ISSN : 1978-774X Vol.7, 2014

Proceeding

7th INTERNATIONAL SEMINAR ON INDUSTRIAL ENGINEERING AND MANAGEMENT (7th ISIEM)

with theme: *"Green Technology on Industrial Engineering, Information and Management"*

Sanur Paradise Hotel, Bali, Indonesia
March 11th– 13th, 2014

ISIEM

Universitas Tarumanagara
PASUNDAN UNIVERSITY
TRISAKTI UNIVERSITY
Universitas Al Azhar Indonesia
Universitas Esa Unggul

Supported by :

LIVING LAB LOGISTICS INDONESIA - NL

Sponsored by :

telkomsigma make·IT·faster by Telkom Indonesia

Organized by :
Industrial Engineering Department
Al Azhar University, Pasudan University, Trisakti University, Esa Unggul University, Tarumanagara University, Atma Jaya Catholic Univ. of Indonesia, Mahendradatta University

1978-774X

ISIEM

Proceeding

7th INTERNATIONAL SEMINAR ON INDUSTRIAL ENGINEERING AND MANAGEMENT (7th ISIEM)

Vol.7, 2014

ISSN : 1978-774X

http://isiem.net

ISSN : 1978-774X

PROCEEDING

The 7th International Seminar on Industrial Engineering and Management (7th ISIEM)

Sanur Paradise Hotel, Bali, Indonesia
March 11th – 13th, 2014

Organized by :

Industrial Engineering Department of

•Al Azhar University •Pasundan University•Trisakti University•
•Atma Jaya Catholic University of Indonesia •Esa Unggul University•
•Tarumanagara University•Mahendradatta University•

Supported by :

Indonesian Industrial Engineering
Higher Education Association

LIVING LAB LOGISTICS
INDONESIA - NL

PREFACE

Dear Collegues,

On behalf of the Organizing Committee, I am honored to welcome you to the 7th International Seminar on Industrial Engineering and Management (ISIEM). This seminaris organized by the Industrial Engineering Department from seven Universities, namely Trisakti, Esa Unggul, Atma Jaya Jakarta, Al Azhar Indonesia, Pasundan, Tarumanagara and Mahendradatta Universities. The purpose of this seminar is to provide an effective forum for distinguished invited speakers, academicians, engineers, professionals and practitioners coming from universities, research institutions, government agencies and industries to share or exchange their ideas, experience and recent progress in industrial engineering and management and other related fields in dealing with the dynamics and challenges of the 21st century. The seminar is also expected to foster networking, collaboration and joint efforts among the conference participants to advance the theory and practice as well as to identify major trends in Industrial Engineering and Management field.

The main theme of this seminar is "***Green Technology on Industrial Engineering, Information and Management***". Under this theme, we will explore sustainable innovation in industrial technology, information, and management concerning global issues. We also discuss approaches to collect, manage, and use any information efficiently and effectively, thus the results will be able to upgrade industrial competitiveness and value in facing the global challenges in industrial environment.

This year we received 93 paper submissions from various universities, research centers, and its affiliations. The Technical Program Committee accepted 84 selected papers that will be presented in this seminar. The accepted papers are categorized into four groups; Supply Chain Management, Production System, Operation Research, Ergonomic, Industrial Management, Quality Engineering and Management, and Decision Support System and Artificial Intelligent.
And finally, the success of this seminar is due to the hard efforts of many people who we gratefully acknowledge. We also thank the authors whose papers are presented, invited keynote speakers, and all parties that we are not able to mention here.

We hope you all will enjoy the three days of discussion through this seminar and enjoy the beauty of Bali Island. We hope to see you again next year, in the 8th International Seminar on Industrial Engineering and Management (ISIEM).

Bali, March 11th, 2014

Chairman of The 7th ISIEM

Nunung Nurhasanah, ST., M.Si

COMMITTEE

STEERING COMMITTEE

1. Dr. Ir. Syarif Hidayat, M.Eng.Sc, M.M. (Al Azhar University)
2. Dr. Lamto Widodo S.T., M.T. (Tarumanagara University)
3. Dr. Dadang Surjasa, S.Si., M.T. (Trisakti University)
4. Ir. Arief Suwandi, M.T. (Esa Unggul University)
5. Hotma A. Hutahaean, S.T., M.T. (Atma Jaya Catholic University of Indonesia)
6. Ir. Toto Ramadhan, M.T. (Pasundan University)
7. Ir. I Ketut Simpen, M.T. (Mahendradatta University)

OPERATING COMMITTEE

Chairman
Nunung Nurhasanah, S.T., M.Si. (Al Azhar University)

Co-Chairman :
Dr. Lamto Widodo S.T., M.T. (Tarumanagara University)

Secretary
Rahmi Maulidya, S.T., M.T. (Trisakti University)

Treasury
Iphov Kumala Sriwana, S.T., M.Si. (Esa Unggul University)

Leaflet :
1. Dr. Lamto Widodo S.T., M.T. (Tarumanagara University)
2. Rahmi Maulidya, S.T., M.T. (Trisakti University)

Sponsorship :
Dr. Rina Fitriana, S.T., M.M. (Trisakti University)

Proceeding :
1. Rahmi Maulidya, S.T., M.T. (Trisakti University)
2. Endro Wahyono (Tarumanagara University)

Seminar :
1. Dr. Ir. Nofi Erni, M.M. (Esa Unggul University)
2. Ir. Roesfiansjah R., M.T. (Esa Unggul University)
3. Andre Sugioko, S.T., M.T. (Atma Jaya Catholic University of Indonesia)
4. Ir. Yogi Yogaswara, M.T. (Pasundan University)
5. Lina Gozali, S.T., M.M. (Tarumanagara University)
6. I Putu Agus Mahendra, S.T., M.Sc. (Mahendradatta University)
7. Luh Merry Dyanthi, S.T. (Mahendradatta University)
8. I Nyoman Sudipa, S.T., M.Si. (Mahendradatta University)

Acomodation :
1. Vivi Triyanti, S.T., M.Sc. (Atma Jaya Catholic University of Indonesia)
2. Marsellinus Bachtiar, ST., MM. (Atma Jaya Catholic University of Indonesia)
3. I Wayan Sukania, S.T., M.T. (Tarumanagara University)

Website :
1. Ir. Wahyu Katon, M.T. (Pasundan University)
2. Dr. Ir. Chevy Herli SA, M.T. (Pasundan University)

REVIEWER

1. Asst. Prof. Natcha Thawesaengskulthai (Chulalongkorn University, Thailand)
2. Prof. Ahmad Syamil, Ph.D. (Arkansas University, USA)
3. Fajar Kurniawan, S.T., M.Si (Saint Mary's University of Hong Kong)
4. Dr. Ir. Tiena G. Amran (Trisakti University, Indonesia)
5. Dr. Ir. Triwulandari SD, M.M. (Trisakti University, Indonesia)
6. Dr. Ir. Lily Amelia, M.Agr. . (Esa Unggul University, Indonesia)
7. Dr. Ir. Nofi Erni, M.M. . (Esa Unggul University, Indonesia)
8. Prof. Ir. Hadi Sutanto, MMAE., Ph.D. (Atma Jaya Catholic University of Indonesia)
9. Prof. Dr. Wegie Ruslan (Atma Jaya Catholic University of Indonesia)
10. Prof. Dr. Ir. S. Sardy, M.Eng.Sc (Al Azhar University, Indonesia)
11. Dr. Ir. Syarif Hidayat , M.Eng.Sc, M.M. (Al Azhar University, Indonesia)
12. Dr. Ir. Hj. Tjutju Tarliah Dimyati, MSIE. (Pasundan University, Indonesia)
13. Dr. Ir. Hj. Arumsari, M.Sc. (Pasundan University, Indonesia)
14. Dr. Lamto Widodo, S.T., M.T. (Tarumanagara University, Indonesia)
15. Dr. Adianto, M.Sc. (Tarumanagara University, Indonesia)

A G E N D A

Day 1 (March 11th, 2014)

18:00	- 18:30	Registration
18:30	- 19:30	Dinner
19:30	- 19:45	Opening Ceremony: Representation of Al Azhar Indonesia, Esa Unggul, Trisakti, Atma Jaya, Pasundan, Tarumanagara, and Mahendradatta University's greeting
19:45	- 21:00	Keynote # 1 **Dr. Ramesh Shastry** **(International Visiting Lecturer of Mahendradatta University)**
21:00	- 21:15	Photo Session with all participants

Day 2 (March 12th, 2014)

6:30	- 8:00	Breakfast and Registration
8:00	- 9:15	Keynote # 2 **Asst. Prof. Natcha Thawesaengskulthai** **(Deputy Dean of Engineering Faculty, Chulalongkorn University, Bangkok, Thailand)**
9:15	- 9:30	Coffee and Tea Break
9:30	- 12:00	Parallel session #1
12:00	- 13:00	Lunch break
13:00	- 15:30	Parallel session #2
15:30	- 15:45	Coffee and Tea Break
18:15	- 20:00	Dinner

Day 3 (March 13th, 2014)

6:30	- 8:30	Breakfast
8:30	- 10:00	Parallel session #3
10:00	- 17:00	City Tour

PARALLEL SESSION

MARCH 12TH SESSION 1 ROOM 1 (DSS)

Moderator : Iphov Kumala, ST, MSi

Time	Paper	Code	Paper Code
9.30-9.45	HUMAN RESOURCE DECISION SUPPORT SYSTEM DESIGN IN MAINTENANCE DEPARTMENT OF XXL COMPANY USING WATERFALL METHOD Rayinda Pramuditya Soesanto , Amelia Kurniawati, Nia Ambarsari Telkom University	DSS	017
9.45-10.00	DEVELOPMENT OF DECISION SUPPORT SYSTEM FOR SELECTING QUALITY MANAGEMENT SYSTEMS AND MANAGEMENT TOOLS Saranya Sukkarn , Natcha Thawesaengskulthai Chulalongkorn University	DSS	012
10.00-10.15	SIMULATION MODEL DESIGN OF REFUELING SYSTEM AT PERTAMINA ALAM SUTERA GAS STATION Abel Anthony, Eric Jobiliong, Enda D. Layuk Allo Universitas Pelita Harapan	DSS	060
10.15-10.30	HELPDESK SYSTEM DESIGN AND DEVELOPMENT IN A UNIVERSITY BASED ON ITIL V3 FRAMEWORK (CASE STUDY: AL AZHAR INDONESIA UNIVERSITY) Endang Ripmiatin, Arum Fitriati University Al Azhar Indonesia,	DSS	070
10.30-10.45	CARBON MONOXIDE POLLUTION DETECTION AND MEASUREMENT USING KNOWLEDGE-BASED AND PROBABILITY APPROACHES Ferry Wahyu Wibowo, Pandan Pareanom Purwacandra Informatics Engineering, STMIK AMIKOM	DSS	007
10.45-11.00	EXPERT SYSTEM DEVELOPMENT FOR IMPROVING QUALITY AT RICE MILLING UNIT Dedy Sugiarto , Dadang Surjasa, Binti Solihah, Nirdukita Ratnawati, Jimmy Susanto Trisakti University	DSS	035
11.00-11.15	ANALYSIS OF USABILITY OPCS SOFTWARE A TEST TO THE STUDENT Rizky Junianto, Laurence, Agustina Christiani, Helena J. Kristina University of Pelita Harapan	DSS	052
11.15-11.30	HOW RFID TECHNOLOGY SUPPORTS E-BUSINESS PROCESSES Sudarmawan, Ferry Wahyu Wibowo, Rizqi Sukma Kharisma Informatics Engineering, STMIK AMIKOM	DSS	008
11.30-11.45	MANUFACTURING INFORMATION SYSTEM FOR SMALL AND MEDIUM ENTERPRISE (CASE STUDY TEXTILE SME) Nida'ul Hasanati, Munawir Biki, Muhammad Aulia Taqwa, Laksmi Saraswati, Winangsari Pradani, Nunung	DSS	071

MARCH 12TH SESSION 1 ROOM 1 (DSS)

Moderator : Iphov Kumala, ST, MSi

Time	Paper	Code	Paper Code
	Nurhasanah, Syarif Hidayat University Al Azhar Indonesia,		
11.45-12.00	WASTE REDUCTION IN THE PRODUCTION PROCESS PLATE PRODUCT TYPE Pc 27 C USING VALUE STREAM MAPPING METHOD AT PT XYZ Iphov Kumala Sriwana, Arie Wijaya Esa Unggul University	DSS	086

MARCH 12TH SESSION 1 ROOM 2 (DSS, IM)

Moderator : Dr. Ir. Triwulandari SD, MM

Time	Paper	Code	Paper Code
9.30-9.45	FRAMEWORK FOR MEASURING KNOWLEDGE MANAGEMENT PERFORMANCE USING KM BALANCE SCORECARD Luciana Andrawina , Amelia Kurniawati Telkom University	DSS	016
9.45-10.00	ANALYSIS OF PHILIPPINES INFORMATION TECHNOLOGY BUSINESS PROCESS OUTSOURCING (IT-BPO) INDUSTRY Jason Baculinao, Yang Ching Chow Chung Yuan Christian University	DSS	050
10.00-10.15	INTEGRATED SYSTEM DESIGN FOR ORDER RELEASE AT MACHINING DEPARTMENT PT. ABC Pratya Poeri Suryadhini, Dida Diah Damayanti, Widia Juliani Telkom University	DSS	025
10.15-10.30	AN ANALYSIS OF SERVICE PERFORMANCE INFLUENCE TOWARDS CUSTOMER SATISFACTION IN SHAPING CUSTOMER LOYALTY (CASE STUDY AT X RESTORANT) Eka KA Pakpahan, Roland YH Silitonga, Metta Erikka. Institut Teknologi Harapan Bangsa	IM	015
10.30-10.45	ETHICAL ASPECTS IN GREEN MARKETING; AN META ANALYSIS APPROACH Erni Rusyani Pasundan University	IM	029
10.45-11.00	BLUE OCEAN STRATEGY WITH CONJOINT ANALYSIS APPROACH TOWARDS THE COOKING SPICE PRODUCTS Tiena Gustina Amran Trisakti University	IM	024
11.00-11.15	DESIGNING BUSINESS STRATEGY TO IMPROVE THE SCALE OF FOOD AND BEVERAGES INDUSTRY IN MOJOKERTO THROUGH INNOVATION WITH CLUSTER APPROACH Sri Gunani Partiwi, Anny Maryani, Agung Subyakto Institut Teknologi Sepuluh Nopember	IM	068

MARCH 12TH SESSION 1 ROOM 2 (DSS, IM)

Moderator : Dr. Ir. Triwulandari SD, MM

Time	Paper	Code	Paper Code
11.15-11.30	IMPLEMENTATION SAK-ETAP, MANAGEMENT CONSULTATION, BUSINESS GOING CONCERN AND EASINESS OF CAPITAL ACQUISITION ON SMALL AND MEDIUM ENTERPRISES (SME's) IN BANDUNG Liza Laila Nurwulan and Budi Septiawan Pasundan University	IM	031
11.30-11.45	BUSINESS MODEL INNOVATION in INDONESIAN JAMU COMPANY Jahja Hamdani Widjaja Maranatha Christian University	IM	009
11.45-12.00	PROPOSAL OF KEY PERFORMANCE INDICATOR WITH INTEGRATION OF BALANCED SCORECARD AND PRISM FRAMEWORK (Case Study : PT TU) I Dewa Made Ari Dananjaya, Triwulandari S. Dewayana Trisakti University	IM	076

MARCH 12TH SESSION 1 ROOM 3 (ER, PS)

Moderator : Ir. Lina Gozali, MM

Time	Paper	Code	Paper Code
9.30-9.45	STATIC BACK STRENGTH - A STUDY AMONG YOUNG ADULTS Anisah. H, Hardianto Iridiastadi, Zulfa Fitri Ikatrinasari Universitas Mercu Buana & Institut Teknologi Bandung	ER	059
9.45-10.00	EFFECT OF THE WORK ENVIRONMENT, LEADERSHIP, WORKPLACE DESIGN, AND WELFARE FACILITIES ON WORK PERFORMANCE Abdul Djalal, Adrianus Ilra, Amalia Azka Rahmayani, Hartomo Islamic University of Indonesia	ER	062
10.00-10.15	DESIGNING ERGONOMIC TOOTHBRUSH, TOOTHBRUSH REFILL, AND TOOTHBRUSH CAP Andriyani Theresia, Novi, Christina Maranatha Christian University,	ER	038
10.15-10.30	INVENTORY DETERMINATION MODEL FOR PACKAGING MATERIALS WITH VARIOUS DEMMAND DATA DISTRIBUTIONS IN CHEMICAL COMPANY Inaki Maulida Hakim, Putri Larassati University of Indonesia	PS	047
10.30-10.45	INVENTORY CONTROL SYSTEM ANALYSIS OF GOODS AT COMPANY X'S MODERN TRADE Victor Suhandi, Lydiawari Silalahi, Vivi Arisandhy Maranatha Christian University	PS	043
10.45-11.00	INVENTORY PLANNING FOR FAST MOVING CONSUMER GOODS USING PERIODIC-REVIEW ORDER-UP-TO-LEVEL (R,S) SYSTEM IN RETAIL X BANDUNG La Nashia, Mira Rahayu, Budi Santosa C, Telkom University	PS	023

MARCH 12TH SESSION 1 ROOM 3 (ER, PS)

Moderator : Ir. Lina Gozali, MM

Time	Paper	Code	Paper Code
11.00-11.15	PREVENTIVE MAINTENANCE SCHEDULING BASED ON SERVICE CENTER AND CUSTOMER'S PERSPECTIVE (CASE STUDY: CAR TYPE X OF COMPANY Y) Yudha Prasetyawan, Mita Musoffa Asti Institut Teknologi Sepuluh Nopember (ITS)	PS	027
11.15-11.30	PERFORMANCE COMPARISON OF HEURISTIC LOT-SIZING MODELS Jason Baculinao, Hui-Ming Wee, Yang Ching Chow Chung Yuan Christian University Taiwan	PS	051
11.30-11.45	GENERATE AND TEST ALGORITHM DEVELOPMENT FOR JOB SCHEDULING IN PARALLEL MACHINES WHICH CONSIDERING SETUP TIME FOR MINIMIZING TARDINESS AND MINIMIZING MAKESPAN FOR ALTERNATIVE SEQUENCES THAT HAVE SAME TARDINESS Victor Suhandi , Melissa Septina Ismanto Maranatha Christian University	PS	020
11.45-12.00	SCHEDULING ANALYSIS AND METALLURGY TESTING RESOURCE ALLOCATION AT METALLURGY LABORATORY B4T BANDUNG Moh. Syarwani, Wahyukaton, Viani Ezra Azizah Pasundan University	PS	063

MARCH 12TH SESSION 2 ROOM 1 (QC, OR)

Moderator : Dr. Ir. Syarif Hidayat, M.Eng.Sc, MM

Time	Paper	Code	Paper Code
13.00-13.15	APPLICATION OF QUALITY FUNCTION DEPLOYMENT AND SERVQUAL FOR DESIGN SERVICE INNIVATION Waraporn Yothinsirikul, Natcha Thawesaengskulthai Chulalongkorn University	QC	011
13.15-13.30	DESIGN OF QUALITY PROCESS STANDARD BASED ISO 9001:2008 CLAUSE 7.5.1 FOR TRADITIONAL BATIK CAP INDUSTRY Dida D Damayanti , Sri Widaningrum, Luciana Andrawina, Irma Pramudya A Telkom University	QC	040
13.30-13.45	DESIGNING SETTING PARAMETER OF TABLET COMPRESSION PROCESS TO MINIMALIZE WEIGHT VARIATION Teuku Yuri Zagloel, Kinanti Rakayantias University of Indonesia	QC	048
13.45-14.00	QUALITY OF COMPUTER MUSIC USING MIDI LANGUAGE FOR DIGITAL MUSIC ARRANGEMENT Pandan Pareanom Purwacandra , Ferry Wahyu Wibowo Informatics Engineering, STMIK AMIKOM	QC	032

MARCH 12TH SESSION 2 ROOM 1 (QC, OR)

Moderator : Dr. Ir. Syarif Hidayat, M.Eng.Sc, MM

Time	Paper	Code	Paper Code
14.00-14.15	QUALITY IMPROVEMENT EFFORT USING TRIZ METHOD CASE STUDY IN CV 'X', A METALCASTING INDUSTRY Christina Wirawan , Maria Sari Desiana Maranatha Christian University	QC	005
14.15-14.30	PARAMETER IDENTIFICATION OF SCANNING QUALITY IN *3D LASER SCANNER*: HARDWARE AND LIGHT INTENSITY SETTINGS Catharina Badra Nawangpalupi, Hanky Fransiscus, Bagus Arthaya, Adiyoga I Putra Catholic University Parahyangan	QC	037
14.30-14.45	THE APPLICATION OF OVERALL EQUIPMENT EFFECTIVENESS (OEE) TO ANALYZE LEAN SIX SIGMA CAPABILITY OF SHRINK LABELS PRODUCTION AT COMPANY X David Sungkono, Yurida Ekawati Ma Chung University	QC	006
14.45-15.00	THE MEASUREMENT OF WORKLOAD AND OPTIMAL NUMBER OF EDUCATION PERSONNEL USING WORK SAMPLING AND TASK PER JOB METHODS (A CASE STUDY AT PT X.) SYAMSUL ANWAR, JASRIL AKADEMI TEKNOLOGI INDUSTRI PADANG	OR	018
15.00-15.15	DEMAND FORECASTING FOR SALES ORDER AND DISTRIBUTION REQUIREMENTS PLANNING SYSTEM (CASE STUDY : IKM XYZ) Winangsari Pradani, Cut Nuraini, Anela Septieni Zulkifli, Nida'ul Hasanati, Nunung Nurhasanah, Syarif Hidayat University Al Azhar Indonesia	OR	072
15.15-15.30	COMPARING TRANSPORTATION COST IN CPO TENDER USING GENETIC ALGORITHM AND OPERATIONS RESEARCH TOOLS Syarif Hidayat, Rizky Betadi Putra University of Al Azhar Indonesia	OR	001

MARCH 12TH SESSION 2 ROOM 2 (PS, ER)

Moderator : Dr. Lamto Widodo, ST, MT

Time	Paper	Code	Paper Code
13.00-13.15	REENGINEERING PROCESS FOR REDUCING TIME OF PROCUREMENT AND INVENTORY PROCESS IN TELECOMMUNICATION TOWER COMPANY WITH IDEF0 TOOLS AND ESIA METHOD Indramawan, Rahmat Nurcahyo, Yadrifil, M.Dachyar University of Indonesia	PS	065
13.15-13.30	MULTI-LEVEL INVENTORY MANAGEMENT CONSIDERING TRANSPORTATION COST AND QUANTITY DISCOUNT Eko Pratomo, Hui Ming Wee, Sukoyo Chung Yuan Christian University	PS	054

MARCH 12TH SESSION 2 ROOM 2 (PS, ER)

Moderator : Dr. Lamto Widodo, ST, MT

Time	Paper	Code	Paper Code
13.30-13.45	REFURBISHMENT OF USED MACHINE ELEMENTS FOR MAKING 2½ AXES MILLING MACHINE PROTOTYPE Bagus Arthaya, Ali Sadiyoko, Oke Setiawan Parahyangan Catholic University	PS	004
13.45-14.00	THE REDESIGN OF BAJAJ STUDY CASE FOR THE OLD BAJAJ IN JAKARTA Indra Gunara Rochyat, Andre Hambali, Esa Unggul University	ER	079
14.00-14.15	ANALYSIS OF CULTURAL ATTRIBUTE IN PRODUCT DESIGN OF CRAFT TO INCREASE PURCHASE INTENTION Lusia Permata Sari Hartanti, Dian Trihastiuti University of Pelita Harapan	ER	041
14.15-14.30	ANALYSIS AND IMPROVEMENT PROPOSAL OF SDN 7 KIARACONDONG BASED ON DIKNAS AUDIT VIEWED FROM ERGONOMICS ASPECT Dina Magdalena, Elty Sarvia, Winda Halim University of Kristen Maranatha,	ER	046
14.30-14.45	DEVELOPMENT OF MATHEMATICAL MODEL AND SOFTWARE FOR DIGITAL CIRCUMFERENCE ANTHROPOMETRIC MEASUREMENT Benedikta Anna H Siboro , Herianto Riau Kepulauan University	ER	049
14.45-15.00	PSYCHOMOTOR VIGILANCE TASK AS A MEASURE OF PERFORMANCE-BASED FATIGUE Rida Zuraida, Hardianto Iridiastadi Binus University, Bandung Institut of Technology	ER	081
15.00-15.15	PRODUCT CONCEPT OF RECHARGEABLE BATTERY FOR ENVIRONMENTALLY FRIENDLY TOWARD ELECTRONIC COMMUNICATIONS EQUIPMENT TO FACILITATE THE USER Geggy Gamal Surya, Efrhenrycx Esa Unggul University	ER	083
15.15-15.30	DESIGNING OF CARTON BOX STACKING TOOL TO INCREASE THE EFFICIENCY OF POND MACHINE AT PT. SUPREME TIRTA LARISINDO Lamto Widodo, Silvi Ariyanti, Alvin Khumara Tarumanagara University & Mercubuana University	ER	077

MARCH 12TH SESSION 2 ROOM 3 (SCM, IM)

Moderator : Ir. Lina Gozali, MM

Time	Paper	Code	Paper Code
13.00-13.15	POLICY ANALYSIS ON SMEs VEHICLE COMPONENTS IN ORDER TO IMPROVE ITS SUPPLY CHAIN ABILITY WITH SYSTEM DYNAMICS APPROACH M. Nurman Helmi Pasundan University	SCM	073

MARCH 12TH SESSION 2 ROOM 3 (SCM, IM)

Moderator : Ir. Lina Gozali, MM

Time	Paper	Code	Paper Code
13.15-13.30	SUPPLIER BUYER RELATIONSHIP SELECTION USING SUPPLY POSITIONING MODEL METHOD Ramadian Puspitasari, Mira Rahayu Telkom University	SCM	022
13.30-13.45	BIO-DIGESTER INSTALLATION PROGRAM TO IMPROVE ENERGY SECURITY: INITIATING VALUE CHAIN MODEL FOR DAIRY FARMERS IN CIATER Catharina Badra Nawangpalupi, Meity Martaleo, Loren Pratiwi, Yani Herawati Catholic University Parahyangan	SCM	067
13.45-14.00	STRATEGIC PROCESS DESIGN FOR FISH – BASED SMEs Sitnah Aisyah Marasabessy Ambon University of Darussalam	IM	045
14.00-14.15	CUSTOMER CRITERIA ANALYSIS FOR EDUCATIONAL ORGANIZATION DESIGN Hartomo, Catur Siwi Handayaningtyas Islamic University of Indonesia	IM	061
14.15-14.30	CRM DIMENSIONAL ANALYSIS AND ANP METHOD FOR SUB-CONTRACTOR COMPANY OF OIL AND GAS INDUSTRY IN ORDER TO REDUCE CUSTOMER COMPLAINTS Doddy Prasetyo Nugroho, Rahmat Nurcahyo, Yadrifil, M.Dachyar University of Indonesia	IM	064
14.30-14.45	HOW TO OBTAIN STUDENTPRENEURSHIP THROUGH ENTREPRENEURSHIP-BASED CURRICULUM JajaSuteja Pasundan University	IM	030
14.45-15.00	HIGHER EDUCATION INSTITUTION XYZ PERFORMANCE MEASUREMENT USING MBCfPE BASED ON KPKU-BUMN APPROACH Sugih Arijanto, Ambar Harsono Institut Teknologi Nasional (Itenas) Bandung; Indonesia Quality Award (IQA) Examiners; KPKU-BUMN Evaluator (1)	IM	053
15.00-15.15	ANALYSIS OF THE RELATIONSHIP BETWEEN LECTURER TEACHING METHOD FOR QUANTITATIVE COURSES AND STUDENTS' LEARNING MOTIVATION (Case Study: Industrial Engineering Department, Maranatha Christian University, Bandung-Indonesia) Yulianti, Jimmy Gozaly Maranatha Christian University	IM	010
15.15-15.30	BUSINESS PROCESS IMPROVEMENT: ORDER FULFILLMENT PROCESS Vivi Triyanti, Savina Salim Atma Jaya Catholic University of Indonesia	IM	085

MARCH 13TH SESSION 3 ROOM 1 (QC, PS)

Moderator : Dr. Rina Fitriana, ST, MM

Time	Paper	Code	Paper Code
8.30-8.45	DESIGN OF INSPECTION AND CLASSIFICATION PROTOTYPE FOR CERAMIC TILES BASED ON THE DIGITAL IMAGE PROCESSING Yudha Prasetyawan, Maria Christina Institut Teknologi Sepuluh Nopember	QC	026
8.45-9.00	PARTICLE SWARM OPTIMIZATION BASED ON BOTTLENECK MACHINE FOR JOBSHOP SCHEDULING Rahmi Maulidya Trisakti University	PS	078
9.00-9.15	DYNAMIC MODIFIED SPANNING TREE ALGORITHM FOR SINGLE-ROW DYNAMIC FACILITY LAYOUT PROBLEM Yogi Yogaswara Pasundan University	PS	074
9.15-9.30	INCREASE OF EFFICIENCY OF WORKSTATION DESIGN THROUGH PRODUCTION SCHEDULING FOR MOSLEM CLOTHES IN SME "XYZ" Nunung Nurhasanah, Laksmi Saraswati, Syarif Hidayat, Nida'ul Hasanati, Winangsari Pradani, Muhammad Aulia Taqwa, Anela Septiani Zulfikar, Cut Nuraini, Munawir Biki University of Al-Azhar Indonesia	PS	028
9.30-9.45	MACHINE SCHEDULING PROPOSED FOR MINIMIZING MAKESPAN AT PT ADIPERKASA ANUGRAH PRATAMA Lina Gozali , Silvi Ariyanti , Febrina Lesley Natali Tarumanagara University	PS	002
9.45-10.00	IMPROVEMENT WORK EFFICIENCY AND MANUFACTURING PRODUCTIVITY AT PT. XYZ WITH LINE BALANCING ANALYSIS Arief Suwandi, Prianggara NAL Esa Unggul University	PS	090
10.00-10.15	IMPLEMENTATION SIX SIGMA AND DATA MINING TO IMPROVE DIE CASTING PRODUCTION PROCESS AT PT. AB Rina FItriana, Johnson Saragih, Sitta Sarasaty Trisakti University	QC	058
10.15-10.30	SELECTION OF OPEN SOURCE ENTERPRISE RESOURCE PLANNING (ERP) SYSTEM FOR FURNITURE MANUFACTURING SMEs AS A COMPETITIVE STRATEGY Wiwid Dolianto, Zulfa Fitri Ikatrinasari University of Mercu Buana	DSS	080
10.30-10.45	QUALITY STUDY OF WASTE WATER PROCESSING I Nyoman Sudipa Mahendradatta Mercu Buana	QC	093

MARCH 13TH SESSION 3 ROOM 2 (DSS, IM)

Moderator : Niken Parwati, ST, MM

Time	Paper	Code	Paper Code
8.30-8.45	KNOWLEDGE MANAGEMENT IMPLEMENTATION WITH SECI MODEL APPROACH IN SARINAH ORGANIC FARMER GROUPS Dadang Surjasa, Dedy Sugiarto , Brian Arif Jingga, Binti Solihah, Nirdukita Ratnawati Trisakti University	DSS	033
8.45-9.00	SECI MODEL IMPLEMENTATION FOR IMPROVING PERFORMANCE OF RICE MILLING UNIT Dedy Sugiarto , Dadang Surjasa, Binti Solihah, Nirdukita Ratnawati, Jimmy Susanto Trisakti University	DSS	036
9.00-9.15	DECISION MAKING OF RAW MATERIAL SUPPLIER FOR PRODUCT PP 10160104XX IN PT. KOMPINDO FONTANA RAYA USING FUZZY AHP APPROACH Lily Amelia, Marisca Violetta Esa Unggul University	IM	089
9.15-9.30	IMPROVEMENT OF ONLINE TRADE SERVICE QUALITY LICENSING SYSTEM IN TRADE MINISTRY OF REPUBLIC INDONESIA M.Dachyar, Yadrifil, Asmirawati Ismail University of Indonesia	IM	066
9.30-9.45	TRANSLATING THE STRATEGY INTO EXECUTION : FROM STRATEGY MAP TO DASHBOARD - STUDY CASE : ENGINEERING FACULTY UNIKA ATMA JAYA Masellinus Bachtiar Atma Jaya Catholic University of Indonesia	IM	091
9.45-10.00	PERFORMANCE MEASUREMENT OF STUDY PROGRAM BASED ON THE PERFORMANCE PRISM MODEL Didien Suhardini, Nurlailah Badariah, wishnu Anindito Trisakti University	IM	082
10.00-10.15	A CHALLENGE IN IMPLEMENTING GOOD CORPORATE GOVERNANCE IN FAMILY-CONTROLLED LISTED COMPANIES IN INDONESIA Dadan Umar Daihani , Johan Darmawan Trisakti University & Maastrich School of Management	IM	055
10.15-10.30	DEVELOPMENT OF COMMUNITY BASED OF SUSTAINABLE TOURISM INDUSTRY IN PENGLIPURAN VILLAGE,BANGLI REGENCY, BALI PROVINCE Luh Merry Dyanthi Mahendradatta University	IM	092
10.30-10.45	NEW PRODUCT MARKETING STUDY : CANNA EDULIS BASED PRODUCT (FLOUR AND NOODLE) Niken Parwati, Intan Bayduri Zaputri, Nita Noriko University Al Azhar Indonesia	IM	042
10.45-11.00	DESIGN SYAR'I TOURISM BASED ON KANO MODEL Agus Mansura, Dzakiyah Widyaningruma, Nashrullah Setiawana Islamic University of Indonesia	IM	021

MARCH 13TH SESSION 3 ROOM 3 (QC, SCM, OR)

Moderator : Andre Sugioko, ST, MT

Time	Paper	Code	Paper Code
8.30-8.45	THE IMPACT OF IT IMPLEMENTATION ON SUPPLY CHAIN PERFORMANCE THROUGH SUPPLY CHAIN AGILITY, CAPABILITIES, AND INTEGRATION AS MEDIATING VARIABLES: A CONCEPTUAL MODEL Ronald Sukwadi Atma Jaya Catholic University of Indonesia	SCM	084
8.45-9.00	STRUCTURE AND ACTOR ANALYSIS IN DKI JAKARTA RICE SUPPLY CHAIN Dadang Surjasa , Dedy Sugiarto, Nirdukita Ratnawati , Binti Solihah Trisakti University	SCM	034
9.00-9.15	CAPABILITY PROCESS ANALYSIS WELDING MACHINE HEAD CAP MODIFIED Siti Rohana Nasution, Adham Chalid Rizqie Pancasila University	QC	039
9.15-9.30	SIX SIGMA IMPLEMENTATION AS PREPROCESSOR TO IMPROVE SERVICE QUALITY IN UNIVERSITIES Fajar Kurniawan Saint Mary's University of Hongkong	QC	087
9.30-9.45	IMPLEMENTATION OF SERVQUAL AND TRIZ METHOD TO IMPROVE SERVICE QUALITY (CASE STUDY AT PT. JNE) Nofi Erni, Iphov Kumala S, Wira Tri Yolanda Esa Unggul University & Tarumanagara University	QC	088
9.45-10.00	IMPLEMENTING ANT COLONY OPTIMIZATION (ACO) IN TRAVELING SALESMAN PROBLEM (CASE STUDY AT DISTRIBUTION STORE PB) Widya Nurcahayanty Tanjung, Sopiah University of Al Azhar Indonesia	OR	044
10.00-10.15	PLANNING A SIMULATION MODEL FOR LOADING AND UNLOADING CONTAINERS TO DECREASE THE CYCLE TIME Andre Sugioko , Christine Nathalia, Trifenaus Prabu Hidayat Atma Jaya Catholic University of Indonesia	OR	003
10.15-10.30	SUPPLY CHAIN RISK MITIGATION USING SUPPLY CHAIN RISK MANAGEMENT (SCRM) APPROACH Didik Achmadi University of Trunojoyo Madura	SCM	069
10.30-10.45	INFLUENCE OF ENVIRONMENT FACTORS TO STRATEGY AND PERFORMANCE OF THE MANUFACTURING INDUSTRIES IN INDONESIA Rachmad Hidayat University of Trunojoyo Madura	IM	019

TABLE OF CONTENT

IM – Industrial Management

IM – Industrial Management

OR – Operation Research

PS – Production System

QM – Quality Engineering & Management

SCM – Supply Chain Management

SCM – Supply Chain Management

ANALYSIS AND IMPROVEMENT PROPOSAL OF SDN 7 KIARACONDONG BASED ON DIKNAS AUDIT VIEWED FROM ERGONOMICS ASPECT

Dina Magdalena[1], Elty Sarvia[2], Winda Halim[3]

Industrial Engineering Department, Maranatha Christian University, Bandung
din_lumud@yahoo.com[1], eltysarvia@yahoo.com[2], windahalim@yahoo.com[3]

ABSTRACT

SDN 7 Kiaracondong is one of the primary school located in Bandung. According to the auditor of DIKNAS, SDN 7 Kiaracondong has some weakness, namely the lack of classroom capacity, the physical environment (lighting and noise) is not sufficient that disrupts the teaching and learning activities, and the unavailability of a library. The data required for the processing and analysis includes general data SDN 7 Kiaracondong, interviews with the school, the data of the physical environment (lighting and noise), number of students, the actual dimensions of the physical facilities, anthropometric data of 100 students,and Indonesia National Standard (classes capacity, library design, physical facilities, library).

After the analysis, carried out the design of physical facilities (librarians table, student desks, student chairs, clerk chairs, cabinets, and bookshelves), which consists of two alternatives, namely the reference anthropometric data and SNI physical facilities. In addition to the physical facility design, the authors provide suggestions to reduce noise and improve the lighting in the classroom as well as the layout of the library. Things which the author proposed for improvement such as construction of the third floor which contain a library, art instruments storage space and 2 extra classes and light bulbs replacement in each classroom with a 30 watt LED fluorescent lamps, replace the windows with soundproof windows, and creation of physical facilities in the library.

Keywords*: Anthropometry, Lighting, Noise, SNI*

1. INTRODUCTION

Many schools are developing in terms of technology , educators, etc . The school has a willingness to change and to improve the performance of teachers. One of the schools that want to develop education is SDN 7 Kiaracondong Bandung . This is due to the team of assessors / auditors of DIKNAS (National Education Department) which provides an assessment of the SDN 7 Kiaracondong about the weaknesses of the school. Here are the results of the assessment of the assessor team :

- Lack of classroom capacity
- Teaching and learning activities that are not conducive
- Lack of library facilities

To address these weaknesses, effort should be made is to make improvements in terms of ergonomics. Issues to be addressed in this study, related to the actual conditions of classroom at SDN 7 Kiaracondong , the actual lighting conditions and noise in SDN 7 Kiaracondong, proposed adding a number of classroom to meet the required capacity, designing the layout and physical facilities SDN 7 Kiaracondong library with data SNI (for the physical facilities), child anthropometric data and anthropometric data from the book by Ir . Eko Nurmianto , M.Eng.Sc., DERT. The goal is to be conducive atmosphere to teaching and learning activities.

2. THEORETICAL BACKGROUND

Ergonomics was derived from two Greeks works: Ergon (Work) and Nomos (Natural Laws) to denotes the science of work and a person's relationship to that work. Ergonomics draws on a number of scientific disciplines, including physiology, biomechanics,psychology, anthropometry, industrial hygiene, and kinesiology.

According to Montagu and Ashley (1960) anthropometry is a technique of measuring the human body (anthro = human, pometry = measure) in terms of dimensions, proportions, and ratios such as those provided by the cephalic index. Once the

standard approach to racial classification and comparing humans to the other primates, the technique is now used for deciding the range of clothing sizes to be manufactured and determining the nutritional status of people.

In the design of appropriate workspace lighting, the following variables need to be considered. The amount and type of light emitted by the light sources themselves determines the illuminance delivered to work and other surfaces. The furniture and materials, by virtue of their reflectances, determine the balance of luminances seen by workers and the amount of indirect lighting and glare. The visual demands of tasks should be analyzed in the evaluation of lighting, particularly with respect to visual acuity and the demands on accommodation and adaption of the eye and the avoidance of visual fatique. (Bridger, 1995)

Humans have the ability to defend the body condition normally (have ability to adapt). The ability to adapt with the temperature outside if the changes of it does not exceed 20% for hot conditions and 35% for cold conditions from normal condition of the body (Sutalaksana, 2006).

Noise also comes from surrounding that can really damage the sense of hearing. There are three aspects that determine the quality of a sound that can determine the level of disruption to the human : the length of time the sound is audible, Intensity (dB), Frequency. (Sutalaksana, 2006).

If a room has people, machinery, or activities in it, the air in the room will deteriorate due the release of odors, the release of heat, the formation of water vapor, the production of carbon dioxide, and the production of toxic vapors. Ventilation must be provided to dilute these contaminants, exhaust the stale air, and supply fresh air. In a building with only a few work areas, it would be impractical to ventilate the whole building. In that case, local ventilation can be provided at a lower level, or perhaps in an enclosed area, such as a ventilated control booths or crane cab. (Niebel, 2003)

Based on the Regulation of the Minister of National Education in 2007, the maximum number of one class are 28 people with the following conditions :

Minimum area = 5 x 6 x 1 m^2 = 30 m^2, or
2 m^2 x number of learners

3. RESEARCH METHOD

Preliminary data collection is done by conducting interviews with the headmaster and teacher in SDN 7 Kiaracondong. Data collection was taken after preliminary research are school profile, physical environment data (lighting and noise), the number of students, the actual dimensions of the physical facilities, anthropometric data of 100 students, and additional data from the book by Ir. Eko Nurmianto, M.Eng.Sc, Dert and the Indonesian National Standard (capacity class, library design, library physical facilities).

Calculation classroom capacity

Compare actual number with standard capacities:

1. Knowing SNI classroom capacity. Maximum capacity in one class of students is 28 people, while class for less than 15 students the minimum area of the classroom is 30 m2 with a minimum width of 5 m.
2. Number of students per classroom actual
3. Calculation of the number of additional classroom

For the number of students who exceed the standard capacity, proposed additional classrooms at SDN 7 Kiaracondong. Below is a summary table of the results of the calculation of the number of additional classes:

Table 1. Calculation Amount Class Addition

Class	Number of Students	Actual number of classroom	Added Classroom
1	48	1	1
2	46	1	1
3	56	1	1
4A	38	2	1
4B	40		
5	44	1	1
6A	48	2	2
6B	48		
Σ	368	8	7

Example :
Class 1 = 48/ 28 = 1,71 ≈ 2
Actual number of classroom = 1

Addition = 2 – 1 = 1 classroom

Physical Environment

Activities undertaken by teachers and students is influenced by the physical environment. So physical environment must support teaching and learning activities. Here is an analysis of lighting and noise according to the audit team in an issue in SDN 7 Kiaracondong:

Table 2 Lighting dan Noise Data

Class	Lighting	Noise	Conclusion	
1	42-350	67.5-80.8	Not ergonomic	need corrective
2	23-132	71.2-82.5	Not ergonomic	need corrective
3	53-765	60.5-73	Not ergonomic	need corrective
4A	46-171	63.6-77.6	Not ergonomic	need corrective
4B	52-821	63.8-78.1	Not ergonomic	need corrective
5	95-913	67.6-76.4	Not ergonomic	need corrective
6A	24-323	67-87.8	Not ergonomic	need corrective
6B	40-418	67.6-82.1	Not ergonomic	need corrective

One of the physical facilities that affect the lighting and noise are the windows. Window effect on the level of noise that was heard by students and teachers. SDN 7 Kiaracondong there are 3 types of window size does not fit all standard windows in the school in general, it should be designed to improve noise reduction windows that noise will be discussed in the design chapter.

Physical Facilities

Authors designed a physical facility in the library accordance with the Indonesian National Standard (SNI) in 2012 regarding the physical library facilities and anthropometry. Physical facilities to be designed is a table (for students and librarians), chairs (for students and librarians), bookcases, and cabinets. Physical facilities such as cupboard, does not exist in ISO 2012 regarding the physical facilities library, but with consideration of the writer, cupboard needed for librarian to store important files. Cupboard size obtained from ISO 2012 regarding the physical facilities in the classroom.

Before doing design with anthropometric, author processing anthropometric data to be considered that would be used in the design. The processing will be discussed in the points below.

1. Summary of test results (normal,uniform, and adequate).

The data collection was done collecting anthropometric data from 100 children at SDN 7 Kiaracondong. After accumulating data then do a normal test, standardized testing and test adequacy. After testing the anthropometric data, it can be calculated percentiles of anthropometric data. Below is a table of percentiles calculated:

Table 3. Percentile

Data Antropometri	Dalam (cm)		
	P5	P50	P95
TBD	34,6	42,5	50,4
TSD	14,1	18,7	23,4
TPO	31,1	36,7	42,3
LB	27,8	33,4	38,9
LP	22,4	28,1	33,7
PPO	30,8	36,8	42,8
PLB	26,6	33,5	40,4
RT	119,8	142,3	164,8
RT ke depan	44,3	54,3	64,3
TBB	88,9	105,0	121,1

The table above is used for the analysis of the design of physical facilities in the library. Anthropometric data are used for reference material consideration the size that will be used by the author.

4. RESULT AND DISCUSSION

Proposal for better classroom and facilities for library will be discussed in this stage, such as additional classroom to meet the capacity of the school, the design of the physical environment (lighting and noise) in the classroom, and library design and physical facilities. Here is the proposal given by the author:

a. Class Capacity

From processing and analysis, it appears that the capacity of the class does not meet the standards of the government. Thus, the authors propose to add a classroom on the 3rd floor. On the 3rd floor, class that can be built is 2 classes with a capacity of students in each class are 25 student for classroom with large 50,05 m^2 and 24 student for classroom with large 49,4 m^2.

To determine the number of students who are in class design is by dividing the class with class capacity SNI (2 m²/number of students). Judging from the amount of the proposed class, there is still a shortage of

classrooms, because of limited space for the class will be tolared to the shortage of school policy. Policies that can be done by the school is to adjust the class by the number of students there. Here is a 3 floor layout designed by author:

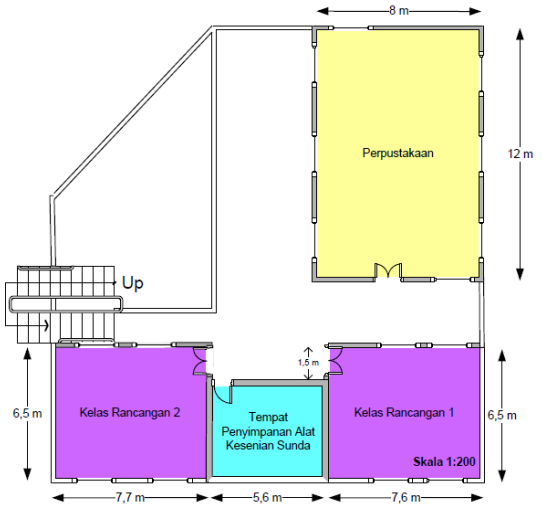

Figure 1 Third floor layout

b. Anthropometric Data

Here is the anthropometric data used for the author that can be used as additional data for further research:

Table 4 Children Anthropometric of SDN 7 Kiaracondong Student

Data Antropometri	Dalam (cm)		
	P5	P50	P95
TBD	34,6	42,5	50,4
TSD	14,1	18,7	23,4
TPO	31,1	36,7	42,3
LB	27,8	33,4	38,9
LP	22,4	28,1	33,7
PPO	30,8	36,8	42,8
PLB	26,6	33,5	40,4
RT	119,8	142,3	164,8
RT ke depan	44,3	54,3	64,3
TBB	88,9	105,0	121,1

c. Physical Environment

Lightning

To design improvements to lighting the authors propose LED type and number of lights as follows:

Table 5 Number of Lamp

Class	Number of Lamp
1	5
2	5
3	4
4A	3
4B	4
5	4
6A	4
6B	4

Noise

To design improvements to reduce noise authors propose the soundproof window. The windows are designed to be installed on the side close to the road, while to the side of the school continue using windows that can be opened, so that there is fresh air in the classroom. Windows affect the incoming light into the classroom. To anticipate class become dark can use the maximum amount of light that have been proposed.

d. Physical facilities

Physical facilities that will be designed by the author based on SNI in 2012 on the library physical facilities and anthropometric data (student and additional data from the book Eko Nurmianto). Here is the proposed physical facilities designed by the author:

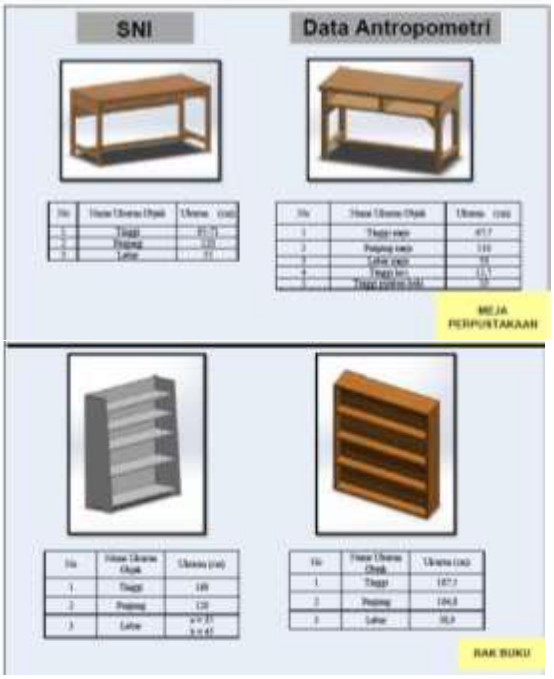

Figure 2. Physical Facillities by SNI and Anthropometric

5. CONCLUSION

- Actual conditions in the study area of SDN 7 Kiaracondong does not meet capacity. The assessment results of the auditor team on the weaknesses in SDN 7 Kiaracondong are correct. The number of students per class is over capacity, which make it difficult for the students and teachers to carry out activities in the classroom.
- We propose to add a new building on the 3rd floor, but the additions can't fulfill all classes. Due to the limited space on the 3rd floor, the classrooms that will be built and changed on the 3rd floor, will depend on school policies. Additional classes that can be built on the 3rd floor are 2 classes only, because of the building capacity. The author proposes the UKS room formerly used as the classroom moved near the principal's office. The space is a small hallway which was used as a storage of art instruments, which will be moved to the 3rd floor.
- The lighting and noise issues were not reached NAB lighting and noise. Lighting proposed for each class use a predetermined amount of light. LED lamps with 30 watt output flux 300 lumen/watt were recommended. The number of lights can be seen in Table 5. In terms of the noise problem, the authors propose that the windows which can muffle the sound would be installed on the side closer to the edge of the highway, so more effective teaching and learning in schools could be expected.
- The library can be built on 3rd floors, because in 2009 the foundation of the school building has been overhauled by the school, so the design of the library can be implemented.

6. REFERENCE

(a) Bridger.R.S. (1995) Introduction To Ergonomics. Singapore: Mc. Graw Hill Inc
(b) Montagu, M.F. and Ashley, A. (1960) : A Handbook of Anthropometry. Springfield : Charles C. Thomas.
(c) Nurmianto, E. (2003) Ergonomi Konsep dan Aplikasinya. ITS. Edisi Pertama. Surabaya : Guna Widya
(d) Niebel, Freivals Andris (2003). Niebel's Methods, Standards, and Work Design. Twelfth Edition.Mc. Graw Hill Inc
(e) Priyatno, Duwi, "Cara Kilat Belajar Analisis Data Dengan SPSS 20", Yogyakarta, 2012.
(f) Sutalaksana, I.Z. (2006) Anggawisastra, R., Thakraatmadja, J.H. Teknik Tata Cara Kerja. ITB.Bandung