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PROCEEDINGS

APIEMS

APIEMS 2014

The 15th
Asia Pacific Industrial Engineering
and Management Systems Conference

> October 12~15, 2014
> Ramada Plaza Jeju Hotel, Jeju, Korea

APIEMS 2014 Information

Detailed Program

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EXIT

KOFST DOOSAN sas KOREA TOURISM ORGANIZATION Jeju CVB Jeju Convention & Visitor Bureau

Message from the APIEMS President

Greeting and a warm welcome to the participants of the 15th Asia Pacific Industrial Engineering and Management Systems Conference. Started in 1998, APIEMS has grown to become the premier conference for industrial engineering and management systems in the region with participants from all around the world. The main theme of this year conference: “Sustainable Industrial Systems and Big Data Management”, is an attempt to address the balance among economic and technical development, social development, and environmental protection in this fast changing world.

I congratulate and thank Prof. Dr. Chi-Hyuck Jun, the conference chair, whose leadership made this APIEMS 2014 conference possible. We are also grateful for the enthusiastic support of APIEMS from the KIIE and the Korea research community.

On behave of the Asia Pacific Industrial Engineering and Management Society, I wish you a successful conference with many thoughtful discussions and debates with old and new friends.

Professor Voratas Kachitvichyanukul
APIEMS President, (2013-2014)
Professor of Industrial & Manufacturing Engineering
Dean, School of Engineering and Technology
Asian Institute of Technology, THAILAND

Message from the General Chair

Welcome to APIEMS 2014 in Jeju City, a beautiful island located at the most south of Korea. It is our great pleasure to organize this conference, which is supported by Korean Institute of Industrial Engineers (KIIE). APIEMS conferences have rapidly emerged as an important forum for exchange of ideas and information about latest developments in the field of industrial engineering and management systems among professionals mostly from Asia-Pacific countries. APIEMS 2014 conference encourages contributors to address the topical theme: Sustainable Industrial Systems and Big Data Management. Papers will represent the latest academic thinking and successful case examples. The wider audience will benefit from the knowledge and experience of leading practitioners and academics in this area.

The conference seeks research contributions from researchers, educators, modelers, software developers, users and practitioners. We hope that you enjoy participating in APIEMS 2014 and staying in Jeju.

Professor Chi-Hyuck Jun

General Chair, APIEMS 2014

Industrial & Management Engineering

POSTECH, Korea

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Keynote Speech

Keynote Speech I
Research Issues in Future Logistics

Oct 13 (Monday) 11:00-12:00

Room: Ramada-1

Chung– Yee Lee
Hong Kong University of Science and Technology, China

Dr. Chung-Yee Lee is Chair Professor/Cheong Ying Chan Professor of Engineering in the Department of Industrial Engineering & Logistics Management at Hong Kong University of Science and Technology. He served as Department Head for seven years (2001- 2008). He is also the Founding and Current Director of Logistics and Supply Chain Management Institute. He is a Fellow of the Institute of Industrial Engineers in U.S. and also a Fellow of Hong Kong Academy of Engineering Science. Before joining HKUST in 2001, he was Rockwell Chair Professor in the Department of Industrial Engineering at Texas A&M University. He worked as a plant manager and also had few years consulting experience in Taiwan. In the past thirty years he has engaged in more than forty research projects sponsored by NSF, RGC, ITF, IBM, Motorola, AT&T Paradyne, Harris Semicon ductor, Northern Telecom, Martin Marietta, Hong Kong Air Cargo Terminal, Hongkong International Terminal, Philips Medical, ...,etc.

His search areas are in logistics and supply chain management, scheduling and inventory management. He has published more than 130 papers in refereed journals. According to an article in Int. J. Prod. Eco. (2009), which looked at all papers published in the 20 core journals during last 50 years in the field of production and operations management, he was ranked No. 6 among all researchers worldwide in h-index.

He received a BS degree in Electronic Engineering (1972) and a MS degree in Management Sciences (1976) both from National Chiao-Tung University in Taiwan. He also received a MS degree in Industrial Engineering from Northwestern University (1980) and PhD degree in Operations Research from Yale University (1984).

Keynote Speech II
Data-Driven Decision Making in Manufacturing: Lessons Learned and Future Opportunities

Oct 14 (Tuesday) 11:00-12:00

Room: Ramada-1

Ronald G. Askin
Arizona State University, USA

Ronald G. Askin, Ph.D., is a Professor of Industrial Engineering and Director of the School of Computing, Informatics, and Decision Systems Engineering at Arizona State University. Professor Askin received his B. S. in Industrial Engineering from Lehigh University followed by an M.S. in Operations Research and PhD in Industrial and Systems Engineering from the Georgia Institute of Technology. He has over 30 years of experience in the development, teaching and application of methods for systems design and analysis with particular emphasis on production and material flow systems. Other interests include quality engineering and decision analysis. He has published over 120 journal and conference proceedings papers in these areas.

Dr. Askin is a Fellow of the Institute of Industrial Engineers (IIE) and serves as Editor-in-Chief of IIE Transactions. He has served on the IIE Board of Trustees, as President of the IIE Council of Fellows, Chair of the Association of Chairs of Operations Research Departments (ACORD) Chair of the Industrial Engineering Academic Department Heads (CIEADH) and President of the INFORMS Manufacturing and Service Operations Management Society (MSOM). He was also General Chair of the 2012 INFORMS Annual Conference. His list of awards includes a National Science Foundation Presidential Young Investigator Award, the Shingo Prize for Excellence in Manufacturing Research, IIE Joint Publishers Book of the Year Award (twice), IIE Transactions on Design and Manufacturing Best Paper Award (twice), the Eugene L. Grant best paper award from The Engineering Economist, and the IIE Transactions Development and Applications Award.

Keynote Speech

Keynote Speech III
Big Data Management

Oct 14 (Tuesday) 13:00-14:00

Room: Ramada-1

Sungzoon Cho

Seoul National University, Korea.

Sungzoon Cho is currently professor of Industrial Engineering Department, the director of Data Mining Center at Seoul National University (SNU) and a member of Government 3.0 Committee of Korean government. He is on the editorial board of International Journal of Operations Research and Information Systems and International Journal of Cognitive Biometrics. He served as the presi yundai Motors, Hyundai Heavy Industries, POSCO, Daewoo Shipbuilding and Marine Engineering, LG Electronics, Doosan Infracore, SK Hynix, SK Telecommunication and CJ. He advised nine PhDs and 56 Master students. He teaches Data Mining and Computational Intelligence at SNU as well as at firms. He received BS and MS in Industrial Engineering at SNU. He won a Fulbright Scholarship to obtain Masters and PhD at University of Washington in Seattle, US, and University of Maryland in College Park, US, respectively.

Conference at a Glance

Oct 12 (Sunday)		Oct 13 (Monday)		Oct 14 (Tuesday)		Oct 15 (Wednesday)	
		08:00-17:00	Registration	08:00-17:00	Registration	08:00-12:00	Registration
		08:30-10:10	Technical sessions MA	08:40-10:40	Technical sessions TA	08:30-10:10	Technical sessions WA
10:00-18:00	Registration	10:10-10:30	Coffee break			10:10-10:30	Coffee break
		10:30-11:00	Opening addresses : APIEMS President, KIIE President, General Chair	10:40-11:00	Coffee break	10:30-12:10	Technical sessions WB
		11:00-12:00	Keynote speech I (Prof. Chung-Yee Lee: Research issues in Future Logistics)	11:00:12:00	Keynote speech II (Prof. Ronald Askin: Data-Driven Decision Making in Manufacturing)		
13:00-17:20	Excursion	12:00-13:30	Lunch	12:00-13:00	Lunch	12:10-13:30	Lunch
		13:30-15:30	Technical sessions MB	13:00-14:00	Keynote speech III (Prof. Sungzoon Cho: Big Data Management)		
				14:00-14:20	Coffee break		
		15:30-15:50	Coffee break	14:20-16:00	Technical sessions TB		
		15:50-17:50	Technical sessions MC	16:00-16:20	Coffee break		
	Registration			16:20-18:00	Technical sessions TC		
				13:00-18:00	Poster Session		
18:00-20:00	Welcome Reception			18:30-21:00	General Reception		

Oct 12 (Sunday)

10:00-18:00	**Registration**
13:00-17:20	**Excursion**
18:00-20:00	**Welcome Reception**

Oct 13 (Monday)

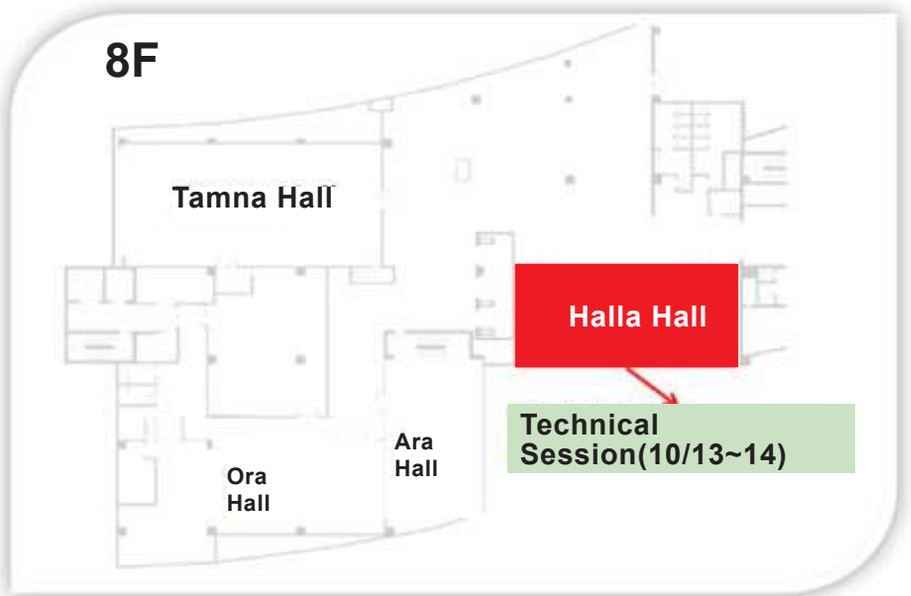
08:00-17:00	**Registration**								
Room	**Mara**	**Biyang**	**Udo**	**Chuja**	**Ramada-1**	**Ramada-2**	**Ramada-3**	**Ramada-4**	**Halla(8F)**
08:30-10:10	**Technical sessions MA**								
	MA1	**MA2**	**MA3**	**MA4**	**MA5**	**MA6**	**MA7**	**MA8**	**MA9**
Session name	Data Mining 1	Management of Technology and Innovations 1	ERP/ E-Business	Service Sciences 1	Quality Engineering & Management 1	Production and Operations Management 1	Metaheuristics	Financial Models & Engineering	Uncertainty Theory (Session I)
Paper #	**528**	**100**	**37**	**54**	**23**	**75**	**42**	**41**	**551**
	207	**111**	**38**	**55**	**28**	**158**	**43**	**146**	**555**
	276	**143**	**352**	**108**	**109**	**211**	**175**	**180**	**556**
	324	**44**	**360**	**215**	**113**	**269**	**353**	**267**	**584**
	296	**97**	**255**	**244**	**226**	**213**	**465**	**273**	
10:10-10:30	**Coffee break**								
10:30-11:00	**Opening addresses: APIEMS President, KIIE President, General Chair**								
11:00-12:00	**Keynote speech I (Prof. Chung-Yee Lee: Research Issues in Future Logistics)**								
12:00-13:30	**Lunch**								
13:30-15:30	**Technical sessions MB**								
	MB1	**MB2**	**MB3**	**MB4**	**MB5**	**MB6**	**MB7**	**MB8**	**MB9**
Session name	Decision Support Systems & Expert Systems	Probability & Statistical Modeling	Ergonomics/ Human Factors 1	Service Sciences 2	Quality Engineering & Managment 2	Production and Operations Management 2	Green Manufacturing/ Management	Transportation	Ergonomics & Welfare Management
Paper #	**173**	**190**	**96**	**322**	**227**	**338**	**417**	**73**	**488**
	254	**299**	**131**	**401**	**228**	**362**	**550**	**91**	**484**
	290	**333**	**305**	**411**	**229**	**394**	**119**	**103**	**530**
	460	**334**	**315**	**479**	**346**	**396**	**156**	**312**	**485**
	116	**3354**	**326**	**504**	**294**	**442**	**342**	**340**	**471**
	538	**450**	**332**	**323**	**307**		**361**	**53**	**505**
15:30-15:50	**Coffee break**								
15:50-17:50	**Technical sessions MC**								
	MC1	**MC2**	**MC3**	**MC4**	**MC5**	**MC6**	**MC7**	**MC8**	**MC9**
Session name	Supply Chain Management 1	Reliability & Maintenance	Ergonomics/ Human Factors 2	Network Optimization	Quality Engineering & Management 3	Simulation 1	Healthcare Systems 1	Optimization Techniques 1	Educational Support System
Paper #	**252**	**118**	**456**	**407**	**325**	**500**	**482**	**374**	**501**
	261	**121**	**359**	**363**	**328**	**196**	**99**	**217**	**562**
	279	**153**	**393**	**268**	**339**	**424**	**112**	**201**	**448**
	280	**320**	**419**	**515**	**346**	**66**	**194**	**169**	**455**
	355	**580**	**449**	**319**	**370**	**179**	**248**	**206**	**154**
	336	**582**	**341**	**142**	**402**			**271**	**507**

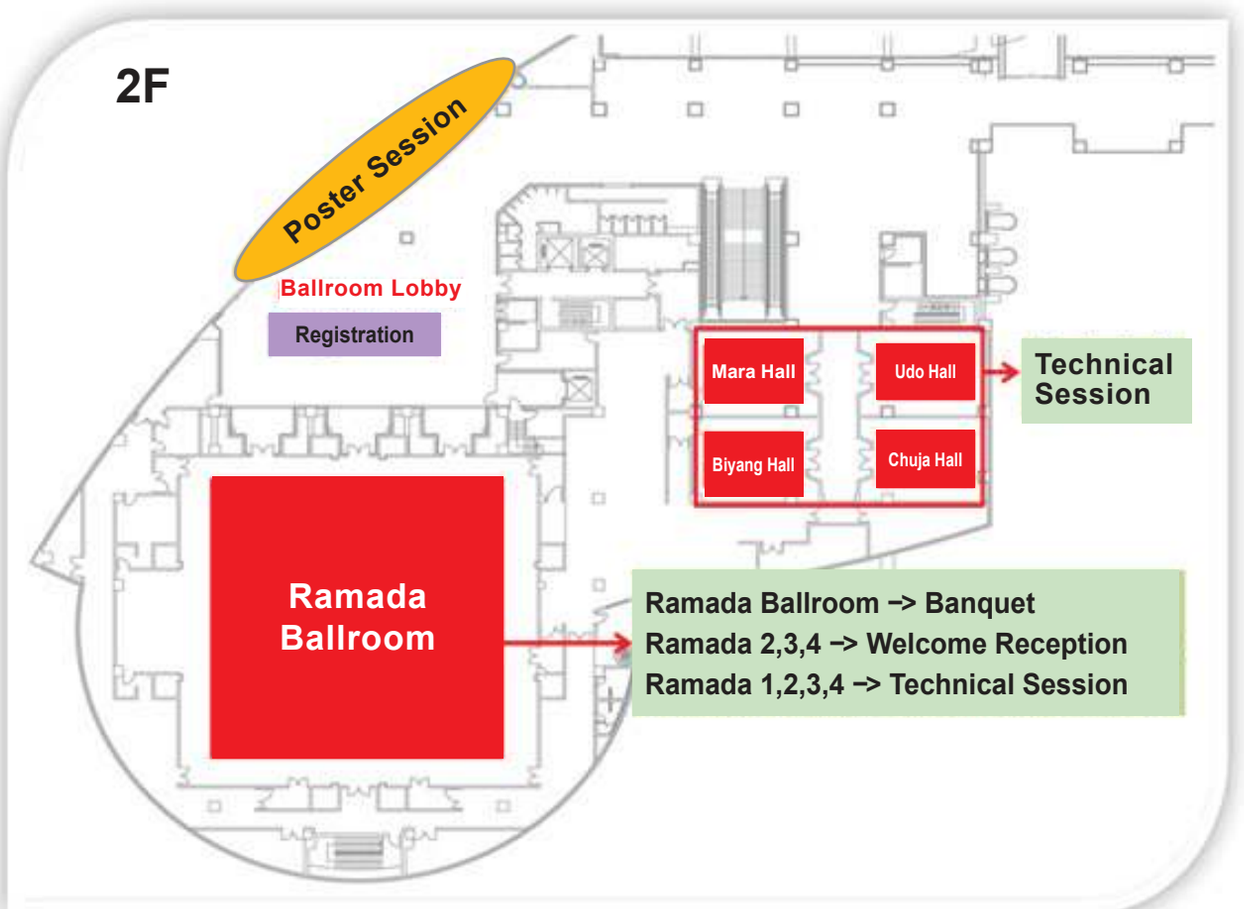
Oct 14 (Tuesday)

08:00-17:00	Registration								
Room	Mara	Biyang	Udo	Chuja	Ramada-1	Ramada-2	Ramada-3	Ramada-4	Halla(8F)
08:40-10:40	Technical sessions TA								
	TA1	TA2	TA3	TA4	TA5	TA6	TA7	TA8	TA9
Session name	Supply Chain Management 2	Communication Support	Data Mining 2	Tourism Management/ Topics in IE/MS	Sustainable Management	Simulation 2	Production & Operations Management 1	Logistics Management	Uncertainty Theory (Session II)
Paper #	50	443	128	472	35	98	282	440	558
	59	535	147	444	114	105	327	477	559
	60	489	203	564	136	221	349	483	560
	61	536	392	15	137	272	431	543	561
	130	480	412	264	291	295	104	344	565
	161	537	216	225	347	356	218	313	428
10:40-11:00	Coffee break								
11:00-12:00	Keynote speech II (Prof. Ronald Askin: Data Driven Decision Making in Manufacturing)								
12:00-13:00	Lunch								
13:00-14:00	Keynote speech III (Prof. Sungzoon Cho: Big Data Management)								
14:00-14:20	Coffee break								
14:20-16:00	Technical sessions TB								
	TB1	TB2	TB3	TB4	TB5	TB6	TB7	TB8	TB9
Session name	Supply Chain Management 3	Management of Technology and Innovations 2	Data Mining 3	Scheduling & Sequencing 1	Knowledge & Information Management	Production & Operations Management 2	Healthcare Systems 2	Flexible Manufacturing Systems	Topics in IE/MS
Paper #	165	188	437	122	250	49	95	579	575
	176	425	469	233	278	124	106	48	354
	208	317	486	284	445	151	306	62	378
	160	150	502	287	297	187	379	286	212
	234	22	581	309	389	12	76	457	202
16:00-16:20	Coffee break								
16:20-18:00	Technical sessions TC								
	TC1	TC2	TC3	TC4					TC9
Session name	Heuristics/Metaheuristics	Inventory Modeling / Artificial Intelligence	Artificial Intelligence	Scheduling & Sequencing 2					Lean Production Management
Paper #	70	381	182	399					542
	464	123	260	405					546
	481	101	490	418					94
	520	318	391	398					545
	192		499	79					547
13:00-18:00	POSTER Session								
Paper #	47	149	166	204	220	245	253	265	205
	365	366	382	400	414	422	432	435	524
	451	473	487	522	527	491	420	145	
18:30-21:00	General Reception								

Oct 15 (Wednesday)								
08:00-12:00	**Registration**							
Room	**Mara**	**Biyang**	**Udo**	**Chuja**	**Ramada-3**	**Ramada-4**	**Ramada-1**	**Ramada-2**
08:30-10:10	**Technical sessions WA**							
	WA1	**WA2**	**WA3**	**WA4**	**WA5**	**WA6**		
Session name	Inventory Modeling & Management	SCM and Forecasting 1	Production Design & Management 1	Scheduling & Sequencing 3	Fuzzy Logic	Optimization Techniques 2		
Paper #	**65**	**92**	**117**	**85**	**30**	**125**		
	80	**31**	**162**	**120**	**58**	**69**		
	71	**34**	**198**	**177**	**224**	**288**		
	446	**32**	**222**	**316**	**576**	**577**		
	518	**102**	**249**	**509**		**415**		
10:10-10:30	**Coffee break**							
10:30-12:10	**Technical sessions TB**							
	WB1	**WB2**	**WB3**	**WB4**	**WB5**	**WB6**		
Session name	Industrial Engineering Education	SCM and Forecasting 2	Production Design & Management 2	Scheduling & Sequencing 4	Quality Engineering & Reliability	Lean Manufacturing		
Paper #	**526**	**52**	**283**	**329**	**453**	**129**		
	139	**36**	**348**	**46**	**508**	**371**		
	256	**87**	**350**	**403**	**270**	**553**		
	495	**413**	**93**	**426**	**517**	**110**		
			84	**454**	**421**	**516**		
12:10-13:30	**Lunch**							

Floor Plan


8F
Tamna Hall
Halla Hall
Technical Session(10/13~14)
Ara Hall
Ora Hall


2F
Poster Session
Ballroom Lobby
Registration
Mara Hall
Udo Hall
Biyang Hall
Chuja Hall
Technical Session
Ramada Ballroom
Ramada Ballroom -> Banquet
Ramada 2,3,4 -> Welcome Reception
Ramada 1,2,3,4 -> Technical Session

Detailed Program

MA1 Data Mining 1

Mara, 08:30-10:10

Chair: Kuo-Hao Chang (National Tsing Hua University, Taiwan)

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MA1-5 (296)	Using data mining methods to forecast book purchase quantities *Farnaz Pirasteh(Pukyong National Univesity, Korea), Mohammad Rouzbeh(Dayche Data Mining Group, Iran), Jay Liu(Pukyong National Univesity, Korea)*	25

MA2 Management of Technology and Innovations 1

Biyang, 08:30-10:10

Chair: Muh-Cherng Wu (National Chiao Tung University, Taiwan)

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Chair: Kazuhiko Yasuda (Tohoku University, Japan)

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MA5 Quality Engineering & Management 1

Ramada-1, 08:30-10:10

Chair: Ruey Huei (Robert) Yeh (National Taiwan Univeristy of Science and Technology, Taiwan)

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MA6 Production and Operations Management 1

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Chair: Daisuke Hirotani (Prefectural University of Hiroshima, Japan)

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*Wu-Lin Chen(Providence University, Taiwan), Chung-Wei Chou, Szu-han Chiu, *Chin-Yin Huang(Tunghai University, Taiwan)*

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*evy herowati, *evy herowati, evy herowati(University of Surabaya and Institute of Technology Sepuluh Nopember, Indonesia), Udisubakti Ciptomulyono(Institute of Technology Sepuluh Nopember, Indonesia), Joniarto Parung(University of Surabaya, Indonesia), Suparno Suparno(Institute of Technology Sepuluh Nopember, Indonesia)*

MC9 Educational Support System

Halla(8F), 15:50-17:50

Chair: Masahide Yamamoto (Kanazawa Seiryo University, Japan)

MC9-1 (501) A system of real time advice for speech improvement 920
**Hiroshi Arai(Kinjo college, Japan), Hidetaka Nambo(Kanazawa University, Japan), Yuko Shimomura, Hiroyuki KAWABE(Kinjo University, Japan), Shuichi Seto(Kinjo College, Japan)*

MC9-2 (562) Consideration on English Learning for Undergraduates Using the Nintendo DS 924
**Hiromi Ban(Nagaoka University of Technology, Japan), Haruhiko Kimura(Kanazawa University, Japan), Takashi Oyabu(Kokusai Business Gakuin College, Japan)*

MC9-3 (448) The Analysis of Concept and Effect Factors on Financial Literacy 929
**Yuji Kitano(Kanazawa Seiryo University, Japan), Koji Osanai(Shiga Junior college, Japan), Keiichiro Nishio(Matsuyama University, Japan)*

MC9-4 (455) The Present Conditions of the Computerization of Education and its Problems Concerning the Educator 936
**Yumi Tatsushima(Kanazawa Seiryo University, Japan)*

MC9-5 (154) AN ANALYSIS OF JOB SATISFACTION OF FACULTY MEMBERS OF BULACAN STATE UNIVERSITY MAIN CAMPUS (COLLEGE OF ENGINEERING) 941
**Dyan Gonzales(Philippine Institute of Industrial Engineers, Philippines)*

MC9-6 (507) Analysis the Influence of Study Program's Education Quality towards Graduates' Potential Marketing 948
**Yulianti Talar, Jimmy Gozaly(Maranatha Christian University, Indonesia)*

TA1 Supply Chain Management 2

Mara, 08:40-10:40

Chair: Etsuko Kusukawa (Osaka Prefecture University, Japan)

TA1-1 (50) Impact of information sharing regarding customer returns ratio on optimal sales strategy under e-commerce 957
**Yuta Saito, Etsuko Kusukawa(Osaka Prefecture University, Japan)*

TA1-2 (59) Analyzing the evolutionary stability for behavior strategies in green supply chain 965
**Daijiro Tomita, Etsuko Kusukawa(Osaka Prefecture University, Japan)*

TA1-3 (60) Pareto-Based PSO Algorithm for Multi-Objective LRP 973
**jie liu(student, Thailand), Voratas Kachitvichyanukul(professor, Thailand), jie liu(student, Thailand)*

TA1-4 (61) Optimal Ordering Policy in Dual-Sourcing Supply Chain considering Supply Disruptions and Demand Information 980
Naoki Watanabe, Etsuko Kusukawa(Osaka Prefecture University, Japan)

TA1-5 (130) Research in Supply Chain Management: Issue and Area Development 988
*elisa kusrini(Department of Industrial Engineering, Indonesia), *siti Budijati(Faculty of Engineering, Indonesia), subagyo subagyo(Indonesian Islamic University, Indonesia), nuraini masruroh(Yogjakarta, Indonesia)*

TA1-6 (161) Cold Chain Logistics Development: Analyzing Taiwan Influences in Indonesia Market 996
*James C. Chen(National Tsing Hua University, Taiwan), Janet Chen, Yun-Wei Hung(Industrial Technology Research Institute, Taiwan), *Muhammad Rinaldi Darmawan, Nadia Aulia Arifin, Hsin-Yu Shih(National Tsing Hua University, Taiwan)*

TA2 Communication Support

Biyang, 08:40-10:40

Chair: Sakiko Ogoshi (Kanazawa University, Japan)

TA2-1 (443) Discrimination of Positive / Negative Attitude Using Optical Flow 1003
Yuta Kobayashi(Kanazawa University, Japan), Munehiro Nakamura(Kanazawa Institute of Technology, Japan), Hidetaka Nambo, Haruhiko Kimura(Kanazawa University, Japan)

TA2-2 (535) Development of the support system for facial expression training 1010
Yusuke Amagata, Yasuhiro Ogoshi(University of Fukui, Japan), Sakiko Ogoshi(Kanazawa University, Japan), Tomohiro Takezawa(The National Institute of Vocational Rehabilitation, Japan), Yoshinori Mitsuhashi(Chiba, Japan)

TA2-3 (489) Discrimination of Micro-Expression with Subjective Assessments 1015
Kiyotaka nakashima(Graduate School of Natural Science, Japan), Munehiro Nakamura(Kanazawa Institute of Technology, Japan), Haruhiko Kimura(Graduate School of Natural Science, Japan)

TA2-4 (536) Facial electromyogram (FEMG) analysis of perception and rendering of facial expression 1020
Akira Takahara, Yasuhiro Ogoshi(University of Fukui, Japan), Sakiko Ogoshi(Kanazawa University, Japan), Tomohiro Takezawa(The National Institute of Vocational Rehabilitation, Japan), Yoshinori Mitsuhashi(University of Fukui, Japan)

TA2-5 (480) Text extraction in natural image 1025
Masayoshi Ueno, Hidetaka Nambo, Haruhiko Kimura(Kanazawa University, Japan)

TA2-6 (537) Electroencephalogram activity during imagined imitative learning 1030
Shu Momose(University of Fukui, Japan), Sakiko Ogoshi(Kanazawa University, Japan), Yasuhiro Ogoshi(University of Fukui, Japan), Tomohiro Takezawa(The National Institute of Vocational Rehabilitation, Japan), Yoshinori Mitsuhashi(University of Fukui, Japan)

TA3 Data Mining 2

Udo, 08:40-10:40

Chair: Jong-Seok Lee (Sungkyunkwan University, Korea)

TA3-1 (128) AUC-based C4.5 tree induction for imbalanced data classification 1035
*Jungmin Lee, Sungho Lee, *Jong-Seok Lee(Sungkyunkwan University, Korea)*

TA3-2 (147) Comparison of machine learning classifiers for glaucoma diagnosis using variable selection 1042
*Su-Dong Lee, Jihyung Lee, Heecheon You, *Chi-Hyuck Jun(POSTECH, Korea)*

TA3-3 (203) An iterative random sampling procedure for outlier detection 1049
*Jihyun Ha, Seulgi Seok, *Jong-Seok Lee(Sungkyunkwan University, Korea)*

TA3-4 (392) Development of Knowledge Management for Forecasting in Restaurant Using Association Rule Mining and Regression Analysis 1057
Annisa Khasanah, Agus Mansur, Yasser Ulil Albab(Universitas Islam Indonesia, Indonesia)

TA3-5 (412) Data stream clustering by controlling decision errors 1064
*Jeonghwa Lee, *Chi-Hyuck Jun(POSTECH, Korea)*

TA3-6 (216) The moderating impact of employee's perceived self-efficacy on knowledge sharing intention 1071
Mei-Fang Chen, Ssu-Wei Huang(Tatung University, Taiwan), Pei-Ju Tung(National Chengchi University, Taiwan)

TA4 Tourism Management/ Topics in IE/MS

Chuja, 08:40-10:40

Chair: Hidetaka Nambo (Kanazawa University, Japan)

TA4-1 (472)	Evaluation for painting show of kindergartner on rout bus in Kaga City *Eri Ishikawa, Ayano Kawasaki, Izumi Yamasaki(Kanazawa Seiryo University, Japan), *Takashi Oyabu(Kokusai Business Gakuin College, Japan)*	1077
TA4-2 (444)	Utilization of historical materials and CGM for foreign visitors **Ayako Sawada(Hokuriku Gakuin Junior College, Japan), Taketoshi Yoshida(Japan Advanced Institute of Science and Technology, Japan)*	1084
TA4-3 (564)	The Verification of Mass Customization Systems in the Chinese Market **Bin Fang(Kanazawa Seiryo University, Japan), Akinori Ono(Keio University, Japan)*	1090
TA4-4 (15)	Using SWOT Analysis to Evaluate the Public Procurement in Compliance with SNI (Case Study: Government Agency at Central of Java) **Aries Susanty, Hery Suliantoro, Diana Puspitasari, Diena Novitasari, Nia Budi Puspitasari(Diponegoro Unversity, Indonesia)*	1094
TA4-5 (264)	Designing Variables Quick Switching System with Process Loss Consideration *Yi-Jhen Jian, *Chien-Wei Wu(National Tsing Hua University, Taiwan)*	1100
TA4-6 (225)	A Variables Multiple Dependent State Sampling Plan for Products with Unilateral Specification Limit *Chih-Chieh Chang Chien, *Chien-Wei Wu, Yi-Feng Hung(National Tsing Hua University, Taiwan)*	1105

TA5 Sustainable Management

Ramada-1, 08:40-10:40

Chair: Mei-Fang Chen (Tatung University, Taiwan)

TA5-1 (35)	Sustainable supply chain management in competitiveness environment *Ming-Lang Tseng(Lunghwa University of Science and Technology, Taiwan), *Anthony Shun Fung Chiu(De La Salle University, Philippines), Ming Lim(Derby University, United Kingdom)*	1110
TA5-2 (114)	Sustainable management of Taiwan's semiconductor supply chain **Chi-Tai Wang, Chui-Sheng Chiu(National Central University, Taiwan)*	1119
TA5-3 (136)	The Use of Smart Meter Data to Analyze the Consumption Patterns *Chia-Yu Shen(National Tsing Hua University, Taiwan), *Hsiao-Fan Wang(Hsinchu, Taiwan)*	1124
TA5-4 (137)	Time of Use Electricity Pricing Optimization in a Monopolized Electricity Market *Hsin-Yu Chiang, *Hsiao-Fan Wang(National Tsing Hua University, Taiwan)*	1131
TA5-5 (291)	Modeling and Optimization of Power Storage Strategy of Hybrid Renewable Energy System in Uncertainty Environments *Chi-Kang Su, *Kuo-Hao Chang(National Tsing Hua University, Taiwan)*	1136
TA5-6 (347)	What psychological factors influence the protection motivation of climate change? **Mei-Fang Chen(Tatung University, Taiwan)*	1141

TA6 Simulation 2

Ramada-2, 08:40-10:40

Chair: Udom Janjarassuk (King Mongkut's Institute of Technology Ladkrabang, Thailand)

TA6-1 (98)	Application of Agent-Based Modeling and Simulation for an Outpatient Department in a Hospital **Chumpol Yuangyai(King Mongkut's Institute of Technology Ladkrabang, Thailand), Udom Janjarassuk(Faculty of Engineering, Thailand), Chonnupong Siritan(King Mongkut's Institute of Technology Ladkrabang, Thailand), Kanokporn Rienkhemaniyom(King Mongkut's University of Technology Thonburi, Thailand)*	1147
TA6-2 (105)	Integrated Maintenance and Inventory Optimisation Model for Offshore Assets **Winda Cahyo(Islamic University of Indonesia, Indonesia)*	1154

TA6-3 (221) A PSO-based Hybrid Approach for Buffer Allocation Problem with Uncertainty 1161
*James T. Lin, Chun-Chih Chiu(National Tsing-Hua University, Taiwan)

TA6-4 (272) State-based Modeling and Simulation of Urban Traffic Systems Including Signalized Intersections 1167
*Mira Myong, Donghun Kang, Byoung Kyu Choi(KAIST, Korea)

TA6-5 (295) MCMC algorithm using self-adaptive differential evolution and local optimization technique for Bayesian framework of complex systems 1174
Jun-Seong Kim, *Chi-Hyuck Jun(POSTECH, Korea)

TA6-6 (356) Evaluation of the Behavior of Persons on a Floor ina Disaster Situation by Multi-Agent Simulation 1179
*Keita Sugiura, Masahiro Arakawa(Nagoya Institute of Technology, Japan)

TA7 Production & Operations Management 1

Ramada-3, 08:40-10:40

Chair: Takayoshi Tamura (Aichi Institute of Technology, Japan)

TA7-1 (282) Study and findings based on actual case data of the degree of the integration in regard to the production quality of information systems 1187
*Hideaki Hayashi, Etsuji Ohmura(Osaka University, Japan)

TA7-2 (327) A Study on Standard Productivity for Compering Productivity of an Assembly Line in Diversified Production Conditions 1195
*Kagehisa Nakayama(Waseda University, Japan), Shohei Machida, Hisashi Onari(WASEDA University, Japan)

TA7-3 (349) Inventory Valuation Model Considering Profitability and Risk 1201
Kiho Kamiya, *Satoshi Kumagai(Aoyama Gakuin University, Japan), Ohba Masaaki(College of Economics, Japan)

TA7-4 (431) A method of operational planning for project-based production in consideration of learning effects and demand uncertainty 1208
*YOSHIHIKO SUZUKI(Seiryo Technica Co. Ltd, Japan), Nobuaki Ishii(Bunkyo University, Japan), masaaki muraki(Emeritus Professor, Japan)

TA7-5 (104) Integrated Transport Terminal: Its Effect on Commuters' Travel Time, Cost, and Comfort (Or How Bitter-Sweet is the Metro Manila SWITT?) 1213
*RUMEL ATIENZA, RUMEL ATIENZA, Carlo Tansuk(DE LA SALLE UNIVERSITY, Philippines)

TA7-6 (218) Effectiveness of an Exponential Smoothing System for a Multi-Stage Multi-Item Production System with Advance Demand Information 1219
*Takayoshi Tamura(Aichi Institute of Technology, Japan), Tej Dhakar(Southern New Hampshire University, United States)

TA8 Logistics Management

Ramada-4, 08:40-10:40

Chair: Anchalee Supithak (Thai-Nichi Institute of Technology, Thailand)

TA8-1 (440) Logistics Management of Oil Palm in Southern Region of Thailand 1227
*Phajongjit Pijitbanjong(Faculty of Industrial Technology, Thailand), Paroon Mayachearw(Songkhla Rajabhat University, Thailand), Rapeepan Pitakaso(Songkhla, Thailand)

TA8-2 (477) On the resources required to provide persistent robotic service agents: Multiple immobile customers and a single service station 1234
Hyorin Park, *James Morrison(KAIST, Korea)

TA8-3 (483) Solving Integrated Inventory and Open Vehicle Routing Problem in Two Depots and Multiple Retailers' Distribution System 1242
*Anchalee Supithak(Thai-Nichi Institute of Technology, Thailand)

TA8-4 (543) Competitive Facility Location and Design Problem by Considering Conditions of Government Regulation and Regional Saturation 1250
Suprayogi Suprayogi, Yosi Hidayat(Institut Teknologi Bandung, Indonesia), *Utaminingsih Linarti(Ahmad Dahlan University, Indonesia)

TA8-5 Cooperative Tactical Planning in Road Transportation with Backhauling Management 1256

(344) **Apichit Manee-ngam(Faculty of Engineering, Thailand), Apinanthana Udomsakdigool(King Mongkut's University of Technology Thonburi, Thailand)*

TA8-6 (313) Monitoring Framework for Dynamic Inbound Flows 1264
*Kiyoul Lee(POSTECH (Pohang University of Science & Technology), Korea), Hyunbo Cho(POSTECH (Pohang University of Science & Techonology), Korea), *Mooyoung Jung(UNIST (Ulsan National Institute of Science & Technology), Korea)*

TA9 Uncertainty Theory (Session II)

Halla(8F), 08:40-10:40

Chair: Xiaowei Chen (Nankai University, China)

TA9-1 (558) Towards Uncertain Network Optimization 1270
**Jin Peng(Huanggang Normal University, China)*

TA9-2 (559) Viral Marketing of Multiple-Attribute Products in a Social Network 1271
*Wei Li, *Yaodong Ni(University of International Business and Economics, China)*

TA9-3 (560) Uncertain Logic Controller and Its Applications 1279
**Wei Dai(Central University of Finance and Economics, China)*

TA9-4 (561) Uncertain Random Multilevel Programming 1280
**Hua Ke(Tongji University, China)*

TA9-5 (565) Assets Pricing and Risk Management in Uncertain Market 1281
**Xiaowei Chen(School of Economics Nankai University, China)*

TA9-6 (428) Liquidity Crashes and Robust Portfolio Management 1282
*Seungkyu Lee(Pohang University of Science and Technology, Korea), *Bong-Gyu Jang, Seyoung Park(POSTECH, Korea)*

TB1 Supply Chain Management 3

Mara, 14:20-16:00

Chair: Muhammad Rusman (Hasanuddin University, Indonesia)

TB1-1 (165) Nash Equilibrium Retail Prices in a Planer Duopoly Market 1295
**Koichi Nakade, Akira Kanazawa(Nagoya Institute of Technology, Japan)*

TB1-2 (176) A Proposal of Bargaining Solution for Cooperative Contract in a Supply Chain 1303
**Wakana Kato, Ikuo Arizono(Okayama University, Japan)*

TB1-3 (208) Capacity Planning and Partnership Management 1310
**Cheng-Hung Wu, Wen-Lan Hsu(National Taiwan University, Taiwan)*

TB1-4 (160) A muli-objective facility location problem in congested systems with service level for each facility and competitive environment 1314
**Mahsa Boroushaki(M.Sc. student of industrial engineering, Iran), hasan hosseini nasab(Associate professor, Iran)*

TB1-5 (234) Blood Bank Location Model for Blood Distribution Planning in Makassar City 1323
**Muhammad Rusman(Hasanuddin University, Indonesia), Amrin Rapi(Ministry of Industry of Republic of Indonesia, Indonesia)*

TB2 Management of Technology and Innovations 2

Biyang, 14:20-16:00

Chair: Chih Wang (National Chiao Tung University, Taiwan)

TB2-1 (188) Establishment and development of the innovation-promoting organization for Industry 1328
**Kana Hayase, Nobutaka Odake(Nagoya Institute of Technology, Japan), Takeshi Matsumoto(Osaka Gas Co., Japan)*

TB2-2 (425) Using Innovative Intellectual Property Indicators to Identify National Knowledge Flow Effects 1336
**Chin-Yuan Fan, Chia-Hao Hsu(Science & Technology Policy Research and Information Center, Taiwan), shu-hao Chang(National Applied Research Labs, Taiwan), pin-hua Lin(Zhongli, Taiwan)*

TB2-3 (317)	Development of Virtual Organisation Framework Model in Tourism Industry Using Axiomatic Design *Agus Fauzi, Eny Maftuchah, Nasrullah Setiawan, Bambang Suratno(Universitas Islam Indonesia, Indonesia)	1345
TB2-4 (150)	Supporting Technology Foresight for Disruptive Innovation: Keyword-based Visual Analysis for Futuristic Data Jieun Kim, *Yongtae Park(Seoul National University, Korea)	1352
TB2-5 (22)	Combining correspondence analysis with association rule mining to carry out market segmentation and product configuration *Chih Wang(National Chiao Tung University, Taiwan)	1358

TB3 Data Mining 3

Udo, 14:20-16:00

Chair: Jen-Ying Shih (National Taiwan Normal University, Taiwan)

TB3-1 (437)	Comparative Benchmarking Analysis among Fine Jewelry and Costume Jewelry Companies in the Philippines Using Data Envelopment Analysis (DEA) *Dennis Beng Hui, Emil Fernandez(De La Salle University Manila, Philippines)	1366
TB3-2 (469)	A Prediction Method based on Weighted Ensemble of Decision Tree on Alternating Decision Forests. *Shotaro Misawa, Naohiro Fujiwara(Graduate Student of Waseda University, Japan), Kenta Mikawa(Waseda University, Japan), Masayuki Goto Goto(Waseda University., Japan)	1375
TB3-3 (486)	Creating Attractive Digital Signage Content at Universities *RYO AKAIWA(Aoyama Gakuin University, Japan), RYUJI MAEKAWA, KAKURO AMASAKA(AOYAMA GAKUIN UNIVERSITY, Japan)	1383
TB3-4 (502)	A Data Mining Approach for Loan Marketing Response Model *Jen-Ying Shih(National Taiwan Normal University, Taiwan), Wun-Hwa Chen(National Taiwan University, Taiwan)	1388
TB3-5 (581)	The 7-Eleven Rule in the Simulation Output Analysis *Wheyming Song(professor, Taiwan)	1394

TB4 Scheduling & Sequencing 1

Chuja, 14:20-16:00

Chair: Byung Do Chung (Sungkyunkwan University, Korea,)

TB4-1 (122)	A two-stage assembly scheduling problem with makespan minimization Lulu Hu, *Tsui-Ping Chung, Hongying Shan(Jilin University, China), Chien-Ming Chen(Harbin Institute of Technology Shenzhen Graduate School, China)	1413
TB4-2 (233)	Particle swarm Optimization for minimizing electrical consumption for flexible flowshop problem Krisanarach Nitisiri(Research Unit on Advanced Productivity Improvement and Logistics Management, Thailand), *Kanchana Sethanan(Faculty of engineering. Khon Kaen university, Thailand)	1420
TB4-3 (284)	Campaign Planning for Multi-Purpose Batch Plants: A Case Study from the Pharmaceutical Industry Mao-Kai Hsu, *Kuo-Hao Chang(National Tsing Hua University, Taiwan)	1427
TB4-4 (287)	Multi-Jobs Lot Streaming to Minimize the Mean Maximum Completion Time in Multi-Stages Hybrid Flow Shop Scheduling *Said Syahputra(Institut Teknologi Bandung, Indonesia, Indonesia), Anas Ma'ruf(Indonesia, Indonesia)	1434
TB4-5 (309)	Shift-Scheduling Characteristic Identification of Non-Star Hotel Industry in Yogyakarta Indonesia *Deny Yuniartha(Universitas Atma Jaya Yogyakarta, Indonesia), Ignatius Luddy Indra Purnama(Atma Jaya Yogyakarta University, Indonesia)	1442

TB5 Knowledge & Information Management

Ramada-1, 14:20-16:00

Chair: Minseok Song (Ulsan National Institute of Science and Technology, Korea)

TB5-1 (250)	Mergers and Acquisitions of ICT Firms for Technological Knowledge Sourcing *Yoonjung An, *Yongtae Park(Seoul National University, Korea)*	1449
TB5-2 (278)	Analyzing Service Processes Using Process Mining: A Case Study *Hanna Yang, *Minseok Song(Ulsan National Institute of Science and Technology, Korea)*	1454
TB5-3 (445)	Document Control for Research Reactor Construction by Advanced Nuclear Safety Information Management System **Kook-Nam Park(Korea Atomic Energy Research Institute, Korea), Sung-Kyu Lee(Divi-vision Co., Korea), Seung-Mi Baek(Korea Atomic Energy Research Instituti, Korea), Min-Ho Choi(Korea Atomic Energy Research Institute, Korea), Yong-Se Kwon(Korea Atomic Energy Research institute, Korea)*	1458
TB5-4 (297)	Factors influencing user acceptance of intelligent personal assistants on smart devices *Jihye Park(LG Household & Health Care, Korea), Euiho Suh(Pohang University of Science and Technology, Korea), *Kiwon Lee(Pohang University of Science and Technology (POSTECH), Korea)*	1463
TB5-5 (389)	Prognosis and Survival Prediction of Lung Cancer by Bayesian Network **Shi-Woei Lin, Yu-Wei Chen, Mohammad Jerusalem(National Taiwan University of Science and Technology, Taiwan)*	1471

TB6 Production & Operations Management 2

Ramada-2, 14:20-16:00

Chair: Ivy Mar Lamos (Bulacan State University, Philippines)

TB6-1 (49)	Application of ECRS and Simulation Techniques in Bottleneck Identification and Improvement:A Paper Package Factory **Chompoonoot Kasemset, Prin Pinmanee, Primapun Umarin(Chiang Mai University, Thailand)*	1477
TB6-2 (124)	Assembly line type II problem of sewing lines in garment industry *James C. Chen(National Tsing Hua University, Taiwan), Tzu-Li Chen(Fu Jen Catholic University, Taiwan), Yi-Jhen Lin, *Chun-Ju Lin, Yi-Hsin Hu(National Tsing Hua University, Taiwan)*	1485
TB6-3 (151)	EFFICIENCY AND BETTER PRODUCTION FLOW FOR A MANUFACTURER OF STATUES: AN APPLICATION OF MOTION AND TIME STUDY **Ivy Mar Ramos, Ivy Mar Ramos(Bulacan State University, Philippines)*	1492
TB6-4 (187)	A Genetic Algorithm for Solving Assembly Line Balancing Problem in Footwear Stitching Line *James C. Chen, Tzu-Li Chen, *Chieh-Ying Lin, Chun-Ju Lin(National Tsing Hua University, Taiwan)*	1500
TB6-5 (12)	Pricing, Production, and Channel Coordination with Stochastic Learning *Tao Li(Santa Clara University, United States), *Suresh Sethi(University of Texas At Dallas, United States), Xiuli He(University of North Carolina at Charlotte, United States)*	1507

TB7 Healthcare Systems 2

Ramada-3, 14:20-16:00

Chair: Gino Lim (University of Houston, UnitedStates)

TB7-1 (95)	Construct the Analysis Platform for Evaluating the Static Postural Stability **Chih-Hung Jen(Lunghwa University of Science and Technology, Taiwan), Bernard C. Jiang(National Taiwan University of Science and Technology, Taiwan), Yin-Sung Chen(Yuan Ze University, Taiwan)*	1512
TB7-2 (106)	Recent Advances in Intensity Modulated Proton Therapy Treatment Planning Optimization **Gino Lim, Wenhua Cao(University of Houston, United States), Radhe Mohan(The University of Texas MD Anderson Cancer Center, United States)*	1520
TB7-3 (306)	Developing A Productivity Improving Framework by Overall Equipment Efficiency and An Empirical Study in A Hospital **Chen-Fu Chien, Pei-Chun Chu, Mei-Li Kuo(National Tsing Hua University, Taiwan)*	1526
TB7-4 (379)	An analysis of patients flow in a hospital case study using Simulation model and plant layout	1534

*Patcharaphorn Poobanchao(KhonKaen University, Thailand), *Panitarn Peerapattana(Department of Industrial Engineering Faculty of Engineering of Khon Kean University, Thailand)*

TB7-5 (76)	Willingness to pay for BPJS Health Insurance: Findings from an Exploratory Study **Aries Susanty(Lecturer, Indonesia), nia puspitasari(diponegoro university, Indonesia), Purnawan Wicaksono(Lecturer, India), Petty Primatury(Student, Indonesia)*	1540

TB8 Flexible Manufacturing Systems

Ramada-4, 14:20-16:00

Chair: Ibrahim Buseif (, Libya)

TB8-1 (579)	The Comparison between Perpetual and Periodic-Review Models for Fast-Moving Products in Convenience Store Distribution Center **Yosi Hidayat, Veronica Adelein, Lucia Diawati(Institut Teknologi Bandung, Indonesia)*	1547
TB8-2 (48)	Using Petri Net (PN) Model for Design Flexible Manufacturing Systems (Prototype FMS's) **Ibrahim Buseif(Staff member, Libya)*	1554
TB8-3 (62)	New Model of FMS using FTPN with Demand Variability and Machine Breakdown **Muhammad Haris Aziz(University of Engineering and Technology, Pakistan), Erik L.J. Bohez(Asian Institute of Technology, Thailand), Abid Ali, Neelum Iqbal(UET Taxila, Pakistan)*	1561
TB8-4 (286)	Cellular Manufacturing System Model under Demand Uncertainty **Muhammad Shodiq Abdul Khannan(Universitas Pembangunan Nasional Veteran Yogyakarta, Indonesia), Anas Ma'ruf(Indonesia, Indonesia), Rachmawati Wangsaputra(Institut Teknologi Bandung, Indonesia), sutrisno sutrisno(UPN Veteran Yogyakarta Indonesia, Indonesia)*	1567
TB8-5 (457)	An iterative production planning approach for flexible semiconductor fabrication **Sun Hoon Kim, Young Hoon Lee, Cheng Yu Hwang, Kee Yong Shin, Ki Yol Nam(Yonsei University, Korea)*	1575

TB9 Topics in IE/MS

Halla(8F), 14:20-16:00

Chair: Taufiq Immawan (Islamic University of Indonesia, Indonesia)

TB9-1 (575)	A study on relieving electric power shortage by on-site solar power supply *SangYun Choe, *Jinwoo Park(Seoul National Univ., Korea)*	1579
TB9-2 (354)	Preliminary Study for Mapping of Business Process Re-engineering of Batik in Jogja and Solo **Taufiq Immawan(Islamic University of Indonesia, Indonesia)*	1584
TB9-3 (378)	Evaluation Method of Information Value Applying for Website **GaoYang Liang(Graduate School of Business Administration Daito Bunka University, Japan), Kiyoshi Nagata(Informatics Faculty of Business Administration and Department of Business Studies Daito Bunka University, Japan)*	1590
TB9-4 (212)	Lean Production in Automotive Parts Industry-A Case Study *James C. Chen(National Tsing Hua University, Taiwan), Tzu-Li Chen(Fu Jen Catholic University, Taiwan), Kirin Chen, Amy Hung(AXIS-group, Taiwan), *Yu Liang, Chun-Ju Lin(National Tsing Hua University, Taiwan)*	1598
TB9-5 (202)	Optimum Humanitarian Relief Logistics for Facility and Stock Location under Time Restriction: Thai Flooding Case Study **WAPEE MANOPINIWES, KEISUKE NAGASAWA, TAKASHI IROHARA(Sophia University, Japan)*	1604

TC1 Heuristics/Metaheuristics

Mara, 16:20-18:00

Chair: Ma. Cecilia Buseif (Mapua Institute of Technology, Philippines)

TC1-1 (70)	GA-BASED OPTIMAL FACILITY LAYOUT DESIGN: CROSSOVER AND MUTATION PROBABILITY EVALUATIONS *Maricar Misola(Technological Institute of the Philippines- Quezon City, Philippines), *Ma. Cecilia Carlos(Mapua Institute of Technology, Philippines), Bryan Navarro(Philippine Institute of Industrial Engineers (PIIE), Philippines)*	1612

TC1-2 (464) An Improved Differential Evolution Algorithm for Vehicle Routing Problem: An Application in Mobile Medical Equipment Maintenance Unit 1620
*Kanokwan Supakdee(Department of Industrial Management Technology, Thailand), Natthapong Nanthasamroeng(Faculty of Industrial Technology, Thailand), Rapeepan Pitakaso(Metaheuristics for Logistics Optimization Laboratory (MLO), Thailand)

TC1-3 (481) Heuristic for multi-stage capacitated p-median problem with supplier evaluation 1626
*Anurak Chaiwichian, Rapeepan Pitakaso(Ubonratchathani University, Thailand)

TC1-4 (520) Heuristic Shift Scheduling forAirport Ground Staff 1633
*Kong Weng Lee(UNIMAS, Malaysia), San Nah Sze(Faculty of Computer Science and Information Technology Universiti Malaysia Sarawak, Malaysia), Keat Keong Phang(Faculty of Computer Science and Information Technology Universiti Malaya, Malaysia)

TC1-5 (192) Optimization of Milk Productivity in Dairy Cattles by Genetic Algorithm 1639
*Senol Altan(Gazi University, Turkey), Fatih Akturk(Ulsan National Insttute Of Science and Technology, Korea), Emrecan Ozeler(Republic of Turkey Ministry of Food, Turkey)

TC2 Inventory Modeling / Artificial Intelligence

Biyang, 16:20-18:00

Chair: Wisut Supithak (Kasetsart University, Thailand)

TC2-1 (381) Multi-Item Economic Production Quantity Model with the Consideration of Raw Material Inventory Management Costs 1647
*Wisut Supithak(Kasetsart University, Thailand), Sasiprapa Limpakan(Kasetsart Uniersity, Thailand)

TC2-2 (123) A Stochastic Programming Model for Vendor Managed Inventory System of an Animal Feed Factory and Farm Network 1654
*Thawee Nakrachata-Amon(Faculty of Engineering, Thailand), Supachai Pathumakul(Khon Kaen University, Thailand)

TC2-3 (101) Vender Managed Inventory for Fresh Agricultural Products 1659
*Mitsuyoshi Horikawa, Takeo Takeno, Mitsumasa Sugawara(Iwate Prefectural University, Japan)

TC2-4 (318) Vehicle risk assessment in accidents using neural network 1665
Yuri Castro, *Young Jin Kim, Baek An Sun(Kyung Hee University, Korea)

TC3 Artificial Intelligence

Udo, 16:20-18:00

Chair: Ronaldo Polancos (De La Salle University, Philippines)

TC3-1 (182) The Study of Tokai Cluster as a Leader of CFRP Industries in Japan 1672
*Akihito Zenke, Nobutaka Odake(Nagoya Institute of Technology, Japan)

TC3-2 (260) Agent-based Real-time Scheduling for Smart Household Appliances 1678
Bobby Kurniawan, *Anggoro Pramudyo, Didik Aribowo(Untirta, Indonesia), Anas Ma'ruf(Institut Teknologi Bandung, Indonesia)

TC3-3 (391) APPLICATION OF CLOUD-BASED KANBAN SYSTEM IN PROJECT MANEGEMENT 1683
Chi-Wei Shih, *Chen-Yang Cheng(Tunghai University, Taiwan)

TC3-4 (490) User's Free Time Estimation When Using Smartphone 1688
*kohei Yamamoto(Kanazawa Graduate School of Natural Science and Technology, Japan), Tatsuhito Hasegawa(Tokyo Health Care University, Japan), Haruhiko Kimura(Kanazawa University, Japan)

TC3-5 (499) Earned Value Management considering Milestone Weighting and Dependency Structure Matrix 1692
*Ronaldo Polancos(De La Salle University, Philippines)

TC4 Scheduling & Sequencing 2

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Chair: Hans-Otto Guenther (Seoul National University, Korea)

TC4-1 (399) Improvement of Scheduling n Jobs m Machines Parallel Algorithm to Minimize Makespan 1696
*Rifa Arifati(University of Pembangunan Nasional Veteran Jakarta, Indonesia), Aji P.

Gunoto(Universitas Pembangunan Nasional Veteran Jakarta, Indonesia)

TC4-2 (405)	A Batch-scheduling problem to minimize actual flowtime of parts through the shop which has m heterogenous batch processors *Nita Hidayat(Industrial Engineering ITB, Indonesia), Andi Cakravastia, TMA Ari Samadhi(Bandung Institute of Technology, Indonesia), *Abdul Halim(Industrial Engineering ITB, Indonesia)*	1701
TC4-3 (418)	Genetics Algorithm for Hybrid and Flexible Flowshop with Non-Identical Machines and Subcontract Case **Nora Azmi(Trisakti University, Indonesia), Gibtha Fitri Laksmi(Ibnu Khaldun University, Indonesia)*	1707
TC4-4 (398)	Mixed Integer Linear Programming for Un-related Parallel Machine Problems to Minimize Total Earliness and Tardiness - A Case Study of Precision Metal Tools Industry *Chun Hsiung Lai, *Chen-Yang Cheng(Tunghai University, Taiwan)*	1714
TC4-5 (79)	A block planning model for integrated lot sizing and scheduling of continuous casters and hot strip mills in the steel industry **Hans-Otto Guenther(Seoul National University, Korea), Imke Mattik(TU Berlin, Germany)*	1719

TC9 Lean Production Management

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Chair: Kenichi Nakashima (Kanagawa university, Japan)

TC9-1 (542)	Single-period inventory model considering a competitive store and two qualities of the product **Takashi Hasuike(Osaka University, Japan)*	1720
TC9-2 (546)	A Single-Producer Multi-Retailer Integrated Inventory System with Scrap in Production and Shortage in sale **Hitoshi Hohjo, Tomoki Koreeda(Osaka Prefecture University, Japan)*	1728
TC9-3 (94)	Joint replenishment problem with can-order policies under carrier capacity and correlated demands **KEISUKE NAGASAWA, Takashi Irohara(Sophia University, Japan), Yosuke Matoba, Shuling Liu(Fairway Solutions Inc., Japan)*	1733
TC9-4 (545)	Inventory-Production System with Non-Zero Target Inventory **Mohammadreza Parsanejad(Keio University, Japan), Bongsung Chu(Soonchunhyang University, Japan), Hiroaki Matsukawa(Keio University, Japan)*	1741
TC9-5 (547)	A Lean Supply Chain Control Problem with Stochastic Demand **Kenichi Nakashima, Thitima Sornmanapong(Kanagawa University, Japan), Hans Ehm(Infineon Technologies AG, Japan), Geraldine Yachi(nfineon Technologies AG, Japan)*	1746

WA1 Inventory Modeling & Management

Mara, 08:30-10:10

Chair: Nobuaki Ishii (Bunkyo University, Japan)

WA1-1 (65)	A Lot Size-Based Collaborative Demand-to-Supply Management System for Make-to-Order Environment **Nobuaki Ishii(Bunkyo University, Japan), Ko Sakashita, Tetsuo Yamada(University of Electro-Communications, Japan), Masaaki Ohba(Nihon University, Japan), Masayuki Matsui(Kanagawa University, Japan)*	1754
WA1-2 (80)	Reorder Point Determination Considering Customer Service Constraint under Limited Demand Information **Yasuhiko Takemoto(Prefectural University of Hiroshima, Japan), Ikuo Arizono(Okayama University, Japan)*	1762
WA1-3 (71)	Inventory Classification Involving Substitution Rules **ikou kaku, Xinyi Zhang(Tokyo City University, Japan)*	1769
WA1-4 (446)	Reducing Inventory using Inventory Management Models **Sakgasem Ramingwong, Danuchin Anantana(Center of Excellence in Logistics and Supply Chain Management, Thailand)*	1775
WA1-5 (518)	An Approach for Avoiding Information Loss in Managing Product Safety Issue Associated with Suppliers *Muhammad Saad Memon, **Young Hae Lee, Sonia Irshad Mari(Hanyang University, Korea)*	1779

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Biyang, 08:30-10:10

Chair: Kazuhiro Takeyasu (Tokoha University, Japan)

WA2-1 (92)	Forecasting utilizing a Day of the Week Index in the Case of Cafe *Koumei Suzuki, Kazuhiro Takeyasu(Tokoha University, Japan)	1787
WA2-2 (31)	Building BTO System in the Sanitary Materials Manufacturer Under the Improvement of Forecasting Accuracy *Kazuhiro Takeyasu(Tokoha University, Japan), hirotake yamashita(Chubu University, Japan)	1795
WA2-3 (34)	UTILIZATION OF GENETIC ALGORITHM TO IMPROVE FORECASTING ACCURACY ? AN APPLICATION TO THE DATA OF A TUBE AND A CATHETER? *Daisuke Takeyasu(The Open University of Japan, Japan), Kazuhiro Takeyasu(Tokoha University, Japan)	1803
WA2-4 (32)	Optimal operation for green supply chain with quality of recyclable parts and contract for recycling activity *Etsuko Kusukawa(Osaka Prefecture University, Japan), Sho Akizawa(Nara Institute of Science and Technology, Japan)	1811
WA2-5 (102)	A Hybrid Method to Improve Forecasting Accuracy In the Case of Japanese Food Restaurant *Jun Tatebayashi, Kazuhiro Takeyasu(Tokoha University, Japan)	1819

WA3 Production Design & Management 1

Udo, 08:30-10:10

Chair: Philip Ermita (PIIE, Philippines)

WA3-1 (117)	Development a Latex Pillow to Meet Customer Requirements *Nattapong KONGPRASERT(Facluty of Engineering, Thailand)	1827
WA3-2 (162)	BananaNut Paper: REENGINEERING PAPER COMPONENT *Marianne Calayag(Bulacan State University, Philippines)	1834
WA3-3 (198)	An Optimal Modularity for Platform-based Product Family Design of Wind Power Generators *Qingnan Li(University of Southern Denmark, Denmark)	1838
WA3-4 (222)	Composite Board Development: Use of Cardava Banana Peel and Watermelon Rind as Alternative Raw Materials *Philip Ermita(PIIE, Philippines)	1845
WA3-5 (249)	Fairing of High Speed Milling tool-path by Using The Cubic NURBS *Anh Duong, Anh Duong(International University in Vietnam, Viet Nam)	1852

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Chuja, 08:30-10:10

Chair: San-Nah Sze (Universiti Malaysia Sarawak, Malaysia)

WA4-1 (85)	Scheduling with multi-attribute setup times on unrelated parallel machines Ching-Jong Liao(National Taiwan University of Science and Technology, Taiwan), *Cheng-Hsiung Lee(Chihlee Institute of Technology, Taiwan), Hsing-Tzu Tsai, Kuo-Jui Wu(National Taiwan University of Science and Technology, Taiwan)	1859
WA4-2 (120)	Scheduling on parallel machines with mold constraints Haidan Zhao, *Tsui-Ping Chung, Hongying Shan(Jilin University, China), Chien-Ming Chen(Harbin Institute of Technology Shenzhen Graduate School, China)	1867
WA4-3 (177)	Transient Period Scheduling of Dual Armed Cluster Tools *Nurhak Aktas, Taesun Yu, Tae-Eog Lee(KAIST, Korea)	1874
WA4-4 (316)	Adaptive Hybrid Genetic algorithm for solving two-stage reentrant flexible flow shop with blocking constraint Chatnugrob Sangsawang, *Kanchana Sethanan(Research Unit on Advanced Productivity	1880

Improvement and Logistics Management, Thailand), Mitsuo Gen(Fuzzy Logic Systems Institute, Japan)

WA4-5 (509) Decision Support System for Order Online Delivery 1888
San-Nah Sze, Bui-Fat Thian, Kang-Leng Chiew(Universiti Malaysia Sarawak, Malaysia)

WA5 Fuzzy Logic

Ramada-3, 08:30-10:10

Chair: Rionel Caldo (Lyceum of the Philippines University - Laguna, Philippines)

WA5-1 (30) Predictive Approach of Assessing the Passing of Engineering Board Courses in Lyceum of the Philippines University-Laguna (LPU-L) Using Fuzzy Logic Technology 1894
Rionel Caldo(Lyceum of the Philippines University - Laguna, Philippines)

WA5-2 (58) Fuzzy Logic Simulation of DC-DC Boost Converter Using Matlab Fuzzy Logic Toolbox 1902
*Rionel Caldo, *Rionel Caldo(Lyceum of the Philippines University - Laguna, Philippines)*

WA5-3 (224) Cost Effectiveness Analysis Comparing Mastectomy versus Lumpectomy with Fuzzy Logic 1908
*Aysun Aktas, *gozde tutuncu(Izmir University of Echonomics, Turkey)*

WA5-4 (576) Fuzzy AHP based Supplier Selection considering the Triple Bottom Line Concept 1914
*Wannimit Khampanya, Tritos Laosirihongthong(Thammasat University, Thailand), *Premaratne Samaranayake(University of Western Sydney, Australia)*

WA6 Optimization Techniques 2

Ramada-4, 08:30-10:10

Chair: Daniel Siek (Chung Yuan Christian University, Taiwan)

WA6-1 (125) Impact of Globalization on Total Factor Productivity of the Manufacturing Sector in Pakistan 1920
Usama Bin Perwez, Muhammad Faseeh Tahir, Aamir Ahmed Baqai(National University of Sciences & Technology, Pakistan)

WA6-2 (69) Optimal Solar Photovoltaic (PV) Penetration in Secondary Distribution Network Using Genetic Algorithm 1929
*Bryan Navarro(Technological Institute of the Philippines, Philippines), *Maricar Misola(Technological Institute of the Philippines- Quezon City, Philippines)*

WA6-3 (288) Numerical Analysis of Three Rookies Assignment Optimization in Limited-Cycled Model with Multiple Periods -the case of Erlang Distribution 1937
Peiya Song, Xianda Kong, Hisashi Yamamoto(Tokyo Metropolitan University, Japan), Jing Sun(Nagoya Institute of Technology, Japan), Masayuki Matsui(Kanagawa University, Japan)

WA6-4 (577) Optimal Ordering Policies under a Progressive Interest Scheme with Supplier's Quantity Discount 1945
*Gary Chen, *Daniel Siek, Hui Wee(Chung Yuan Christian University, Taiwan)*

WA6-5 (415) An analysis on the influences of flat pricing for unlimited voice callings: the aspects of MNOs and consumers in Korea 1951
SEONGJUN LEE, SAESOL CHOI(Electronics and Telecommunications Research Institute, Korea)

WB1 Industrial Engineering Education

Mara, 10:30-12:10

Chair: Young Jae Jang (KAIST, Korea)

WB1-1 (526) Solution Based Learning: A New Approach in Product Design and Development Andragogy 1957
Risdiyono Risdiyono(Islamic University of Indonesia, Indonesia)

WB1-2 (139) A study for making standardized-work tables suited for enterprises of the engineering / metalworking industry 1962
Masahiro Shibuya(Tokyo Metropolitan University, Japan), Kenichi Iida(Hokkaido Research Organization, Japan), Koki Mikami(Hokkaido University of Science, Japan)

WB1-3 (256) "Implementation of methods and solutions for improving statistical thinking of non-English speaking students studying in Industrial Engineering field" 1967
Huy Nguyen, Huy Nguyen, Huy Nguyen(International University - Vietnam National University

HCMC, Viet Nam)

WB1-4 (495) — Industrial Engineering Education using KAIST LEGO Manufacturing Systems (KLMS) — 1975
Young Jang, Vina Yosephine(KAIST, Korea), Sun Kyung Oh(Korea Advanced Institute of Science and Technology, Korea), Sukhyun Cho, Kiryong Kyeong(KAIST, Korea)

WB2 SCM and Forecasting 2

Biyang, 10:30-12:10

Chair: Kazuhiro Takeyasu (Tokoha University, Japan)

WB2-1 (52) — Improving Forecasting Accuracy in the Case of Intermittent Demand Forecasting — 1983
*Daisuke Takeyasu(The Open University of Japan, Japan), *Asami Shitara(Tax Corporation Arknet, Japan), Kazuhiro Takeyasu(Shizuoka City, Japan), Asami Shitara(Tax Corporation Arknet, Japan)*

WB2-2 (36) — Reformation of Production System Based Upon Demand Forecasting — 1991
*hirotake yamashita(Chubu University, Japan), *Kazuhiro Takeyasu(Tokoha University, Japan)*

WB2-3 (87) — A Hybrid Method to Improve Forecasting Accuracy with An Application to the Data of Bread — 1999
Yuki Higuchi(Setsunan University, Japan), Hiromasa Takeyasu(Kagawa???Junior???College, Japan), Kazuhiro Takeyasu(Tokoha University, Japan)

WB2-4 (413) — EXTENDED OPTIMAL REPLACEMENT POLICY FOR A TWO-UNIT SYSTEM UNDER CUMULATIVE DAMAGE MODEL — 2006
Shey-Huei Sheu, TZU-HSIN LIU(Providence University, Taiwan), ZHE-GEORGE ZHANG(Western Washington University, United States)

WB3 Production Design & Management 2

Udo, 10:30-12:10

Chair: Masahiro Arakawa (Nagoya Institute of Technology, Japan)

WB3-1 (283) — The Implementation of Affective Based Product Design in Small Enterprise Manufacturers — 2007
Imam Widodo, Tio Sampurno(Islamic University of Indonesia, Indonesia)

WB3-2 (348) — A Study of Product Design Using Parts and Parts Structures Characterized by Reviews on Internet — 2012
Masahiro Arakawa, Eriko Katou(Nagoya Institute of Technology, Japan)

WB3-3 (350) — Derivation of design freeze sequence using Bayesian network framework — 2018
*Jihwan Lee, *Yoo Hong(Seoul National University, Korea)*

WB3-4 (93) — Investigation of PLA/PCL biocomposite scaffolds fabricated via SVM rapid prototyping — 2025
*Kanokporn Kamonchit, *Thittikorn Phattanaphibul(Kasetsart University (Sriracha Campus), Thailand)*

WB3-5 (84) — Assessment of an ERP Graphical User Interface Design Related to Human Cognition — 2031
Grace Lorrain Intal, Catherine Briones(Mapua Institute of Technology, Philippines)

WB4 Scheduling & Sequencing 4

Chuja, 10:30-12:10

Chair: Katsumi Morikawa (Hiroshima University, Japan)

WB4-1 (329) — Simulation-based outpatient appointment scheduling with the aid of clearing function — 2040
Katsumi Morikawa, Katsuhiko Takahashi(Hiroshima University, Japan), Daisuke Hirotani(Prefectural University of Hiroshima, Japan)

WB4-2 (46) — Flexible Jobshob Scheduling Model Considering Production Cost and Tardiness Cost Simultaneously — 2048
Devy Sari, Anas Ma'ruf(Institut Teknologi Bandung (Bandung Institute of Technology), Indonesia)

WB4-3 (403) — Batch Scheduling for a Single Machine with Forgetting Effect to Minimize Total Actual Flow Time — 2055
*Rinto Yusriski, *Sukoyo -(Bandung Institute of Technology, Indonesia), T.M.Agung Samadhi(Institut Teknologi Bandung, Indonesia), Abdul Halim(Industrial Engineering ITB, Indonesia)*

WB4-4 (426) — Integrating Batch Production and Maintenance Scheduling on a Deteriorating Machine to Minimize Production and Maintenance Costs in Just in Time Environment — 2061

*ZAHEDI *(INSTITUT TEKNOLOGI BANDUNG, Indonesia), TMA Ari Samadhi, Suprayogi .(Bandung Institute of Technology, Indonesia), *Abdul Halim(Industrial Engineering ITB, Indonesia)*

WB4-5 (454) Creation of Total Shift Scheduling Model in Restaurant Service -An Example of the Highly Classical Luxury Hotel Restaurant - 2070
**Kazuki Fujita, Kakuro Amasaka(Aoyama Gakuin University, Japan)*

WB5 Quality Engineering & Reliability

Ramada-3, 10:30-12:10

Chair: Rionel Caldo (Lyceum of the Philippines University - Laguna, , Philippines)

WB5-1 (453) Establishment of a New Vietnam Production Model 2077
**Shogo Miyashita, Kakuro Amasaka(Aoyama gakuin University, Japan)*

WB5-2 (508) A taxonomy of failure rate indexes based on literature review 2083
*sanghyeon koh(Pohang University of Science and Technology, Korea), kiwook jung, Bongjun Ji(Pohang university of science and technology, Korea), *Hyunbo Cho(POSTECH, Korea)*

WB5-3 (270) Comparative Study of SA algorithms of optimal arrangement problem in a Multi-state k-out-of-n:F system 2090
**Naoki Yoshida(Tokyo Metropolitan University, Japan), Koji Shingyochi(Jumonji University, Japan), Hisashi Yamamoto(Tokyo Metropolitan University, Japan), Tomoaki Akiba(Chiba Institute of Technology, Japan), Xiao Xiao(Tokyo Metropolitan University, Japan)*

WB5-4 (517) A New Universal Generating Function Method to Search for all Minimal Paths Generate in Networks 2098
*Wei-Chang Yeh(National Tsing Hua University, Taiwan), *Hui-Wen Lee(National Tsing Hua University Hsinchu, Taiwan)*

WB5-5 (421) Prioritizing the Factors for Quality Excellence Practices Using Analytic Hierarchy Process (AHP) Method 2106
**Mehran Doulat Abadi(Universiti Teknologi Malaysia (UTM), Malaysia), Sha'ri Mohd. Yusof(Universiti Teknologi Malaysia, Malaysia)*

WB6 Lean Manufacturing

Ramada-4, 10:30-12:10

Chair: Daniel Siek (Chung Yuan Christian University , Taiwan)

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*Worakit Changjutturas(Department of Industrial Engineering Faculty of Engineering of Khon Kaen University, Thailand), *Panitarn Peerapattana(Department of Industrial Engineering Faculty of Engineering of Khon Kean University, Thailand)*

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**Nestor Ong(University of Santo Tomas, Philippines), Patricia Kamil Kinol, Angela Camille San Miguel, Charlene Mae Ramirez(Faculty of Engineering, University of Santo Tomas, Philippines)*

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*Sonia Irshad Mari, *Young Hae Lee, Muhammad Saad Memon(Hanyang University, Korea)*

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Chair: (,)

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	*Chi-Yen Yin(National Taiwan University, Taiwan)	
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SUZUKI, YOSHIHIKO	TA7-4
Syahputra, Ibnu Abi Said	TB4-4
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Takahashi, Natsumi MC4-3
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Takemoto, Yasuhiko MA5-3, WA1-2
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Takeyasu, Hiromasa WB2-3
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Thian, Bui-Fat WA4-5
Ting, Ching-Jung MA7-4
Tomita, Daijiro TA1-2
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Tsai, Du-Ming MC6-4
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Tsai, Meei-Ing MA6-3, MA6-5, MC8-2
Tsai, Ming-Chi MA6-3, MA6-5, MC8-2
Tseng, Ming-Lang TA5-1
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Tseng, Yan-Hsin MC6-4
Tuan Ya, Tuan Mohammad Yusoff Shah MB7-4
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Wang, Hsiao-Fan MB7-3, MC4-2, MC7-4, TA5-3, TA5-4
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Wang, Mao-Jiun MB3-1
Wang, Zih-Huei MC5-1
Wang, Hsuan Chih TB2-5
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YAMAGAMI, Kan MB2-5
Yamaki, Naokazu MC2-3
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Research in Supply Chain Management: Issue and Area Development

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Abstract. Today the study of supply chain management (SCM) is growing rapidly and provides a great opportunity to do research both empirical and theoretical development. Research opportunities in SCM has been reviewed by many researchers and grouped into many categories. This paper contains a review of research SCM and classify into 7 categories, namely (1) SCM Operational Management & Strategy, (2) knowledge management, (3) Relationship Management, (4) Information Technology in SCM, (5) Supply Chain Design, Logistics & Infrastructure, (6) Global Issues, (7) Environment, Legal & Regulations. The issue in each category and research opportunities will be discussed in this paper.

Keywords: Supply Chain Management, Research Opportunities in SCM, Issue in SCM

1. SUPPLY CHAIN MANAGEMENT ISSUE CLASSIFICATIONS

The development of the field of Supply Chain management (SCM) on all aspects of the business have provided great opportunities to do research. Research opportunities in SCM has been reviewed by many researchers. They classified SCM issue and its feasibility into many categories. Shukla, Garg & Agarwal (2011) and Jain et al (2010) have classified based on the issues that arised in SCM. Shukla, Garg & Agarwal (2011) classified SCM issue into 10 issues, while Jain et al (2010) classified it into 15 issues. Kouvelis, Chambers & Wang (2006) divided it into 8 main areas in SCM research. Soni & Kodali (2011) called it as

Principal component bodies (PCB) and the issues that related to SCM consist of 5 issues. Meanwhile, Schoenherr (2009) has reviewed about logistic issue and SCM within global area and classified it into 5 categories. Burgess et al (2006) grouped SCM issues into 6 areas based on literature review ranging from 2000 to 2009. Classification has been done also by Borade & Bansod (2008), that grouped SCM base on the aspects and the issues that are to be managed in supply chain. For the detail of classification of each paper is showed on the Table 1.

2. RESEARCH OPPORTUNITIES IN SCM

Base on Table 1, the SCM issue ca be classified into 7 categories, which includes: (1) SCM Operational Management & Strategy, (2) Knowledge Management, (3) Relationship Management, (4) Information Technology In SCM, (5) Supply Chain Design, Logistic & Infrastructure, (6) Global Issue, (7) Environment, Legal & Regulation. The following sections will explain each of the category.

2.1 SCM Operational Management & Strategy & Risk Management

SCM Operational Management & Strategy covers almost all issues that related to SCM strategy development and SCM operational in application as well as in theory. A variety topics that fall into this category, such as SCM Strategy Time Based Strategy, Quality, Outsourcing, Human resources, Supply Chain dynamics and Bulwhip effect, Buyer Behavior, Organization Behaviour, Operational Hedging and Risk Management in Supply Chain and Performance measurement. Various areas of research opportunities based on the literature review include: Integrated Information Technology and e-commerce within framework and SCM strategy, Allignment strategy among user in SCM ,Combining SCM strategy with new theory, demand driven SC : aligning supply and demand in SCM, SC in food and service industry, Performance measurement in SCM level area (focal firm is not included) and power imbalances, sistematic organizational structure of SC, supply chain security, risk management in natural disaster.

2.2 Knowledge Management in SCM

Knowledge illustrates the intelectual capital of the company which can be related to work related experience, expertise, know how, best practice that can be achieved and distributed to all stakeholders of the company. According to Horwitch and Armacost (2002), knowledge management involves individuals and groups that exist within company and among companies, management of tacid knowledge (invisible) and explicit knowledge to make better decision, better actions to support the company's business strategy. Knowledge is a critical key for companies to satisfy cutomer need through the development of products and services (Davenport and Khahr, 1998 in Sukla,2011). Some research opportunities in these area include: development of new culture based on empowerment, shared learning and continous improvement in SCM as well as research opportunities in order to develop knowledge management that occurs among company in SCM.

2.3 Relationship Management

One of the success key in SCM is the integration and relation between actors in SCM. Relationship management needs to supervise not only in relationship with supplier, but also the relationship with customer. Some issues that appear in relationship management include Alliances or Relationships Customer supplier relathionship, Supplier Development Supplier Selection and Management,Trust and Commitment,Parnertship issue,Buyer supplier relathionship. Some research opportunities in relationship management can be longterm relationship between actors in SCM, eliminate obstacles in a complex network of inter company, such as lack of common purpose, multiple and hidden goal, power imbalances, culture and procedure, conflict over autonomy and accountability, overdependence, lack of trust and mutual trust between users in SCM and modeling into mathematical model.

2.4 Information Technology In SCM

Rapid development in information technology and internet usage created knowledge based competition which was affecting company in SCM (Lang, 2001). The use of technology such as internet, e commerce, WWW, Vendor Managed Inventory, RFID facilitates transformation of goods, informations, financials that greatly affect the structure of SCM, SCM tranforms from traditional to modern SCM based on IT. Some issues are widely discussed in the SCM related to technology such as: Vendor Managed Inventory and Reengineering Programs,World Wide Web and Ecommerce,Computer Application and Electronic Data Interchange. Some research opportunities in this category such as: E- commerce dan WWW based SCM application, decision model and internet technology , internet influences empirical study on some e-SCM processes, Cloud computing and software in SCM,Security data exchange dan Stored online.

Tabel 1. SCM Issue Classifications

N	Issue Classification	Authors
1	1. Information Technologi 2. Knowledge management 3. Customer-Supplier relationship 4. Customer relation 5. SC design 6. Logistics 7. Global SC 8. Partnership 9. Environmental issue 10. Trush and commitment	Shukla, Garg, & Agarwal (2011)
2	1. SCM Strategy 2. SCM Frameworks, Trends And Challenges 3. Alliances Or Relationships 4. Transportations & Logistics 5. World Wide Web and Ecommerce 6. Time Based Strategy 7. Quality 8. Environmental and Social Responsibility 9. Outsourcing 10. Human Resource Issues 11. Supplier Development /Selection and Management 12. Computer Application and Electronic Data Interchange 13. Buyer Behavior 14. International/Global Supply Chain 15. Manufacturing Resource Planning, Legal and Regulatory Issues	Jain et al (2010)
3	1. SC dynamics and Bulwhip effect 2. Supply Chain Design, Capacity, and Sourcing Decisions 3. Supply Chain Management Practice: Vendor Managed Inventory and Reengineering Programs 4. Supply Chain Planning and Scheduling 5. Supply Chain Coordination: Information Sharing, Incentives and Contracts 6. Multi-Channel Coordination Challenges: Coordinating Offline and Online Procurement and Distribution 7. Design for Supply Chain Management: Postponement and Product Variety. 8. Operational Hedging and Risk Management in Supply Chains	Kouvelis, Chambers, & Wang (2006)
4	1. Strategic Management 2. Best practice 3. Organization Behaviour 4. Relation and parnership 5. Logistic 6. Marketing	Soni & Kodali (2011)
5	1. Internal Factors: a. Human resources b. Isues practices LSCM 2. Logistics: a. 3 Pl b. Logistics design/infrastructur 3. Environment: a. Risk/Uncertainty b. Reform and political Development	Schoenherr (2009)

N	Issue Classification	Authors
	c. Example of SC 4. Enabler: a. IT b. Buyer supplier relathionship 5. External Pressure: a. Competitiveness b. Green LSCM and reverse Logistic	
6	1. Leadership 2. Intra-organizational relationships 3. Inter-organizational relationships 4. Logistics 5. Process improvement orientation 6. Information systems 7. Business results & outcomes	Burgess et al, (2006)
7	1. Postponement and build to order SCM 2. Supply chain risk 3. Supply chain performance 4. Sustainable supply chain management 5. Supply chain integration	Seuring & Gold (2012)
8	1. Information Technology and Information Management 2. Knowledge Management 3. Customer and Supplier Relationship Management 4. Supply Chain Design 5. Logistics and Distribution Management 6. Outsourcing and Global Issues 7. Partnership Issues 8. Performance Measurement 9. Environmental Issues	Borade & Bansod (2008)

2.5 **Supply Chain Design, Logistic & Infrastructure**

Supply chain design is based on integrated activity among companies. The design includes logistic structure design or another activities in supply chain include design performance measurement troughout supply chain. According to Shukla (2011), to the current static approaches and theoretical models in SC design has not been effective considering all variables and constrains that involves in supply chain design. There is difficulties to involve dynamic variables in SCM system. In logistic, some topics are still being observe such as outsourcing in 3PL and 4PL and reverse logistics. Some issues are widely discussed in supply chain design, logistic and infrastructure, such as Supply Chain Design, Capacity and Sourcing Decisions, 3 PL-4PL logistics,Logistics design/infrastructur,Supply Chain Planning and Scheduling,Supply Chain Coordination: Information Sharing, Incentives and Contracts,Multi-Channel Coordination Challenges: Coordinating Offline and Online,Procurement and Distribution,Design for Supply Chain Management: Postponement and Product Variety. Research opportunity in this area includes system thinking, modeling and complex simulation system in SC,design and infrastucture on 3PL and 4 PL for spesific country and across the nationality and reverse logistic.

2.6 **Global Issue**

Global issue of SCM involves user across the world in terms of infrastructure, regulatory, differences of currency, culture and behaviour, etc. Schoenherr (2009) distinguished global supply chain issues into 5 categories: internal Logistic & SCM (L&SCM) factors (human resource issues and practices of L&SCM), logistics (third-party logistics and logistics design/infrastructure), L&SCM enablers (information technology and buyer-supplier relationships), the environment (risk/uncertainty, reforms and political developments, and examples as to how environmental variables can impact the management of supply chains) and external pressures (competitiveness,

Table 2 . Research Opportunities in SCM

No	Categories	Issue	Development areas / Research	Authors
1.	SCM OPERATIONAL MANAGEMENT & STRATEGY	• SCM Strategy • Time Based Strategy • Quality • Outsourcing • Human resources • SC dynamics and Bulwhip effect • Buyer Behavior • Organization Behaviour • Operational Hedging and Risk Management in Supply Chain • Performance measurement	• Integrate information technology and e commerce into framework and strategy SCM • Strategi allignment among user in SCM • combine management SCM strategy with new theory • Demand driven SC : aligning supply and demand in scm • SC in food and service industry • Performance measurement in SCM level (not focal firm level) and power	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011) • Schoenherr (2009) • Kouvelis, Chambers, & Wang (2006) • Guinipro(2008) • (Zhu &Sarkis,2004)
2.	KNOWLEDGE MANAGEMENT	• Knowledge Management in SCM	• Development new culture based on empowerment , on going , shared learning, continous improvement in SCM • Development of	• Shukla, Garg, & Agarwal (2011)
3.	RELATIONSHIP MANAGEMENT	• Alliances Or Relationships Customer supplier relathionship • Supplier Development Supplier Selection and Management • Trust and Commitment • Parnership issue • Buyer supplier relathionship	• Longterm relationship model between SCM staff • Eliminate obstacles in complex company's network, al ; lack of common purpose, multiple and hidden goals, power imbalances,	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011) • Schoenherr (2009) • Kouvelis, Chambers, & Wang (2006) • Guinipro(2008)

			overdependence , lack of trust • Development of mutual trust model between staff in SCM and design	
4.	INFORMATION TECHNOLOGY IN SCM	• Vendor Managed Inventory and Reengineering Programs • World Wide Web and Ecommerce • Computer Application and Electronic Data Interchange	• E- commere and www based scm application • decision model application and internet usage • Empirical study by influence of internet at some process e scm a cloud computing and software in LSCM	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011) • Schoenherr (2009) • Kouvelis, Chambers, & Wang (2006) • Agatz et al (2008)
5.	SUPPLY CHAIN DESIGN, LOGISTIC & INFRASTRUCTURE	• Supply Chain Design, Capacity and Sourcing Decisions • 3 PL • Logistics design/infrastructur • Supply Chain Planning and Scheduling • Supply Chain Coordination: Information Sharing, Incentives and Contracts • Multi-Channel Coordination Challenges: Coordinating Offline and Online • Procurement and Distribution • Design for Supply	• system thinking and modeling and complex simulation system in design SC • Design and infrastucture on 3PL and 4 PL for spesific country and across the nationality. • Reverse logistics	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011) • Schoenherr (2009) • Kouvelis, Chambers, & Wang (2006)
6.	GLOBAL ISSUE	• International/Global Supply Chain	• Interfirm relationship across nationality • Spesific business culture,context	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011)

			• Impact on regulatory,finansial and economic system , deregulasy and opening market in global LSCM • Performance measurement for global lscm	Chambers, & Wang (2006)
7.	ENVIRONMENT, LEGAL & REGULATION	• Environmental and Social Responsibility • Manufacturing Resource Planning, Legal and Regulatory Issues • Enviromental issue • Reform and political Development	• SC strategy for public good involved with government regulation • Green and reverse logistic in Multinational	• Jain et al (2010) • Shukla, Garg, & Agarwal (2011) • Soni & Kodali (2011) • Schoenherr (2009) • Kouvelis, Chambers,

green L&SCM and reverse logistics). Some research opportunities in this area are interfirm relationship across nationality, Spesific business culture,context and infrastucture, Risk and uncerainty in multinational LSCM, Impact on regulatory, finansial and economic system, deregulasi and opening market in global LSCM, Performance measurement for global LSCM.

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2.7 **Environment,Legal & Regulation**

Future development of SCM will be more focused on environmental issues which still attract the researchers's attention (Shukla, 2011). It is driven by the global demand to increase pratical management in level of supplier to improve efficiency and effectiveness. Further recommended separately integrate environmental issues into decision making in SCM. Some issues in this area, such as environmental and Social Responsibility, Manufacturing Resource Planning, Legal and Regulatory Issues, Enviromental issue, Reform and political Development, Risk Uncertainty. Research opportunity in this area include SC strategy for public good which associate to government policy and green and reverse logistic in Multinational.

Various categories of issues and research opportunities are given in Table 2.

3. CONCLUSION

From the literature review it can be concluded that the research in the field of scm cover areas ranging from operational level within and between companies to the global level. Various issues concerning the environment and policies are also a focus of research today. Support the advancement of information technology makes the ease of communication and interaction between actors scm while providing research opportunities to apply various types of information technology. Similarly, the global problems facing by the actor scm provide new challenges for reseaher in managing scm in the global era.

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