONG QIANG, Allan Nengsheng ZHANG

Hybrid Ant Colony Optimization for Library Distribution Network 976
Weidong LIN, E.S. CHAN, S.Y. CHIA, H. LI

Using Decision Analysis Method to Evaluate the Cost-effectiveness of Similar effect Medical Materials in Hospital 981
Nai-Chuan FANG, Ming-Jong YAO, Tsueng-Yao TSENG

2-tuple Linguistic Prioritized Harmonic Applied to Group Decision Making 986
Jin Han PARK, Jong Jin SEO, Young Chel KWUN

The Associations between Professional Commitment, Learning Burnout, and Grade Point Average in Independent College Students 991
Aiqun YU, Ji-Wei MA, Yi-Wen CHEN

AHP in Prioritizing Vibration Parameters for Maintenance of Machine Tools 996
Manjunath GOWDA, H. N. SURESH, K. M. BASAPPAJI

Mathematical Programming Model for Type-I Two-sided Assembly Line Balancing Problem 1001
Hsiu-Hsueh KAO, Din-Horng YEH, Sih-Ting HUANG

The Design of an AGV in the Manufacturing Cell 1006
Suksan PROMBANPONG, W KIATTIPHATTHANANUKUL, A SONGSANAN, Assariya SUKIN

The Improvement in the Reliability Problem for Air Current Breaker's Over Current Protect Function 1010
Cheng-Chung CHIEN, C.N. CHANG, Yung-Tang WU, C. C. TSENG, D.H. CHIU , J.K. WAN, C.S. WU, C.T. HSU, E.D. CHEN, F.H. LI, T.H. SHAO

A Study of Software Reliability Growth Model for Time-dependent Learning Effects 1015
Kuei-Chen CHIU

Research on Machining Process Reliability in Multi-procedure Machining Processes 1020
Ping JIANG, Yunyan XING, Yajie LIU, Bo GUO, Gan LIN

Vibrations of Timoshenko Beams with Damping and Forcing Terms 1025
Norio YOSHIDA

A Performance Comparison Between the Base Stock (BS), Traditional Kanban Control System (TKCS) and Extended Kanban Control System (EKCS) 1030
Alvin ANG

Air Traffic Management of an Airport Using Discrete Event Simulation Method 1034
Maurizio BEVILACQUA, Filippo CIARAPICA, Giovanni MAZZUTO, Leonardo POSTACCHINI

Insertion Loss Analysis of Perforated Panel Muffler Using Finite Element Method with Equivalent Fluid Model 1039
Jingxiang LI, Shengdun ZHAO, Kunihiko ISHIHARA

Personnel Selection System Framework Research 1043
Zhengsheng HAN, Hongyan DUI, Shudong SUN

From Individual Creativity to Team Creativity 1047
Liqun WEN, Mingjian ZHOU, Qiang LU

Application of Affective Engineering in the Opening and Closing of Sport Utility vehicle Tailgates 1052
Taebeum RYU

The Impact Study of Transformational Leadership Style on Organizational Success 1056
Akechai JUDKRUE

The Effect of Online Service Failures on Consumer Repurchase Intention Basing on Mainland China Online Retailing 1061
Junfeng LIAO, Linlin ZHONG

Exploring the Intention of Customers to Use Innovative Digital Content Information Technology 1065
D.Y. SHA, Guo-Liang LAI

New Formal Approach To Project Critical Buffer 1070
Tomasz BLASZCZYK, Pawel BLASZCZYK

Investment Decisions on the Case Industrial Port BOT Project 1075
Tyrone T. LIN, H.C. SU

A Trimming Design Method for Product Innovation 1080
Yao-Tsung KO, Ping-Hong KUO

Multi-project Planning and Optimisation for Shipyard Operations 1085
Allan Nengsheng ZHANG, B. MA, D. LOKE, S. KUMAR, Y. Y. CHAN

Research on Jiangsu PV Solar Industrial Cluster Upgrading Driven by RJVs 1090
Lan CHEN, Bo WU

Exploring the Impact of Patent Expenditures on Performance: Evidence from Chinese Stock Market 1095
Xin LI

Leader's Values, Abusive Supervision, and Employee Performance: A Theoretical Model 1099
Xiaoli WEN, Chunhua CHEN

Research on the KMS for Small and Medium Manufacturing Enterprises based on ASP and CSP 1104
Huiyu HUANG, Jianying LUO, Zhicong ZHANG

Temporal Network Analysis of Emerging Technologies: Topic Transition in World Wide Web (WWW) Conferences 1108
Kazuma ARINO, Takao FURUKAWA, Nobuyuki SHIRAKAWA, Kumi OKUWADA

Knowledge Asset-based Three-stage Model of Innovative Enterprises Evolution 1113
Yunmei WANG, Chunlin SI, Fan XIA, King-Lien LEE

Modelling Ontology for Supporting Human Resource Planning Process 1118
Rohayati RAMLI, Mohd. Noah SHAHRUL AZMAN, Mohd Yusof MARYATI

Patent Portfolio Efficiency Using Data Envelopment Analysis: Case of Wind Power Market 1122
Rahul KAPOOR, Matti KARVONEN, Tuomo KASSI

Study of Supplier Support through New Product Development in System Integration Industry - Comparison of Case Studies based on Different Product Newness 1127
Min-Sun WUANG, Kuei-Fei YANG

Impact of Passionate and Charismatic Leadership on Creativity and Innovation within SMEs 1132
Wilson MALADZHI, Bingwen YAN, Oluwole Daniel MAKINDE

Analysis of RFID Technology on Controlling Shrinkage and Anti-counterfeiting in Luxury Industry 1137
Wei XU, Zhaotong LIAN, Xifan YAO

The Service Science Practice Research: A Proof of Service Concept on i236 Project in New Taipei City 1142
Hung Chih LAI, Yao Cheng YU, Kae Kuen HU, Hui Shan KUO

The Evaluation of Enterprise Manufacturing Services Maturity Model 1147
Hao LI, Yangjian JI, Xinjian GU, Guoning QI

Ten Steps in Mixed Engineering Education and Training 1152
Hsing-yu HOU, Huey-shing TSAI

Bilingual Teaching Practices of "Quality and Reliability Engineering" Course 1156
R. JIANG, T. WANG

An Empirical Study on Influencing Factors of Consumer Behavior of Engineering Insurance 1161
Li DONG, Yan-ling LIU

Evaluating the Reliability of Infrastructure Networks by Resilience Analysis 1165
C.Y. LAM, K. TAI

Visionary Leadership as a Catalyst for Innovative Culture in SMEs 1170
Bingwen YAN, Wilson MALADZHI, Oluwole Daniel MAKINDE

Extra-cluster Knowledge Search and Innovation Performance: An Empirical Study Based on Industrial Cluster Firms from Yangtze River Delta in China 1175
Ru-yan HONG, Jianmei MIAO

A Study of Regional Distributions and Dissimilarity Measures for Multi-Scale Nonlinear Structure Tensor in Texture Segmentation 1180
Shoudong HAN, Yong ZHAO, Wenbing TAO

Research on Project Portfolio Management of Product Development based on 3D Visualization 1185
Angang WEI, Gang ZHAO, Changyu CHEN, Fei WANG

Research of Idea Generation Process for Fuzzy Front End Based on Patent Analysis 1190
Jing GUO, Ping JIANG, Jingwei GUO, Runhua TAN

Virtual Human Emotional Behavior Model based on Neural Network 1195
Na REN, Tingting ZHAO, Hongjiang WANG, Rongxue ZHANG, Wenqiang ZHANG, Nan ZHANG

Research on Image Matting Technology Based on Image Edge Detection 1199
Rongxue ZHANG, Tingting ZHAO, Renna , Hongjiang WANG

Decision Analysis & Methods (4)

Factors for the Introduction of RFID on the Distribution Industry 1204
Hsin-Pin FU, Z.J DU, A LIN, Y.L LIN

Decision Evaluation for Damage Evaluation and Prevention Analysis in Bank Operational Risk Management 1209
Aron LARSSON, Sara VICKMAN

Evaluating GHG Components using Artificial Intelligence: Connection Weight Approach 1214
Oludolapo OLANREWAJU, Adisa JIMOH, Pulek KHOLOPANE

The AHP-based Decision Making on Innovation Trajectories in Public Research and Development Organisations 1218
Pawadee MEESAPAWONG, Yacine REZGUI, Haijiang LI

An Optimal LED Allocation System Based on Multilevel Integer Programming Method 1223
Haw-Ching YANG, T.H. TSAI, H.W. CHEN, F.T. CHENG

Analyzing Consequences of Diabetes Mellitus Using Intuitionistic Fuzzy Set 1228
Sujit DAS, Samarjit KAR

Effects of Buyers Capacity Limitation in an Integrated Lead Time Controllable Consignment Stock Inventory System 1233
Huizhi YI, Bhaba SARKER

Human Factors (1)

Assessment of Architectural and Physical Factors in Human Resources Performance in Project-Oriented Organizations 1238
Mona FOROOZANFAR, Mahmood GOLABCHI, Saied YOUSEFI

Effects of Load-Carrying Postures and Gender on Postural Sway 1243
Xingda QU

Study on Construction and Implement of User Model in Turret Display and Control System 1248
Kan ZHANG, Qing XUE, Minxia LIU, Qiqi YIN

Human-computer Interaction Analysis of Turret Based on Context-Aware 1253
Li-Ying FENG, Qi-qi YIN, Li-tao WANG, Qing XUE

The Comparison of Ergonomics Postures Assessment Methods in Rubber Sheet Production 1257
Panya WINTACHAI, Nivit CHAROENCHAI

A Paper Prototype Usability Study of a Chronic Disease Self-management System for Older Adults 1262
Da TAO, Calvin OR

Property of Worker Allocation Optimization with Two Professional Workers in Limited-Cycle Multiple Periods 1267
Xianda KONG, Jing SUN, Hisashi YAMAMOTO, Masayuki MATSUI

Human Factors (2)

Applied Human Factors Engineering in Advanced Carriage Design of Mass Transport System 1272
Seng Fat WONG, Qili CHEN

Managerial Compensation and Earnings Management: From the Managerial Overconfident Perspective 1277
Jing SUN, Xiaofeng JV, Yanmin PENG, Yue CHANG

A Study and Survey on the Service Condition of Barrier-free Facilities in the Transportation System with Ergonomic Evaluation 1282
Seng Fat WONG, Lili ZHONG, Weng Keong CHAN, Weng Hou LEONG, Kin Seng HO

Association of Visual Abilities, Motor Skill and Anticipation Responses on Parking Performance 1287
Bor-Shong LIU, Hsien-Yu TSENG, Tung-Chung CHIA, Tsung-Yen HO, Yu-Ho CHEN

An Airworthiness SHELL Model for Aircraft Maintenance 1292
Tsun Tat WONG, Sun TONG

The Mediating Impact of Ergonomics Between Existing Safety Culture And Targeted Safety Culture Amongst Safety And Health (SH) Practitioners 1297
Rozlina MD SIRAT, Awaluddin MOHAMED SHAHAROUN , Norhayati ZAKUAN, Syed Abdul Hamid SYED HASSAN

Ergonomics Effects of Work Pace And Work:Rest Ratio on Repetitive Powered Handtool Operations 1302
Jia-Hua LIN, Raymond MCGORRY, Rammohan MAIKALA

Causing Mechanism Analysis of Human Factors in the Marine Safety Management Based on the Entropy 1307
Haiyan WANG, Tingting DAI

Operations Research (4)

Investigating Sensitivity of Multi Response Optimization Methods 1312
Nitendra GAUTAM, Om Prakash YADAV, Bimal NEPAL

Comparing Two Proposed Meta-Heuristics to Solve a New P-Hub Location-Allocation Problem 1317
Ali GHODRATNAMA, Reza TAVAKKOLI-MOGHADDAM, Armand BABOLI

Real Options Between Three Asymmetric Firms 1322
Takashi SHIBATA

Modeling Fixed-Sequence Multi-Stage News Agency for Efficient Message Total System Time 1325
Abdullah ABDUL JABBAR, Nashat FORS, Seraj ABED, Sherif RABIA

Use of Shrinkage and Grouping Approaches to Forecasting Seasonal Demand 1330
Kui ZHANG, Pengyi GAO, Ziwu LONG

DEA Sensitivity Analysis on the Factors Responsible for Industrial Energy Consumption: Case Study on the Canadian Industrial Sector 1334
Oludolapo OLANREWAJU, Adisa JIMOH, Pulek KHOLOPANE

Arbitrage and Spread in FX market: an Extended Glosten and Milgrom Model 1338
Ming MA, Yufei ZHANG

Operations Research (5)

Optimal Pricing and Lot-sizing for Fresh Produce and Foods with Quality and Physical Quantity Deteriorating Simultaneously 1341
Yiyan QIN

Online Dispatching of Rail-Guided Vehicles in an Automated Air Cargo Terminal 1344
Wuhua HU, Jianfeng MAO

Maximizing the Total Weight Value of Just-In-Time Jobs in Identical Parallel Machines with Periodic Time Slots 1349
Eishi CHIBA, Takao KAGEYAMA, Yoshiyuki KARUNO, Hiroyuki GOTO

A New Lagrangian Decomposition and Coordination Approach for Energy Portfolio and Production Planning for Multiple Companies 1354
Eiji SEKIYA, Tatsushi NISHI, Masahiro INUIGUCHI

Maximum-Profit Rooted Not-Necessarily-Spanning Tree Problem 1359
Eishi CHIBA, Yusuke ABE, Toshiki SAITOH, Takao KAGEYAMA, Hiroki KOGA, Takashi KOBAYASHI, Hiroyuki GOTO

An Optimal Model for Adding Relation to an Indirect Subordinate in a Linking Pin Organization Structure 1364
Kiyoshi SAWADA

MTS Lead Time Uncertainty Study in Periodic Review MTS-MTO System 1368
Feng Yu WANG, Rajesh PIPLANI, Laura Xiao Xia XU, Amrik Singh BHULLAR

Engineering Education and Training

Research on Foundation and Practice of 123 Modes in Professional Engineer Education Training Plan 1373
Wang JINGHUA, Zhou JUN, Li JING, Yang ZEHUI, Zhang XINGUANG

Improving Capacity for Engineering Systems Thinking (CEST) among Industrial Engineering Students 1378
Sigal KORAL KORDOVA, Moti FRANK

Management Model to Certification and Recertification Criteria to Professional Engineers 1381
Oscar Alejandro VASQUEZ BERNAL, Felix Antonio CORTES ALDANA

Analyzing International Scientific Collaboration Pattern for China by Using ESI Database 1386
Dan XIANG, Huaxing LI

Externalization Of Knowledge In Indian Higher Education Through Increase In Research Publications 1391
Kalyan Kumar BHATTACHARJEE

Towards Modeling Manufacturing Flexibility Information in Metalcasting SMEs 1396
Rhythm WADHWA

Experience – An Essential Component to Improve the Confidence in Using Technology For Learning: An Empirical Study in Hong Kong Higher Education 1401
Hon Keung YAU, Alison Lai Fong CHENG

Applying Fuzzy MADM Approach for the Selection of Technical Institution 1405
Victor GAMBHIR, N.C. WADHWA, Sandeep GROVER, Sanjeev GOYAL

Supply Chain Management (4)

Fuzzy Power Stream Mapping to Measure Dominating Power in Supply Chain 1409
Anirban KUNDU, Vipul JAIN

Developing a Web-based Collaborative Forecasting Platform to Support Tourism Supply Chain Management 1414
Xinyan ZHANG, Haiyan SONG

Determination of Size of Supply Base under Uncertain Cost Information 1419
Jishnu HAZRA, B. MAHADEVAN

A Quantity-Flexibility Contract in Two Periods with Supply Chain Coordination 1424
Xin LI, Zhaotong LIAN, Wenhui ZHOU

Stochastic Demand Fulfillment Model with Multiple Demand Classes: Using Revenue Management 1429
Wen YANG, Richard Y. K. FUNG

Virtual Depot Approximation for the Transshipment Problem 1434
Dmitry KRASS, Oleksandr SHLAKHTER

Supply Chain Management (5)

Ranking of Automotive Supplier Selection Criteria in Pakistan: An AHP Approach 1439
Fikri DWERI, Sharfuddin Ahmed KHAN

Modeling the Macro-environmental Influences: An International Logistics View 1443
Supachart IAMRATANAKUL, Bordin RASSAMEETHES, Vatcharapol SUKHOTU, Sununta SIENGTHAI, Voratas KACHITVICHYANUKUL, Ravi SHANKAR

Information Security in Supply Chains - A Process Framework 1448
Arup ROY, A.D. GUPTA, S.G. DESHMUKH

A Modeling of Retailers Pricing in Advance Selling Based on Fairness and Reciprocity 1453
Junfeng LI, Shuping YI

A MILP Model and Heuristic Approach for Supply Chain Network Design with Minimum Volume Constraints 1458
Mouna KCHAOU BOUJELBEN, Celine GICQUEL, Michel MINOUX

Academic Supply Chain Management for Tertiary Educational Institutions 1463
Bishwajit Banik PATHIK, Md. Mamun HABIB

Supply Chain Management (6)

A Group Genetic Algorithm for the Fleet Size and Mix Vehicle Routing Problem 1468
Michael MUTINGI, Charles MBOHWA

Optimizing Replenishment Policy for Deteriorating Item Considering Inventory Dependent Demand, Inspection and Imperfect production 1473
Chun-Jen CHUNG

Integrated Supplier-Buyer Inventory Model with Optimal Reorder Point, Controllable Lead Time, and Service Level Constraint 1478
Yosi Agustina HIDAYAT, Suprayogi SUPRAYOGI, Sifa ISLAM, David Try LIPUTRA

New Approaches for Analyzing the Logistical Synchronization of Material Provision in Production Networks 1483
Patrick PRUSSING, Sven BAUMGARTEN, Georg ULLMANN

An Optimization Based Decision Support Model for Thai Rubber Industry Supply Chain : Preliminary Results 1488
Janya CHANCHAICHUJIT, Mohammed QUADDUS, Martin WEST, Jose SAAVEDRA-ROSAS

Modeling an Industrial Strategy for Inventory-Distribution Coordination of Telecom Operators in China: the 'Consignment Stock' Case 1493
Tianjian YANG, Yujia FAN, Xinzhe WANG

A Bi-objective Stochastic Programming Model for a Green Supply Chain with Deteriorating Products 1497
Zeinab SAZVAR, S.M.J. MIRZAPOUR AL-E-HASHEM, Armand BABOLI , M.R. AKBARI JOKAR, Yacine REKIK

An Order Splitting Policy for Deteriorating Products with Non-linear Holding Cost under Stochastic Supply Lead Time 1502
Zeinab SAZVAR, M.R. AKBARI JOKAR, Armand BABOLI

Quality Control & Management (3)

Customer Value Creation through Product Quality and Customer Usage of Product Functions: Managing the Industry Shift towards Smartphones 1507
Bjoern FRANK, Boris HERBAS TORRICO, Takao ENKAWA

A Simple Method on Power Calculation in Experiments for Treatment Comparison 1512
Huairui GUO, Pengying NIU, Ferenc SZIDAROVSZKY

Empower the Future: A Culture of Empowerment - The Link to Organisational Effectiveness 1517
Jurgens FRERK, Charles MBOHWA

Process Reliability Modeling Based on Characteristic Mapping 1523
Wei DAI, Fen KUANG, Jin AN, Yu ZHAO

A Case Based Approach for Modeling Process Elements and Overall Service Quality Perception 1528
Sheila ROY, Indrajit MUKHERJEE

An Integrated Architecture for Lean Waste Analysis 1533
Mohamed K. OMAR, Rohana ABDULLAH, Md Nizam ABD RAHMAN

Information Processing and Engineering (1)

Improvement of Retrieval in Case-based Reasoning for System Design 1538
Thierry COUDERT, Elise VAREILLES, Laurent GENESTE, Michel ALDANONDO

Construction of Transport Networks that Combine Building Pathways and Roads for Evacuation Routing and Scheduling Problem 1543
Mojahid SAEED OSMAN, Bala RAM

A Case Study on Real-Time Parcel Delivery Sequence Optimization 1548
Jaekyung YANG, Wooyeon YU, Myoung Jin CHOI

Comparing Complex Business Process Models 1553
Philip WEBER, Paul TAYLOR, Basim MAJEED, Behzad BORDBAR

Critical Business Objects and Its Applications in Designing Performance Management Systems 1558
Mohamad AGHDASI, Ehsan MALIHI, Yasaman ASADI, Shohreh GHADAMI

Lossless Image Compression with Areas of Cross-Point Regions for Modeling 1563
Tin Thanh DANG, Canh Xuan HUYNH

Information Processing and Engineering (2)

Usability of an Electronic Health Record 1568
Rui PEREIRA, Julio DUARTE, Maria SALAZAR, Manuel SANTOS, Antonio ABELHA, Jose MACHADO

A Hybrid Evolutionary-based Process Mining Technology to Discover Parallelism Structures 1573
Hsin-Jung CHENG, Yeh-Chun JUAN, C. OU-YANG

Logistics Process Modeling and Execution in the Cloud 1578
Jens LEVELING, Damian DANILUK, Arkadius SCHIER

Application of Exploratory Data Analysis in Healthcare: the Case of Warfarin Initiation Phase in a Swedish Hospital 1583
Hendry RAHARJO, Baris TEKIN, Jingren CHANG

Exploring How Add-On Software Development Affects Graphic Editors' Learning Results 1588
Liang-Yuan HSIUNG, Mu-Hui LAI, Hwa-Ming NIEH, Yuan-Du HSIAO

Extendible Data Model for Real-time Business Process Analysis 1593
Marcello LEIDA, Andrej CHU, Maurizio COLOMBO, Basim MAJEED

Research on Real-time Temperature Monitoring System of Thermal Power 1598
Jiang GUO, Ming-shu FAN, Kai-kai GU, Xiao-Lu XU, Ke-fei ZHANG

Developing Kernel Intuitionistic Fuzzy C-Means Clustering for E-Learning Customer Analysis 1603
Kuo-Ping LIN, Ching-Lin LIN, Kuo-Chen HUNG, Yu-Ming LU, Ping-Feng PAI

Production Planning & Control (4)

Economic Production Quantity Model with Imperfect Quality During a Process Adjustment Period 1608
Ismail AL-ME'RAJ, Shokri Z. SELIM, Yahya CINAR

A Review of Key Research Streams for Managing Uncertainties in Production Planning and Control 1612
Emrah ARICA, Jan Ola STRANDHAGEN, Hans Henrik HVOLBY

A Novel Process Planning Approach for Hybrid Manufacturing Consisting of Additive, Subtractive and Inspection Processes 1617
Zicheng ZHU, Vimal DHOKIA, Stephen NEWMAN

A Real Time Event Supervisor System for Efficient Production Control 1622
Emrah ARICA, Sindre GRINDHEIM, Olivier ROULET-DUBONNET

The Problem of One-Dimensionally Cutting Bars with Alternative Cutting Lenghts in the Tubes Rolling Process 1627
Richard LACKES, Markus SIEPERMANN, Torsten NOLL

Assembly Process Driven Product Architecting 1632
Harrys DANIILIDIS, Udo LINDEMANN

Systems Modeling and Simulation (1)

Estimating Machine Startup Timing with Petri Nets 1637
Reggie DAVIDRAJUH

Simulating Staffing Needs for Patient Registration in a Hospital 1642
Sung SHIM, Arun KUMAR, Roger JIAO

Simulation Based MANOVA Analysis of Pharmaceutical Automation System in Central Fill Pharmacy 1647
Debiao LI, San Wong YOON

Enriching the Generic Simulation Modeling and Executing Framework with the Statistical Software Package R and the SQLite Database 1652
Dae-Eun LIM, Jangwon CHO, Haejoong KIM, Hyun-Min PARK

Coil Baking Process Modeling with Neural Network 1656
Wimalin S. LAOSIRITAWORN

Integrated Optimization of Pricing, Production and Delivery Decisions in a SVMB System of Deteriorating Items and PSO Algorithm 1661
Zhixiang CHEN, Bhaba SARKER, Bingqing WU

System Reliability Modeling for Multi-state Hierarchical System with Multi-level Information Aggregation 1666
Mingyang LI, Byoung Uk KIM, Jian LIU

Systems Modeling and Simulation (2)

A Case Study of Using Simulation for Process Improvement in a Hospital Admission Center 1671
Pei-Fang TSAI, Jian-Ciang CHEN, Jhih-Han CHEN, Fu-Man LIN, Porntipa ONGKUNARUK

Applying the Informatinal Approach to Global Optimization to the Homoscedastic Stochastic Simulation 1676
Jun YUAN, Chengwei HAN, Szu Hui NG

SLA-Based Virtualized Resource Allocation for Multi-tier Web Application in Cloud Simulation Environment 1681
Haitao YUAN, Jing BI, Bo Hu LI, Xudong CHAI, Ming TIE

Simulation Study on the Effect of Diagnosis Related Group Design in Length-of-Stay and Case-Mix Index for Hospitals in Taiwan 1686
Jian-Ciang CHEN, Pei-Fang TSAI, Fu-Man LIN

Synthetic Population - A Case Study of Hong Kong Population 1691
Yam Hon CHAN, Kwok Leung TSUI

Consideration of Human Reliability in Actor-Oriented Simulation of New Product Development 1696
Soenke DUCKWITZ, Raymond DJALOEIS, Malte HINSCH, Joerg FELDHUSEN, Christopher M. SCHLICK

Layout Redesign of a Warehouse through Modeling and Simulation 1701
Chin Soon CHONG, Feng Yu WANG, Laura Xiao Xia XU, Eng Hock LUA

Picking Path Optimization of Automated Storage and Retrieval System 1706
Xiaocui MIAO, Lindu ZHAO

Service Innovation and Management (1)

Modeling Population Dynamics on a Spatially Distributed Service Network: Depicting the Influence of Socio-economic Factors on Service Delivery 1711
Joymariel MELECIO-VINALES, Alexandra MEDINA-BORJA, J MEDIN

Microfoundations of Dynamic Capabilities: A Case Study in Airline Catering Industry 1716
Emre EKSI, Ayberk SOYER, Sezi CEVIK ONAR

An Operational Definition of Path Dependency 1721
Cigdem KADAIFCI, Ayberk SOYER, Sezi CEVIK ONAR

Developing a Measurement Model for Path Dependency 1726
Burcu AKYILDIZ, Sezi Cevik ONAR, Ayberk SOYER

The Driving Forces of Customer Involvement in Service Innovation from the Customer 1731
Jun JIN, Junying CHEN

Characterizing Product-Service Systems in the Healthcare Industry - An Internal Stakeholder Perspective 1736
Man Hang YIP, Robert PHAAL, David ROBERT

Service Innovation and Management (2)

Applying Quality Function Development to Develop the Home Delivery Service Model for Specialty Foods in Traditional Market 1741
Mu-Chen CHEN, Chia-Lin HSU, Ying-Yi LEE

Research on Service-oriented Manufacturing Based on Service Knowledge Integrated Platform 1746
Gao NA, Zhao SONGZHENG

The Application of Value Innovation from Blue Ocean Strategy in Cultural Creative Industy 1750
Tain-Fung WU, Chih-Lan KAO

Pathway Identification via Process Mining for Patients with Multiple Conditions 1754
Xiaojin ZHANG, Songlin CHEN

Service Recovery Matrix: Matching Service Failures and Recovery Options 1759
Victor John CANTOR, Richard LI

Utilizing QFD in Creation of a New Industrial Service Concept 1764
Ville OJANEN, Tatiana SHUNINA, Tuomo KASSI

Exploring Innovation Model for Business Technology Incubator in Developing Countries 1769
James K. C. CHEN, Chu-Shiu LI, Amrita BATCHULUUN

Service Innovation and Management (3)

The Impact of Culture, Leadership, Governance, and ICT Systems on Service Innovation in Service Value Networks 1774
Renu AGARWAL, Willem SELEN

The Relationships Between Beach Vacationers' Motivation and the Physical Settings of Beaches 1779
Huey-Hsi LO

Equilibrium Strategic Behavior and Optimal Pricing with Experience Service 1785
Zhaotong LIAN, Jinbiao WU, Lihua CAO

Exploring CRM Implementation - The Conceptual Model of the Impact of CRM on Service Operations 1790
Pimjai TONGMEE, Prattana PUNNAKITIKASHEM

An Exploratory Study on Preferred Open Innovation Types and Partners in South African SMEs 1795
Willie KRAUSE, Corne SCHUTTE, Niek DU PREEZ

External Marketing and Internal Marketing: Which Capability Holds the Key to an Outstanding Performance? 1800
Wen-Jung CHANG, Christina TAY

Technology and Knowledge Management (4)

Do Individual Emotion and Corporative Environment Influence Technology Transfer in Taiwan Technology Industry? 1805
Meng-Shan TSAI, Meng-Chen TSAI, Chi-Cheng CHANG

Research on Knowledge Innovation Oriented Post-evaluation Method of Basic Research Project 1810
Lin GONG, Zixu CHEN, Guoxin WANG, Jiping LU

Analyzing the Building and Using Situations of E-learning Platform: From Total Quality Management and Knowledge Management Perspectives 1815
Meng-Shan TSAI, Meng-Chen TSAI, Chi-Cheng CHANG

The Financial Impact of Using RFID in Healthcare 1820
Ibrahim AL KATTAN, Taha ANJAMROOZ

Technology Evaluation: Fitting Tools and Techniques to the Stages of the Evaluation Process 1825
Fernando ROMERO, Fernando BARBOSA

Knowledge Management Maturity Assessment in Research Institutions Using Analytic Hierarchy Process and Fuzzy Comprehensive Evaluation Method 1830
Jingwen LI, Yaoguang HU, Jialin HAN

Quality Dimensions Relevant to a First Tier Automotive Supplier: Case Study at an Automotive Seat Cover Supplier 1835
Kem RAMDASS

Technology and Knowledge Management (5)

Government as the Decision Maker in Infrastructure Projects: What Diffusion Models Tell Us 1840
Ann KLOBUCHER, Dan EDGAR, Jessica HILDAHL, Melissa ELFERING, Harm-Jan STEENHUIS

Knowledge Engineering in Interdisciplinary Research Clusters 1845
Claudia JOOSS, Rena VOSSEN, Ingo LEISTEN, Anja RICHERT, Sabina JESCHKE

The Complementary of TQM on Technology Management Strategy: A Multinational Perspective from the ASEAN Automotive Industry 1853
Pei-Lee TEH, Tritos LAOSIRIHONGTHONG, Dotun ADEBANJO

Does Science and Technology Correlation with Academic Ability? a New Science and Technology Linkage Evaluation Ranking System Introduce 1858
Yi-Ching LIAW, Chin-Yuan FAN, Te-Yi CHAN, K. L. CHI

Critical Knowledge Sharing Barriers: An Interpretive Structural Modeling Approach 1863
Bhupendra Prakash SHARMA, M. D. SINGH

A Comprehensive Instrument to Efficiently Measure Firm IT Capability in an IT Environment 1868
Chui Young YOON, Seung Yong KIM

Facilities Planning and Management

Process Management within a Multi-project Large-scale Plant Engineering Environment 1873
Egon MUELLER, Ralph RIEDEL, Martin DOMAGK, Christian BARNSTEDT, Florian MEURS

A New Multi-objective Mathematical Model for Relief Logistic Network under Uncertainty 1878
Mohammad REZAEI-MALEK, Reza TAVAKKOLI-MOGHADDAM

Bibliometric Analysis of Power Grid Research: Identifying Knowledge Domain 1883
Ichiro SAKATA, Hisato TASHIRO

Exploring the Antecedent and Subsequence Factors for Knowledge Management 1888
Meng-Chen TSAI, Chi-Cheng CHANG

A Location - Routing Problem with Emergency Referral Solved by Using a Genetic Algorithm 1893
Phongchai JITTAMAI, Jarupong BANTHAO

A Single Phase Optimization of Stochastic Location Allocation Problem in a Two Echelon Supply Chain 1898
Mahdi BASHIRI, Mehdi JAFARIAN

Factory Layout Benchmark with Extended Failure Mode and Effect Analysis 1903
Uwe DOMBROWSKI, Christoph RIECHEL

Major Accident Prevention in the Planning Process of Offshore Operation and Maintenance Activities - Initial Study 1909
Sizarta SARSHAR

Reliability and Maintenance Engineering (3)

Risk Metrics: Interpretation and Choice 1914
Inger Lise JOHANSEN, Marvin RAUSAND

How to Develop the Grouping Strategy for Offshore Wind Turbines at the Wind Farm Level 1919
Zafar HAMEED, Jorn VATN

Reliability and Spare Parts Estimation Taking into Consideration the Operational Environment - A Case Study 1924
Abbas BARABADI, Behzad GHODRATI, Javad BARABADY, Tore MARKESET

Using Piecewise Exponential Model to Schedule Preventive Maintenance Interval in Manufacturing Systems 1930
Liangpeng CHEN, Boray HUANG, Loon Ching TANG, Min XIE

Simulation on Optimum Operation of Ship Main Engine Support System by Using System Dynamics 1935
Dhimas HANDANI, Makoto UCHIDA

Reliability Optimization of a Series System with Multiple-choice and Budget Constraints Using a Genetic Algorithm 1940
Alireza ZAREI, Ahmadreza ZAREI

Optimal Replacement Threshold and Inspection Interval for Condition-Based Maintenance with Variable Failure Cost 1944
Hamid Reza GOLMAKANI, Morteza POURESMAEELI

E-Business and E-Commerce

Cultural Adaptations of Macau's Casino Hotel Web Sites 1949
Chang Boon LEE, Stella LEONG

A Study of Impulse Buying in Virtual Communities 1954
Guohong WEI, Chun HU

Generic Modeling Propositions for Configuring, Sale, Product and Production 1959
Linda ZHANG, Elise VAREILLES, Michel ALDANONDO, Petri HELO

Evaluations of A Core Broking Model from the Viewpoint of Online Group Trading 1964
Pen-Choug SUN, Michael ODETAYO, Rahat IQBAL, Anne JAMES

The Effect of Online Group-buying on Off-line Buying Decisions 1969
Junfeng LIAO, Xichen DONG, Xunqi LIU

Study on the Loss of Social Welfare Caused by Search in the Market Based on the Asymmetric Information 1972
Qiong WANG, Shixiang HUANG

Project Management (2)

Entering the Nuclear Power Plant Supply Chain: the France Case Study 1976
Giorgio LOCATELLI, Mauro MANCINI, Gianluca COCCO, Valentino RUZZON

Bidding Decision Making in Construction Industry: An Analysis Based on Procedural Rationality 1981
Zhuo FENG, Shuibo ZHANG, Ying GAO, Fei KANG

Strategic Resource Planning Based on Staffing Profiles 1986
Eduardo MIRANDA

Theory of the Triple Constraint - a Conceptual Review 1991
C. Jurie VAN WYNGAARD, Jan-Harm PRETORIUS, Leon PRETORIUS

Accounting for Risk Interactions and Using Importance Measures for Risk Prioritization in Project Management 1998
Chao FANG, Xun XIAO, Xiaoyan ZHU

Perceptual Differences Between Project Managers and Sponsors in the Intiation Phase of a Project 2003
Stephen ONU

Risk Management for Construction Projects with Colored Petri Nets: an Agent-Based Modeling Framework 2008
Yangbing ZHANG, Yongqiang CHEN, Xingyu ZHU

On Deployment of Empowered Team Concept into Matrix Organization 2013
Hanwei XU, Bin LIN, Minmin SHEN

Robust Optimization of Project Portfolio Selection and Scheduling Problem with Stochastic Returns 2018
Ying LI, Yongyi SHOU

Global Manufacturing and Management (1)

Strategy for Virtual Factory Information System Design 2023
Yuqiuge HAO, Ahm SHAMSUZZOHA, Petri HELO

Virtual Enterprise Management: Perspective of Process-Based Business Collaboration 2028
AHM SHAMSUZZOHA, Filipe FERREIRA, Jose FARIA, Americo AZEVEDO, Yuqiuge HAO, Petri HELO

The Relationship among Country of Origin Effects, Brand Image and Purchase Intentions in Taiwanese Apparel Market 2033
Chu Erh HSIUNG, Cheng-Ter HO

Scientific Catch-up Process in Asian Countries: A Case Study of Solar Cell 2038
Ichiro SAKATA, Hajime SASAKI, Hisato TASHIRO, Aya ISHIHARA, Keiko KAYUKAWA

Technology Gap, Market Experience and MNCs' Technology Licensing Strategies: Evidence from China 2043
Lei XIONG, Xiaobo WU, Rui GUO, Ruishe ZENG

Using System Thinking to Investigate Co-Opetition Analysis for Manufacturers in the Cloud Industry 2048
Chin-Yuan FAN, Sheau-Pyng JU, Ming-Fong LAI

Global Manufacturing and Management (2)

Global Product Development: the Experience in a Brazilian Manufacturing and Assembler Automotive Subsidiary 2053
Andre SEGISMUNDO, Paulo A. CAUCHICK MIGUEL

The Impact of Guanxi on Internationalization Entry Mode for Chinese Enterprises: A Multiple-Case Study 2058
Rongjun DU, Xiaobo WU, Xubo BAI

Latest Developments Aiming an Integrated Management System Tool Focusing Maturity Assessment 2063
Jose Pedro TEIXEIRA DOMINGUES, Paulo SAMPAIO, Pedro AREZES

Facilitating Customer Involvement Into the Decision-making Process of Concept Generation and Concept Evaluation for New Product Development 2068
Chih-Hsuan WANG

Information Interpretation-oriented Integration Interface for Manufacturing Enterprises 2073
Changyu CHEN, Gang ZHAO

Safety, Security and Risk Management (2)

Value Drivers in Supply Chain Security 2078
Lea HANNOLA, Ville OJANEN, Sirra TOIVONEN, Tuomo KASSI

Development of a Barrier Management System for Continuous Monitoring and Maintenance of Safety Barriers 2083
R.M. Chandima RATNAYAKE, Sukvir PANESAR SINGH, Jawad RAZA

How Can We Improve Healthcare Management for Patient Safety by Analyzing Large-Scale Incident Reports ? 2088
Masanori AKIYAMA, K FUJITA

Prediction of Soleplate Corrosion in Petroleum Storage Tank Based on Grey Model GM(1,1) 2093
Xiao-gang ZHAO, Yi ZHOU, Fei CHENG, Jian-cheng ZHU, Jie ZHENG, De-peng GAO

Modeling and Reliability Assessment of a 3-channel Safety-instrumented System 2098
Yiliu LIU, Marvin RAUSAND, Hui JIN

Dynamic Measurement and Evaluation on Foreign Exchange Risks of International Construction Projects 2103
Xiuqin WANG, Bin GAO

Resilience Measurement for A Class of Supply Chain Disruption 2108
Shu YI, Xinping WANG, Lindu ZHAO, Micheal HERTY

Estimating the Remaining Useful Life of Li-ion Batteries with a Bayesian Updating Model 2113
Yizhen HAI, Jie TANG, Kwok Leung TSUI

Poster Session 2

Reliable Joint Inventory Location Problem with Penalty Cost and Capacitated Facilities 2117
Elham TAGHIZADEH, Mostafa ABEDZADEH, Mostafa SETAK

Impact of Customer Response to Retailer Stock-out on Supply Chain Performance 2122
Xiaoling ZHANG, Qiang LU, Teresa WU

Pricing and service level strategies based on customers 2127
Junxiu JIA, Z. YUAN

A Simulation Based Experimental Investigation of Demand and Supply Uncertainty 2131
Carman Ka Man LEE, Rohan PASARI

Forecasting Product Returns Using Causal Analysis and Multiple Linear Regression 2136
Shantanu CHAKRABORTY, Rajesh KUMAR, Prasanna AKELLA, Satyendra SINGH

Evaluating Retailer Consumer Return Policy under VMI Partnership 2140
Shahrokh HEMATYAR, S. Kamal CHAHARSOOGHI

Decision Aided Tool for Recycled Spare Parts Management Under Uncertainties 2145
Nouha GHORBEL, Sid-Ali ADDOUCHE, Abderrahman ELMHAMEDI, Younes BOUJELBENE

An Integrated Method of Hierarchical Planning and "Pull-way" Production Control for Lean Shipbuilding 2150
Mingdi ZONG, Houfang SUN

Optimal Control of a SOM System with Demands for Product and PSS 2155
Kangzhou WANG, Zhibin JIANG, Tongyi WANG, Guowei LI

A Due Date Assignment Method based on LOMC 2160
Hao-yun YAN, Bin WU, Hong-yu LI

Analysis of the Life Cycle Trend of the Export Market of Taiwanese Bicycle Industry 2165
Leichuan LIN, Shan-Yau WU

A Novel Formulation for Unit Commitment With Wind Power Considering Production Cost of Every Generator 2169
Guowei HU, Zhaohong BIE, Bowen HUA

Orders Tracking and Production Visualization Oriented Lean Production 2174
Jialin HAN, Yaoguang HU, Jingwen LI, Qiqi YIN

An Adaptive Approach to Failure Modes and Effects Analysis for Computer-aided Inspection Planning 2179
Shirin MIRDAMADI, Ali SIADAT, Jean-Yves DANTAN, Lionel ROUCOULES

Problem Transformation Approach to Solve the Single-machine Scheduling Problem with Availability Constraints 2184
Kenta TAKII, Shunji TANAKA

Practical Order Release Planning Linking Enterprise and Shop Floor Tracking Systems for High-Mix Low-Volume (HMLV) Manufacturing 2189
Tay Jin CHUA, Tian Xiang CAI, Feng Yu WANG

A New Intuitionistic Fuzzy Cosine Similarity Measures and Its Application 2194
Kuo-Chen HUNG, Kuo-Ping LIN

Performance and Efficiency Measurement for Canadian Bank Branches 2199
Zijiang YANG, Yuanyuan LUO, Younes BENSLIMANE

Fuzzy Random Possibilistic Programming Model for Multi-objective Problem 2204
Arbaiy NUREIZE, Junzo WATADA

Effect of Market Orientation on Performance: An Empirical Study 2209
Hung-Tso LIN, Yin-Chi HUANG, Chia-Hua LEE

A Game Theoretic Model for Analysis of Material Reuse Modularity 2214
Yangjian JI, Roger JIAO, Liang CHEN, Chunlong WU, Hao LI

The Impacts of Product Delay Cost on Rush Order Decision for Job Shop Production Systems 2219
Min WANG, Cheng-Yu HUANG, Chun-Yuan CHENG

Application of Undesirable Input-Output Two-Phase DEA Model in Environmental Performance Audit 2224
Rongbing HUANG

The Experiment and Numerical Simulation for Hydro-mechanical Deep Drawing Process 2229
Fan XU, Shengdun ZHAO, Jun LIN

Experimental Investigation of the Influence of the Different Loading Conditions on the New Type Precision Bar Blanking System 2235
Bin ZHONG, Shengdun ZHAO, Renfeng ZHAO, Fan XU

RCPSP with Partially Renewable Resources and Resource Consumption during Setup Operations 2240
Hironori OKUBO, Toshiyuki MIYAMOTO, Kazuyuki MORI, Shoichi KITAMURA, Yoshio IZUI

Design and Actualization of IoT-based Intelligent Logistics System 2245
Zhiqiang XU, Jialiang HE, Zhiyong CHEN

Keshtel Algorithm (KA); A New Optimization Algorithm Inspired by Keshtels' Feeding 2249
Mostafa HAJIAGHAEI-KESHTELI, Majid AMINNAYERI

Robust Remaining Useful Life Prediction for Li-ion Batteries with a Naive Bayesian Classifier 2254
Selina NG, Kwok Leung TSUI

An Integrated Study in Determining the Optimal Policy for Warranty, Pricing and Production of Repairable Products under FRW 2259
Chun-Wu YEH, Tean-Quay LEE, Chih-Chiang FANG

Servicing Strategy and Preventive Maintenance for Products Sold with One-Dimensional Warranties 2264
Mustofa MAKMOEN, Andi CAKRAVASTIA, Bermawi ISKANDAR, Dradjad IRIANTO

An Acceleration Method for the Permutation Flow Shop Problem Minimizing Total Flow Time 2268
Xingye DONG, Ping CHEN, Houkuan HUANG, Maciek NOWAK

Quay Crane Sequencing Considering Productivity, Interference and Yard Congestion Constraints 2272
Effrosyni THEODOROU, Ali DIABAT, Davor SVETINOVIC

A Multi-Objective Model in the Green Supply Chain Network Design 2277
Farzad NIAKAN, Armand BABOLI , Reza TAVAKKOLI-MOGHADDAM, Valerie BOTTA-GENOULAZ, Jean-Pierre CAMPAGNE

Development of an EOQ Model for Single Source & Destination, Deteriorating Products Incorporating Price & Freight Discount under Fuzzy Environment 2282
Kanika GANDHI, P.C. JHA, Yogender SINGH

Optimal Duration and Control of Promotional Campaign for Durable Technology Product 2287
Sugandha AGGARWAL, Anshu GUPTA, Yogender SINGH, P.C. JHA

An Integrated Model for Quay Crane Assignment and Quay Crane Scheduling Problems 2292
Yi-Min FU, Ali DIABAT, I-Tsung TSAI

Optimization of the Billet Cutting Operation in the Aluminum Industry: a Case Study 2297
Nadjib BRAHIMI, Abrar KHALAF, Hebah AL-HAMMADI

Multi-stage Parallel-machine Job Shop Scheduling with Due Windows 2302
Rong-Hwa HUANG, Chang-Lin YANG

A Revised Model for the Static Berth Allocation Problem with Berth Restrictions on Vessel Assignment 2307
Ahmed SIMRIN, Shaikha AL ZAABI, Ali DIABAT

Evaluation of C4ISR System Effectiveness based on Markov Logic Networks 2312
Ruotong LIAO, Yanjun LIU, Zhong LIU, Qian MENG, Xunhui LUO

Evaluation of Project's Alternatives Based on a Multi Criteria Decision Approach 2317
Mohammadhosein MOKHTARANI, Hamed SHAKOURI G, H SOLEIMANI

Aircraft Trip DOC Parameters: A Function of Stage Length, Seat Capacity and Design Range 2322
Yu WANG, Hong SUN, Peiwen ZHANG

Stock Characteristics and Transaction Cost in Japanese Stock Market 2326
Junji MAWARIBUCHI, Koichi MIYAZAKI

A Bibliometric Description and Content Analysis of Mega-project Characteristics 2331
Xiaofeng PENG, Wen CHE, Yongyi SHOU

Empirical Study on the Relationships Between Leadership and Technology Entrepreneurial Performance 2337
Cuixia WANG, Jianmei MIAO, Weiwei YE, Xu YI

Study and Application on Aided Innovation Design Method Based on Semantic Analysis and TRIZ theory 2341
Zixu CHEN, Lin GONG, Yan SONG, Guoxin WANG

The Exploration of Transform Leadership and Organizational Performance --- Two Mediators' Model 2346
Chi-Chuan WU, Fang Chia HSIEH, Chien-Wei HO

Corporate Citizenship Taking on Social Welfare: Concept Area and Competitive Advantage 2351
Xueying TIAN

The Establishment of Model for Measuring Interpretation Satisfaction: The Role of Service Quality and Perceived Interpretation Value 2356
Li-Hui CHANG, Cheng-Shih LIN, Tsen-I KUO

Socially Responsible Service Operations Management - Trends and Challenges 2360
Hosang JUNG, Seungbae SIM

A Rapid Optical System for Surface Roughness Measurement of Hard Films 2365
Chil-Chyuan KUO, Y.T SIAO

Simulation Study on Quality Risk of Quality Organizational Structure Based on Agent-based Model 2370
Chunhui YANG, Tao HU, Zhaohui LUO, Lei YANG

Quality Monitor in Multi-operation Machining Processes based on Wavelet Filtering 2375
Bing CHEN, Pei WANG, Dinghua ZHANG, Kai LIU

The Joint Impact of Process Ownership and Continuous Process Improvement on Financial Performance and Customer Satisfaction 2380
Doris WEITLANER, Markus KOHLBACHER, Andreas KAMAGAEW

Author Index **2385**

Interpretive Structural Model of Key Performance Indicators for Sustainable Manufacturing Evaluation in Automotive Companies

E. Amrina[1], S. M. Yusof[2]
[1]Department of Industrial Engineering, Andalas University, Padang, Indonesia
[2]Department of Manufacturing & Industrial Engineering, Universiti Teknologi Malaysia, Johor, Malaysia
(elita@ft.unand.ac.id, shari@fkm.utm.my)

Abstract – **This paper aims to analyze the interrelationships among the key performance indicators of sustainable manufacturing evaluation in automotive companies. The initial key performance indicators have been identified and derived from literature and were then validated by industry survey. Interpretive structural modeling (ISM) methodology is applied to develop a hierarchical structure of the key performance indicators in three levels. Of nine indicators, there are five unstable indicators which have both high driver and dependence power, thus requiring further attention. It is believed that the model can provide a better insight for automotive managers in assessing their sustainable manufacturing performance.**

Keywords - **Automotive, interpretive structural modeling, key performance indicators, sustainable manufacturing**

I. INTRODUCTION

Sustainable manufacturing has become a very important issue amongst industries worldwide. Achieving sustainability in manufacturing activities have been recognized as a critical need due to diminishing non-renewable resources, stricter regulations related to environment and occupational safety, and increasing consumer preference for environmentally-friendly products [1].

The adoption of sustainable manufacturing offers companies a cost effective route to improve their economic, environmental, and social performance as the three pillars of sustainability [2]. Companies that adopt sustainable practices are able to achieve better product quality, higher market-share, and increased profits [3].

It has been suggested that sustainable manufacturing must respond to [4]: (i) economical challenges, by producing wealth and new services ensuring development and competitiveness through time; (ii) environmental challenges, by promoting minimal use of natural resources (in particular non-renewable) and managing them in the best possible way while reducing environmental impact; and (iii) social challenges, by promoting social development and improved quality of life through renewed quality of wealth and jobs.

Sustainable manufacturing has to be evaluated based on the triple bottom line of economic, environmental, and social performance [5] as well as to consider their interdependencies [6].

There are few studies that have identified the key performance indicators for sustainable manufacturing which integrate the triple bottom line of sustainability. However, to the best of author's knowledge, there exists no hierarchical structure to which one can provide insight to the relationship among the key performance indicators. In this research, attempt is made to identify the interrelationships among the indicators. A hierarchical structure model has been developed using the Interpretive Structural Modeling (ISM) methodology.

II. METHODOLOGY

The methodology has three interrelated stages:

Stage 1: Identification of KPIs

This study starts with the development of initial key performance indicators (KPIs) for sustainable manufacturing evaluation in automotive companies through literature review. The initial KPIs have been constructed by integrating manufacturing performance indicators and sustainable manufacturing indicators. The initial KPIs have adopted the triple bottom line of sustainability consisting of environmental, economic, and social performance factors. As a result, the initial KPIs consist of three factors divided into nine indicators were identified [7] as shown in Table I.

TABLE I
INITIAL KPI OF SUSTAINABLE MANUFACTURING EVALUATION

Factors	Indicators
1. Environmental performance	1. Emissions
	2. Resource utilization
	3. Waste
2. Economic performance	4. Quality
	5. Cost
	6. Delivery
	7. Flexibility
3. Social performance	8. Employee
	9. Supplier

Stage 2: Conducting industry survey

In order to validate the initial KPIs, a survey was conducted to 118 automotive companies which manufacture parts and accessories for motor vehicles and their engines listed in Proton Vendor Association (PVA)

members. A total of 54 completed responses were received and three of them were incomplete, resulting in a response rate of 43.2 percent. The survey results indicate that all the initial KPIs are at important to very important level as shown in Table II.

In term of factors, social performance is regarded as the highest important factor, followed by economic and environmental performance. For indicators, supplier and quality are the most important indicators. Finally, three factors with a total nine indicators have been proposed as the KPIs for sustainable manufacturing evaluation in automotive companies [8].

TABLE II
MEAN IMPORTANT LEVEL OF THE KPI

Factors	Mean	Indicators	Mean
Social	4.170	Supplier	4.240
Economic	4.143	Quality	4.208
Environmental	4.062	Delivery	4.158
		Resource utilization	4.140
		Cost	4.135
		Employee	4.128
		Emission	4.060
		Flexibility	4.056
		Waste	3.960

Stage 3: Conducting ISM survey

An ISM questionnaire was designed and mailed to six senior managers from the automotive companies in Malaysia. Those managers were carefully selected based on their experience in automotive industry. The result is used to develop a hierarchical structure model of the KPIs for sustainable manufacturing evaluation. Details are given in the following section.

III. DEVELOPMENT OF ISM MODEL

ISM is a computer-assisted learning process that enables individuals or groups to develop a map of the complex relationships between many elements involved in a complex situation [9]. It helps build an interaction map to identify the interrelationships between variables. ISM methodology gives a better understanding of a system structure and draws up a useful guideline in generating a graphical representation of the structure [10].

The following steps show the development of an interpretive structural model of the nine KPIs for sustainable manufacturing evaluation in automotive companies.

A. Structural self-interaction matrix (SSIM)

Six experts were consulted in identifying the relationships amongst the KPIs through ISM survey. In total, 19 direct relationships were confirmed in the survey. The SSIM for the KPIs is given in Table III.

TABLE III
STRUCTURAL SELF-INTERACTION MATRIX (SSIM)

Dimensions	1	2	3	4	5	6	7	8	9
1. Emission	-	X	O	O	O	O	O	O	O
2. Resource utilization		-	V	V	V	V	O	O	O
3. Waste			-	O	X	O	O	O	O
4. Quality				-	X	O	O	A	A
5. Cost					-	V	V	X	X
6. Delivery						-	O	O	A
7. Flexibility							-	O	O
8. Employee								-	O
9. Supplier									-

Four symbols are used to denote the direction of relationship between the indicators (*i* and *j*):

V for the relation from *i* to *j*
A for the relation from *j* to *i*
X for both directions, relations from *i* to *j* and *j* to *i*.
O if the relation between the indicators does not appear valid.

B. Initial reachability matrix

The SSIM is transformed into a binary matrix, called the initial reachability matrix by substituting V, A, X, O by 1 and 0 as per the following rules:

- If the (i, j) entry in the SSIM is V, then the (i, j) entry in the reachability matrix becomes 1 and the (j, i) entry becomes 0.
- If the (i, j) entry in the SSIM is A, then the (i, j) entry in the reachability matrix becomes 0 and the (j, i) entry becomes 1.
- If the (i, j) entry in the SSIM is X, then entry for both (i, j) and (j, i) is 1.
- If the (i, j) entry in the SSIM is O, then entry for both (i, j) and (j, i) is 0.

The initial reachability matrix of the KPIs for sustainable manufacturing evaluation is obtained by following the rules above and shown in Table IV.

TABLE IV
INITIAL REACHABILITY MATRIX

Dimensions	1	2	3	4	5	6	7	8	9
1. Emission	1	1	0	0	0	0	0	0	0
2. Resource Utilization	1	1	1	1	1	1	0	0	0
3. Waste	0	0	1	0	1	0	0	0	0
4. Quality	0	0	0	1	1	0	0	0	0
5. Cost	0	0	1	1	1	1	1	1	1
6. Delivery	0	0	0	0	0	1	0	0	0
7. Flexibility	0	0	0	0	0	0	1	0	0
8. Employee	0	0	0	1	1	0	0	1	0
9. Supplier	0	0	0	1	1	1	0	0	1

C. Final reachability matrix

The final reachability matrix, shown in Table V, is developed from the initial reachability matrix by incorporating the transitivities using the following equation:

$$M = M^k = M^{k+1},\ k>1 \quad (1)$$

where k denotes the powers and M is the reachability matrix. Note that the reachability matrix is under the Boolean operations. The transitivity is a basic assumption of ISM, which stated that if a variable A is related to B and B is related to C, then A is necessarily related to C [9].

In the table, the driving and dependence power of each indicator are also shown. The driving power is the total number of indicators (including indicator itself) which it may relate. The dependence power is the total number of indicators which may relate to it.

From the table, emission and resource utilization have the highest driver power, but they have the least dependence power. On the other hand, delivery and flexibility have the least driving power, but the highest dependence power. For other indicators, the values for both driver and dependence power are the same.

TABLE V
FINAL REACHABILITY MATRIX

Dimensions	1	2	3	4	5	6	7	8	9	Driver Power
1. Emission	1	1	1	1	1	1	1	1	1	9
2. Resource utilization	1	1	1	1	1	1	1	1	1	9
3. Waste	0	0	1	1	1	1	1	1	1	7
4. Quality	0	0	1	1	1	1	1	1	1	7
5. Cost	0	0	1	1	1	1	1	1	1	7
6. Delivery	0	0	0	0	0	1	0	0	0	1
7. Flexibility	0	0	0	0	0	0	1	0	0	1
8. Employee	0	0	1	1	1	1	1	1	1	7
9. Supplier	0	0	1	1	1	1	1	1	1	7
Dependence Power	2	2	7	7	7	8	8	7	7	

D. Level partitions

From the final reachability matrix, the reachability set and antecedent set [11] for each indicator can be obtained. The reachability set consists of the indicator itself and the other indicators, to which it may relate. The antecedent set consists of the indicator itself and the other indicators, which may relate to it. Then, the intersection of these sets is derived for all indicators.

The indicator for which the reachability and the intersection sets are the same is given the top-level indicator in the ISM hierarchy. After the identification of the top-level indicator, it is discarded from the other remaining indicators. This iteration is continued until the level of all indicators is obtained as shown in Table VI.

TABLE VI
LEVEL PARTITIONS (ITERATION 1-3)

Dimensions	Reachability set	Antecedent set	Intersection set	Level
1. Emission	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2	1, 2	III
2. Resource utilization	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2	1, 2	III
3. Waste	3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 8, 9	3, 4, 5, 8, 9	II
4. Quality	3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 8, 9	3, 4, 5, 8, 9	II
5. Cost	3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 8, 9	3, 4, 5, 8, 9	II
6. Delivery	6	1, 2, 3, 4, 5, 8, 9	6	I
7. Flexibility	7	1, 2, 3, 4, 5, 7, 8, 9	7	I
8. Employee	3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 8, 9	3, 4, 5, 8, 9	II
9. Supplier	3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 8, 9	3, 4, 5, 8, 9	II

For this case, the process of level partitions involving three iterations. The identified levels of the indicators will aid in building the digraph and the final model of ISM [9]. Then, the final reachability matrix is converted into the canonical (lower triangular) matrix by arranging the indicators according to their determined levels as shown in Table VII.

TABLE VII
CANONICAL MATRIX

Dimensions	6	7	3	4	5	8	9	1	2
6. Delivery	1	0	0	0	0	0	0	0	0
7. Flexibility	0	1	0	0	0	0	0	0	0
3. Waste	1	1	1	1	1	1	1	0	0
4. Quality	1	1	1	1	1	1	1	0	0
5. Cost	1	1	1	1	1	1	1	0	0
8. Employee	1	1	1	1	1	1	1	0	0
9. Supplier	1	1	1	1	1	1	1	0	0
1. Emission	1	1	1	1	1	1	1	1	1
2. Resource utilization	1	1	1	1	1	1	1	1	1

E. ISM-based model

Based on the relationships given in the canonical matrix, a directed graph (digraph) is generated and the transitivities are removed. The indicators are organized in a hierarchical structure in three levels as shown in Fig. 1. Delivery and flexibility are regarded as the basic indicators by Malaysian automotive companies in evaluating sustainable manufacturing performance. Emission and resource utilization appear to be the leading indicators in achieving sustainable manufacturing performance. It might be because they are most closely related to the environment factor. In the intermediate level, cost is regarded as the most influencing indicator for sustainable manufacturing evaluation in Malaysian automotive companies. It is followed by quality, supplier, employee, and waste.

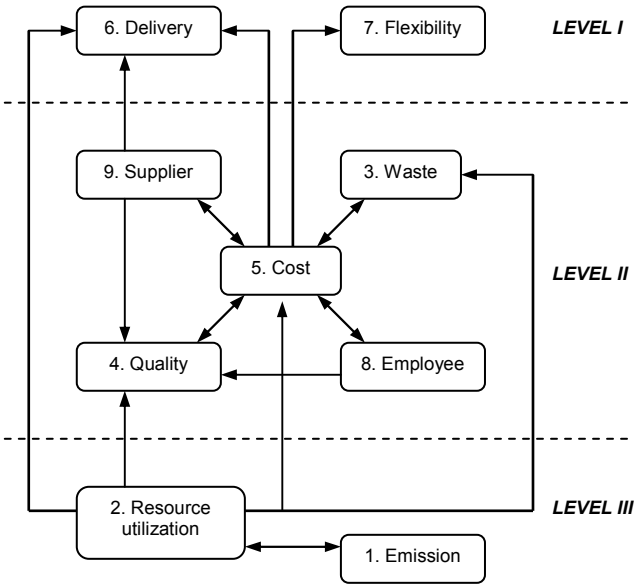


Fig. 1. ISM model for SMP dimensions

F. MICMAC analysis

The MICMAC analysis is used to analyze the driver and dependence power of the indicators [12]. The indicators are classified into four clusters as shown in Fig. 2. The clusters are named autonomous, dependent, linkage, and driver, respectively.

It can be seen that there are no autonomous indicators (in first quadrant) in the driver–dependence power diagram. This brings to light the fact that all the indicators are influencing to the sustainable manufacturing performance evaluation in the Malaysian automotive companies.

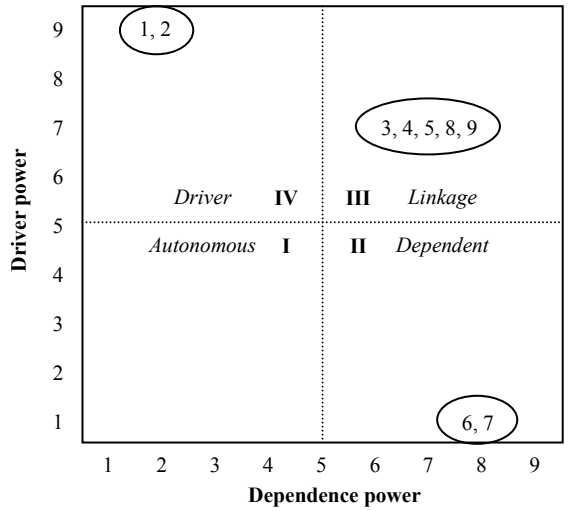


Fig. 2. Driver-dependence power diagram

The diagram indicates that delivery and flexibility are in second quadrant as dependent indicators. They are not driving any other indicators but driven by all other indicators. On the other hand, emission and resource utilization in fourth quadrant as driver indicators, are driving all other indicators but not driven by any other indicators. Waste, quality, cost, employee, and supplier fall in the third quadrant are unstable indicators. Any action on these indicators will have an affect on the others and also provide a feedback effect on them. The decision makers should pay more attention to these indicators.

IV. CONCLUSION

This paper has developed an interpretive structural model (ISM) of key performance indicators (KPIs) for sustainable manufacturing evaluation in automotive companies. The indicators are structured into three levels. The digraph establishes the interrelationships among the indicators. The relative importance and interdependencies among the indicators are also given by driver-dependence power diagram. The ISM-based model gives a visual and a better understanding of the interrelationship among the indicators. The model can provide the decision makers with a more realistic representation of relationships among the indicators for sustainable manufacturing evaluation in automotive companies. Future work will further incorporate the model into Analytical Network Process (ANP) methodology to the development of sustainable manufacturing evaluation tool for automotive companies.

ACKNOWLEDGMENT

The authors would like to thank to the Ministry of National Education, Indonesia and University Teknologi Malaysia RU Grant No 04J44.

REFERENCES

[1] A. D. Jayal, F. Badurdeen, O.W. Dillon Jr., and I. S. Jawahir, "Sustainable manufacturing: modeling and optimization challenges at the product, process and system levels", *CIRP Journal of Manufacturing Science and Technology*, vol. 2, no. 3, pp. 144-152, 2010.

[2] F. Pusavec, P. Krajnik, and J. Kopac, "Transitioning to sustainable production – part I: application on machining technologies", *Journal of Cleaner Production*, vol. 18, pp. 174–184, 2010.

[3] A. N. Nambiar, "Challenges in sustainable manufacturing", in *Proceedings of the International Conference on Industrial Engineering and Operations Management 2010,* Dhaka, Bangladesh, pp. 1-6.

[4] F. Jovane, H. Yoshikawa, L. Alting, C. R. Boer, E. Westkamper, D. Williams, M. Tseng, G. Seliger, and A. M. Paci, "The incoming global technological and industrial revolution towards competitive sustainable manufacturing",

CIRP Annals - Manufacturing Technology, vol. 57, no.2, pp. 641-659, 2008.

[5] B. R. Bakshi, and J. Fiksel, "The quest for sustainability: challenges for process systems engineering", *AIChE Journal*, vol. 49, no. 6, pp. 1350-1358, 2003.

[6] A. Gasparatos, M. El-Haram, and M. Horner, "A critical review of reductionist approaches for assessing the progress towards sustainability", *Environmental Impact Assessment Review*, vol. 28, pp. 286–311, 2008.

[7] E. Amrina, and S. M. Yusof, "Key performance indicators for sustainable manufacturing evaluation in automotive companies", in *Proceedings of the IEEE International Conference on Industrial Engineering and Engineering Management 2011*, Singapore, pp. 1093-1097.

[8] E. Amrina, and S. M. Yusof, "Sustainable manufacturing performance measures in Malaysian automotive companies: survey results", presented at the *10th Global Conference on Sustainable Manufacturing*, Istanbul, Turkey, 2012.

[9] G. Kannan, S. Pokharel, and P. S. Kumar, "A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider", *Resource, Conservation and Recycling*, vol. 54, pp. 28–36, 2009.

[10] S. P. Chen, and W. Y. Wu, "A systematic procedure to evaluate an automobile manufacturer-distributor partnership", *European Journal of Operational Research*, vol. 205, pp. 687–698, 2010.

[11] J. N. Warfield, "Developing interconnection of complex structural modeling", *IEEE Transactions on Systems, Man, and Cybernetics,* vol. 4, no. 1, pp. 81–87, 1974.

12] A. Mandal, and S. G. Desmukh, "Vendor selection using interpretive structural modeling (ISM)", *International Journal of Opeartions and Production Management*, vol. 214, no. 6, pp. 52–50, 1994.

Scopus Preview

Scopus SciVal | Register Login Help

This is a preview of SCOPUS.
Click here to learn more about accessing SCOPUS with our Integration Services. Visit also our SCOPUS Info Site.

The Scopus Author Identifier assigns a unique number to groups of documents written by the same author via an algorithm that matches authorship based on a certain criteria. If a document cannot be confidently matched with an author identifier, it is grouped separately. In this case, you may see more than 1 entry for the same author.

Print | E-mail

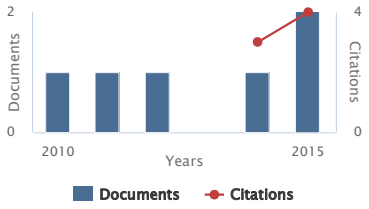
Amrina, Elita
Universitas Andalas, Department of Industrial Engineering, Padang, Indonesia
Author ID: 49862661700

About Scopus Author Identifier | View potential author matches
Other name formats: Amrina Amrina, E.

Follow this Author Receive emails when this author publishes new articles
Get citation alerts
Add to ORCID
Request author detail corrections

Documents: 6
Citations: 7 total citations by 7 documents
h-index: 1
Co-authors: 3
Subject area: Engineering , Business, Management and Accounting View More

Analyze author output
View *h*-graph



6 Documents | Cited by 7 documents | 3 co-authors

6 documents View in search results format

Sort on: Date Cited by ...

Export all | Add all to list | Set document alert | Set document feed

Key performance indicators for sustainable manufacturing evaluation in cement industry Show abstract | Related documents	Amrina, E.,Vilsi, A.L.	2015	Procedia CIRP	0
Key performance indicators for sustainable campus assessment: A case of Andalas university Show abstract | Related documents	Amrina, E.,Imansuri, F.	2015	Lecture Notes in Electrical Engineering	0
Interpretive structural model of key performance indicators for sustainable manufacturing evaluation in cement industry Show abstract | Related documents	Amrina, E.,Vilsi, A.L.	2014	IEEE International Conference on Industrial Engineering and Engineering Management	0
Interpretive structural model of key performance indicators for sustainable manufacturing evaluation in automotive companies Show abstract | Related documents	Amrina, E.,Yusof, S.M.	2012	IEEE International Conference on Industrial Engineering and Engineering Management	0
Key performance indicators for sustainable manufacturing evaluation in automotive companies Show abstract | Related documents	Amrina, E.,Yusof, S.M.	2011	IEEE International Conference on Industrial Engineering and Engineering Management	7
Manufacturing performance evaluation tool for Malaysian automotive small and medium-sized enterprises Show abstract | Related documents	Amrina, E.,Yusof, S.M.	2010	International Journal of Business and Management Science	0

Display 20 results per page Page 1

Top of page

Author History

Publication range: 2010 - 2015
References: 94

Source history:
IEEE International Conference on Industrial Engineering and Engineering Management View documents
IEEE International Conference on Industrial Engineering and Engineering Management View documents
International Journal of Business and Management Science View documents
View More

Show Related Affiliations

The data displayed above is compiled exclusively from articles published in the Scopus database. To request corrections to any inaccuracies or provide any further feedback, please contact us (registration required).
The data displayed above is subject to the privacy conditions contained in the privacy policy .

About Scopus
What is Scopus
Content coverage
Scopus Blog
Scopus API

Language
日本語に切り替える
切换到简体中文
切換到繁體中文

Customer Service
Help and Contact

ELSEVIER Terms and Conditions Privacy policy
Copyright © 2016 Elsevier B.V. All rights reserved.Scopus® is a registered trademark of Elsevier B.V.
Cookies are set by this site. To decline them or learn more, visit our Cookies page

RELX Group™