Joint International Conference

APCHI-ERGOFUTURE-PEI-IAIFI 2014

"With new mind set and widen horizon to catch the future: Physiology is the basic science for human life"

UDAYANA UNIVERSITY, DENPASAR – BALI – INDONESIA

OCTOBER 22-25, 2014

Programme Book

BALI 2014

Programme Book

Joint International Conference

APCHI-ERGOFUTURE-PEI-IAIFI 2014

"With new mind set and widen horizon to catch the future: Physiology is the basic science for human life"

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WELCOME FROM CONFERENCE CHAIR

Om Swastyastu,

Based on long experiences working in Human Computer Interface (HCI), Ergonomics (Erg), physiology, occupational safety and health (OSH), up to now we are practically still running at the same place. Accident or occupational diseases in fact still happening, even in the workplace equipped with up to date regulation and personal protected devices. Unsafe acts and unsafe behavior must be managed to develop safety behavior. Mindset changes become an important issue to be success. To solve that problem. Balinese Branch of Indonesia Ergonomics Society supported by APCHI, PEI, IEA, IAIFI, Center of Ergonomics Study of Udayana University and Bali Human Ecology Study Group (BaliHESG) organize the Joint Internasional Conference APCHI-ERGOFUTURE-PEI-IAIFI 2014. The conference will be held at Udayana University at Jl. P.B Sudirman, Denpasar - Bali on 22 – 25 October 2014.

The goals are. 1. To provide guidance and direction for young ergonomists, 2. To show the unfit, improper, inappropriate research and application of ergonomics, physiology, computer interface, and OSH, 3. to convince that a total and a more strategic approach must be done in conducting research and application with aimto have maximum benefit.

The scientific program of APCHI-ERGOFUTURE-PEI-IAIFI 2014 including : 1) workshops and tutorials, 2). Keynotes address, 3) Free communication (parallel session) of various topics of physiology, human computer interface, ergonomy in small scale industries, children, women, cognitive ergonomy, MSDs, office, communities, agriculture, architecture, etc. and 4) Field Visit and Tour to Bali best tourism object (on request). To make the conference more successfully, the organizing committee invited overseasparticipants to participate in the conference. Bali is a paradise island with unique attraction culture shall becoming unforgettable experience to all participants.

Om Shantih, Shantih, Shantih Om,

Conference Chair
Dr. Ir. Putu Gde Ery Suardana, M.Erg

GREETINGS AND BEST WISHES TO THIS CONFERENCE

Dear Hosts, Conference organizers, colleagues, and friends,

I would like to use this opportunity to express my congratulations to you for all your efforts and hard work to organize such an important event. Your dedication for promoting ergonomics discipline and profession as well as sharing and enlarging ergonomics knowledge has resulted in this well-organized conference with great contributions. I attended a previous APCHI-ErgoFuture Conference back to 2010, I was positively impressed with the work done by Indonesian scholars.

It is impressive to see how Indonesian researchers dedicate their work on solving local ergonomics needs while reaching out to the world. I truly support your efforts to apply ergonomics knowledge to the priority needs of the local and national community. I recognize clearly the great commitment of the organizers in continuing their efforts of hosting this conference again in four years short. It is equally important to satisfy local ergonomics needs and to network the international ergonomics community.

This conference hold in Bali, Indonesia, has served as an important platform for local and foreign participants to communicate, exchange knowledge and experience, as well as discuss and realize new ideas and mutual cooperation. It is an important event for the big ergonomics family, and is shaping the future development of ergonomics not only in this region but also globally. I hope our efforts could continue and make this conference in a regular basis, so the experience of the pioneers and their contributions could be carried over from generation to generation. Let this event be a place where we will regularly see old friends and meet new friends. Please accept my congratulations and best wishes to the success of our hosts' efforts and this conference!

Eric Min-yang Wang
President, International Ergonomics Association

CHANGING MIND SET AND WIDENING THE HORIZON TO ACHIEVE BETTER FUTURE

Recently we are facing various complex development problems which should be anticipated, - within our limitation -, in attaining our goals to enhance the quality of life and working life of the people at large. Impacts of Globalization, Global Warming, Eruption, Earthquake, 24 hours society, flooded area, drinking water shortage, are some of the problems we have to face and to anticipate.

And for a small island with all its limitation, likes Bali, in anticipating all those problems should be able to carry out a smart and wise development policy, likes to conduct "Development for Bali" and not "Development in Bali". There is no choice for Bali except to carry out sustainable development, using the three economic potentials: agriculture, tourism and small scale industry in synergist as means to attain the goals. To be different and winning the competition, cultural tourism must be utilized in developing tourism. Agriculture and Small scale industry should be able to show its consistency as the backbone of Bali's economy in crisis.

In all those activities ergonomists and ergonomics associations should be able to give their strong contribution and should be able to play a role as playmaker due to its position and strong role in human-machine-environment interface.

As the problems are so complex a Total Ergonomics Approach which consist of SHIP and Appropriate Technology approaches must be utilized. And to conduct such an approach, mind set change of the human resource must be developed. Holistic thinking and act must be empowered. Team approach must be conditioned. Egoism and arrogant attitude must be thrown away.

And through ergo future 2006, 2010 and 2014, we try to aware the problems, to empower the human resource and to enhance the capability of tools to support. Therefore we have to thank everybody who have already given their concerned and commitment to this efforts by supporting the conferences in various means.

We shall not stop the efforts only by organizing conferences, but beyond that. Fundamental efforts have been planted and time to grow it together by academician, government and people at large, has already come.

Finally welcome to all participants in the conferences and let us make a jump in our endeavor to enhance the quality of life and working life of the people.

Please enjoy your visit scientifically and culturally. Thank you.

Prof Emeritus Adnyana Manuaba
Initionator Ergofuture

TABLE OF CONTENT

CONFERENCE PROGRAMME

October, 22 – 25 2014

1st DAY CONFERENCE PROGRAMME
October, 22 – 2014

Time	Theater Widya Sabha FK Unud (R.Sidang FK Unud), 4th Floor	R.Sidang FK Unud, 4th Floor	Physiology Room FK Unud, 2nd Floor	Room 3.10 Pascasarjana Building, 3rd Floor	Auditorium Pascasarjana Building, 3rd Floor
08.00	REGISTRATION				
09.00	OPENING CEREMONY				
10.00	COFFEE BREAK				
10.30	**KEYNOTE SPEAKERS** 1. Professor Eric Min-yang Wang (Experiences on Ergonomics) 2. Dr. Kazutaka Kogi (Perspective of Occupational Health and Safety) 3. Prof. Masaaki Kurosu (Re-considering the concept of USABILITY) **Moderator : Prof. N. Adiputra**				
12.00	LUNCH BREAK				
13.00 17.00	**WORKSHOP "ADI Instruments"**	**PANEL FORUM FOR ERGOFUTURE**	**COACHING CLINIC FOR PUBLICATION**	**IAIFI MEETING**	**WORKSHOP SPORT PHYSIOLOGY**
18.30 20.30	Welcome Dinner with "Bupati Badung" @ PUSPEM MANGUPRAJA MANDALA, SEMPIDI				

2nd DAY CONFERENCE PROGRAMME
October, 23 – 2014

Time	Theater Widya Sabha FK Unud 4th Floor	Auditorium Pascasarjana 3rd Floor
08.00	REGISTRATION	
08.30	**KEYNOTE SPEAKERS** 1. Sho Onodera (Physiological Responses of the Exercise in Water) 2. Prof. Bintoro (The Role of Physiology Toward Agriculture Development)) 3. Prof. Koji Terasawa (About Japanese Health Education) **Moderator** : Dr. I P.G. Adiatmika	**KEYNOTE SPEAKERS** 1. Prof. Klaus J.Zink (Ergonomics in the past and the future – specific challenges for industrially developing countries) 2. Professor Sadao Horino (Naturalistic Study of Bicycling by Means of "Rin-Reco, Cycling-Event Video Recording in Relation to Ergonomic Analysis and Prevention of Road Traffic Accident) 3. Dr. Richard Graveling (Reflect, discover, innovate: from typewriter to tablet-the changing face of office workplaces) **Moderator** : Prof. K. Tirtayasa
10.00	COFFEE BREAKS	
10.30	**SOEDJATMO LECTURE** Prof.Dr.drh. Pudji Astuti, MP, AIFH **Moderator** : Dr. dr. Leonardo Lubis **Jubilium Reunion of IAIFI** **PIC** : dr. Ratna Sundari, M.Biomed	**KEYNOTE SPEAKERS** 1. Professor Lim Kee Yong (Safety Culture: Review, Requirements & Development of a New State-of-the-Art Safety Culture Model & Index) 2. Professor Paola Amaldi (Designing effective new complex systems in aviation and health system) 3. Prof Gaur G Ray (Challenges in Outside Classroom Education Through Interactive Human-Computer System) **Moderator** : Dr. Ir. Lilik Sudiajeng
12.00	LUNCH	

2nd DAY FREE PAPER PRESENTATION
October, 23 – 2014

Time	Theater Widya Sabha FK Unud, 4th Floor	Auditorium Pascasarjana, 3rd Floor	Room 3.10 Pascasarjana, 3rd Floor	BPPS Room Pascasarjana, 3rd Floor	Lab. Bahasa FK Unud, 3rd Floor	R.Sidang FK Unud, 4th Floor
13.00	**Parallel session I** 1. Suyasning HI, et al (AG108) Blood Profile Elderly At Tulikup Village Gianyar Regency Bali 2. Galuh Alviana,et al(AG109) Antidiabetic Activity of Calcium Bentonite in Alloxan Monohydrate-induced Diabetic Wistar Rat Models 3. Novia Purnama F, et al (AG110) The Correlation Between Intraocular Pressure and Visual Field Progression in Glaucoma 4. Hemavahthy Mani , et al (AG111) Cardio Respiratory Endurance of International Pharmacy Students in UNPAD **Moderator:** Nur Muhammad Faiz Habibullah	**Parallel session I** 1. Hari Purnomo, et al(AA1) The Comparison of Hand Anthropometry for 1st, 2nd and 3rd Grades of Elementary School In Yogyakarta 2. Fariza Hanis Abdul Razak, (AA2) The Comparison of Hand Anthropometry for 1st, 2nd and 3rd Grades of Elementary School In YogyakartaMeasuring Fun Experience using … 3. Hilma Raimona Zadry, et al(AA3) Alternative Design Of Ergonomic Walk Learning Tool For Toddlers Using Quality Function Deployment (Qfd) 4. Manik Mahachandra, et al (AA5) Key Body Dimensions of Indonesian Children for Determining Standard Clothing Size **Moderator :** Irma Nur AFIAH	**Parallel session I** 1. Hartomo Soewardi, et al(AB19) Packaging Design of the "Pondoh" Zalacca Fruits and Chips 2. I Wayan Parwata, et al (AB20) Perancangan Ulang Alat Pembersih Batok Kelapa Berbasis Ergonomi Untuk Meningkatkan Produktivitas Dan Kenyamanan Kerja 3. Hilma Raimona Zadry, et al (AB21) Redesign Of Long Spinal Board With Ergonomics Approach For Evacuation Process Of Spinal Cord Injury Victims 4. Lamto Widodo,et al (AB24) The ergonomic design of a MINI hotel for Indonesian TRAVELLERs **Moderator :** Linda Herawati	**Parallel session I** 1. Latri Tresnawati, et al (AC38) The InfluenceIntensity Of Illumination Agains Eye Fatigue And Quality Products In The Kitchen LE'Catering 2. Luh Putu Ruliati, et al (AC39) Study About Work Fatigue And The Risk Factors Related to Work Fatigue on Concrete Brick Workers in Kecamatan Maulafa 3. SangeetaPandit, et al (AC40) Ergonomic Intervention in Seat modification for Commercial Handloom Of Kamrup district of Assam 4. I Ketut Wijaya (AC42) Making Salt With Sunlight In Village Pengalon, Regency Karangasem **Moderator :** I Made Anom Santiana	**Parallel session I** 1. Aris Widayati, et al(AH123) Up regulasi ekspresi laminin tanpa ekspresi VE Chaderin pada pembuluh darah … 2. Endang Sri Wahyuni, et al(AH124) The Effect of Jasmine Leaf Ethanol Extract (Jasminum sambac L. Ait) on Increased Contraction In... 3. Endang Sri Wahyuni, et al (AH125) The Effect of Cyperus rotundus rhizome extract on Aortic Intima-Medial Thickness of … 4. Sudiarto, et al AH126) Correlation of Physical Activity Levels While Pregnancy at Gestational Age 37-38 Weeks … **Moderator:** Kristanti Wanito Wigati	**Parallel Session I** **Part 1** 1. Supriya Mantry,et al (AL172) Adaptive process automation for web based applications 2. Shivani Sharma, et al (AL173) Web Accessibility – Realizing Human Valuesof Development Team 3. Dian Kemala Putri, et al (AL186) Learning from animated and static pictures in comprehension of public transport … 4. Sajal Nagwanshi and Gaur G. Ray (AL175) Development of a force sensitive touch screen based assistive device for people with … **Moderator:** Dian Palupi Restuputri

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Lab. Bahasa** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
14.00	**Part 2.** 1. Nur Muhammad Faiz Habibullah, et al AG(112) Characteristics of Sagittal Plane Spinal Curvatures among Elementary School Teachers 2. Putri T. Radhiyanti, et al (AG113) Lung function and VO2max of textile factory workers 3. Raisha Pratiwi Indrawati, et al (AG114) Impact of Nearwork Activity on Visual Acuity Among Junior High School Students in Jatinangor 4. Vita Murniati Tarawan, et al (AG117) The Difference of Anxiety Level between Premenopausal Women With Yoga And Premenopausal Women Without Yoga **Moderator :** Galuh Alviana	**Parallel session II** 1. Irma Nur AFIAH, et al (AA6) Characteristics Of Walking Motion In Elderly Japanese Women 2. Susy Purnawati (AA7) Empowerment Of Aging Worker For Better Productivity And Corporate Culture And Image 3. Wahyu Susihono (AA8) The Musculoskeletal Of Workers In Pouring Liquid Metal With Of Double Operator Ladle Design Operation Is More Comfortable Than Single Operator Design Of Ladle 4. Kadiri Shamusideen, et al (AA9) The Challenges of Implementation of Ergonomics Interventions in Manufacturing Industries in Nigeria **Moderator: Hari Purnomo**	**Parallel session II** 1. Linda Herawati,et al (AB25) Designing Ergonomics House For Elderly 2. Mira Rahayu, et al (AB26) Tools Desain for rice transportation using Rapid Entire Body Assesment Method dan Quality Function Deployment at Perum Bulog Sub Divre Wilayah 1 Bandung 3. Prima Fithri,et al (AB27) Additional Features of Car Seat for Pregnant Woman 4. Ir. Rosnani Ginting, MT, et al (AB28) Design of Decision Support System to Optimize Customer Satisfaction Based on QFD Method **Moderator:** Hartomo Soewardi	**Parallel session II** 1. I Made Anom Santiana (AC43) Using 5r Principle To Increase Work Productivity Worker In Cv "X" Tabanan 2. Luciana Triani Dewi,et al (AC44) Work Improvement in Home Industries Using Participatory Ergonomics Approach: Case Study in Yogyakarta 3. I Made Anom Santiana (AC45) Regulating Work Time To Increase Work Produktivity Worker Use Flatiron At Garment "X" In Badung Regency, Bali 4. Anizar (AC46) Ergonomic Work Facilities Design To Reduce Musculoskeletal Disorders Among Chips Workers **Moderator:** Latri Tresnawati	**Part 2.** 1. Kristanti Wanito Wigati, et al (AH128) Red Amaranth (Amaranthus tricolor Linn) Preserves Sperm Count and Motility of Mice (Mus musculus) Induced Lead Acetate 2. Sundari Indah Wiyasihati, et al (AH129) Potency of Red Spinach (Red amaranthus) as an Antioxidant on Lead Acetate Induced Toxicities in Mice 3. Idola Perdana, et al (AH130) The Effect Of Mahkota Dewa Fruits (Phaleria Macrocarpa) Extract To The Epithelial Thickness Of Wound Incission In Rats (Rattus norvegicus) 4. Asnar E, et al (AH131) A Function Discriminate The Risk Of Type 2 Diabetes Among Indonesian Obese Characteristics **Moderator :** Aris Widayati	**Part 2.** 1. Kikuo Asai (AL176) Subjective Evaluation of Haptic Visualization System Using 2D Lateral Force Feedback … 2. Kasim Ozacar, et al (AL177) Design of a Comfortable Interactive Multi-user Stereoscopic Display… 3. Dian Palupi Restuputri, et al (AL178) The Development of Usability Assessment Tool For Airline … 4. Dominikus Budiarto, et al (AL179) Proposed Design And Intention To Use Virtual Reality (VR) Media For Lecturer Of … **Moderator:** Supriya Mantry
15.00	**COFFEE BREAKS**					

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15.15	**Parallel Session II** **Part 1.** 1. Ruqaiyah., et al (AG119) The Effects of Chronically high-intensity Exercise on the β-endorphin and FSH (follicle stimulating hormone) among Female Army Officer. 2. Habiba Aurora, et al (AG120) Efek Estrogenik Genistein Terhadap Pembentukan Jantung pada Zebrafish **Moderator:** Ardik Lahdimawan	**Parallel session III** **Part 1.** 1. Rizki Wahyuniardi,et al (AA10) Framework Development and Measurement of Operator Workload Using Modified Cooper Harper Scale Method (Case Study in PT Sinar Terang Logamjaya Bandung West Java) 2. Yumi Meuthia, et al (AA11) Measurement Of Labor Physical And Mental Work Load At Crumb Rubber Production Line In Pt P&Pbangkinang 3. Wahyu Susihono (AA12a) Evaluation Work Movement In Process Of Metal Casting Mold Disassembly As The Basis For Recommendations To The Working Posture Improvement **Moderator:** Edi Setiadi Putra	**Parallel session III** **Part 1.** 1. Rosnani Ginting, et al (AB29) Design Improvement Cement Spatula Tool With Kansei Engineering, Quality Function Deployment And Analytic Network Process 2. Grace Mulyono (AB30) DesignAnalysisof Classroom Furniture forOverweight Users 3. Lusi Susanti,et al (AB31) Introducing Modular Design For Smes In The Furniture Industry In West Sumatra Province **Moderator:** M Yusuf	**Parallel session III** **Part 1.** 1. Chandra Dewi K, et al (AC47) Improvement Work System In Art Stone Small Scale Industries 2. Robert Hutagalung, et al (AC48) Method And Equipment Design Using Ergonomics Approach To Increase The Performance Of The Traditional Smoked Fish Workers In Ambon 3. Ihya Hazairin Noor, et al (AC52) The Correlation Between Age, Tenure And Height With Musculoscletal Disorders (Msds) Complaints **Moderator:** Bachwal Lavanya	**Parallel Session II** **Part 1.** 1. Purwanto B, et al (AH132) Dynamic Eccentric Exercise Improve Glut-1 Expression on Calf Muscle of Diabetic Mice Models 2. Amir Chamdani, et al (AH133) The Effect Of Addition Of Sodium Chloride Solution To The Absorption Of Glucose 3. Isna Qadrijati (AH134) Detection infertility : fast, easy, and practical with Immunocytochemistry (ICC) **Moderator:** Isna Qadrijati	**Parallel Session II** **Part 1.** 1. Ceicalia Tesavrita, et al (AL180) Eye-trakingUsability Study for evaluating Hotel Website 2. Muhammad Helnan Nawawi, et al (AL181) Analysis of Word Processors by Using Usability Approach for Microsoft Word 2013 and Open Office Writer 4.1 3. Devianatika Yuniari, et al (AL 182) Designing Roemah Dago Website Based on Eye-traking Usability **Moderator:** Yuni S Pratiwi

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16.00	**Part 2.** 1. Ardik Lahdimawan, et al (AG121) Effect of Ramadan Fasting on Endorphin and Endocannabinoid level in Serum, PBMC and Macrophage 2. Ratih Paramita Suprapto,, et al (AG122) Cyperus rotundus rhizome extract decreases Monocyte Chemoattractant Protein-1 (MCP-1) Serum Level of Wistar Rats Fed with Atherogenic Diet **Moderator** : Ruqaiyah	**Part 2.** 1. Edi Setiadi Putra, et al (AA13) Penerapan Ergokultur Sunda Dalam Desain Produk Perangkat Kerja Pedagang Kaki Lima Kuliner Di Kota Bandung 2. Irwanti, NKD, et al (AA14) Work Sitting Posture Improvement Through Onsite Self-Improvement Methods And Setting Active Rest Decrease Fatigue And Musculoskeletal Complaint On Finance Employees In Triatma Surya Jaya Foundation 3. Hartomo, et al (AA16) Ergonomic Design of The Coconut Fibers Handbag By Using Axiomatic Design Method **Moderator:** Rizki Wahyuniardi	**Part 2.** 1. Agus Sri Lestari (AE78) Awarenesson knowledge of "cadres" in measuring anthropometry at post services elderly. 2. M. Yusuf (AB33) Repair Of Work Station To Improve Productivity Jewel Workers In Karangasem Bali 3. ThedyYogasara, et al (AB34) Enjoyable Pressure Cooker: Redesigning Physical Formof Products Based on Product Emotions and Usability Criteria 4. Arief Rahman, et al (AB35) Mobile Direct Time Study : Design and Evaluation **Moderator:** Rosnani Ginting	**Part 2.** 1. Bachwal Lavanya, et al (AC49) An Ergonomic assessment of brick molding operation in India as against the nutritional status of the molders. 2. Dini Wahyuni, et al (AC50) Workplace Improvement in Coconut Fiber Processing 3. Bandyopadhyay Bijetri, et al (AC51) Load carrying in two different modes by the brick kiln workers – A comparative analysis **Moderator:** Chandra Dewi K	**Part 2.** 1. Isna Qadrijati (AH135) Steroid hormone and calcium antagonist affect expression of CatSper channels in human spermatozoa 2. Yuliana Heri Suselo, et al (AH136) The Polymorphism Of Trans Membrane Protease Serine 6 (Tmprss6) Gene Rs855791 As A Risk Factor Of Iron Deficiency Anemia In Pregnant Women 3. Dono Indarto, et al (AH137) Dipeptidyl peptidase 8 down regulates adenylate kinase 2 activity and may be involved in cellular energy metabolism 4. Sinu Andhi Jusup (AH138) Administration Of Low Sodium Salt Decreasesblood Pressure In Rat Animal Model **Moderator:** Purwanto B	**Part 2.** 1. Yuni S Pratiwi, et al (AL183) Visual Comfort Comparison between Angle Gaze and Lightness Difference: A cross sectional study using … 2. Agung Kurniawan, et al (AL184) Study of Software Development SWAT (Subjective Workload Assessment Technique) DOS Version … 3. Johanna Renny Octavia, et al (AL185) GEOmuseum: A Fun Interactive Guide to Enhance Museum Visiting Experience for Youngsters in Indonesia 4. Amarria Dila Sari, et al (AL193) Analysis of Usability Level of Online Store Website for "olx.co.id" and "berniaga.com **Moderator:** Devianatika Yuniari

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17.00		**Parallel session IV** 1. Hartomo Soewardi, et al (AA17) Design Of Slondok Maker Machine By Using Kansei Engineering Method 2. Hartomo, et al (AA18) Ergonomic Packaging Design of Vegetable Shredded By Using "Kansei Engineering" Approach 3. Bernadus Kristyanto, et al (AA12) Assessing a Person's Head and Neck Movement as The Design Basis of Mannequin's Movement Simulation **Moderator:** Wahyu Susihono	**Parallel session IV** 1. B. Suhardi, et al(AB36) Electricity Energy Audit For HVAC Systems And Artificial Lighting Systems In Industrial Engineering Department Sebelas Maret University 2. Wawan Yudiantyo, et al (AB37) Analysis and Design Physical Facilities, Layout, and Physical Environment at Work Station of Beverages in Kedai Steak Purwakarta and design shacker to eliminating fatique 3. I Ketut Gde Juli Suarbawa, et al(AB37a) Work Tools Improvement To Increase Work Productivity Of Sugar Craftsmen In Dawan Village Klungkung **Moderator:** Arief Rahman	**Parallel session IV** 1. Khoirul Muslim, et al (AC53) A web based occupational health and safety management system requirements in small and medium enterprises 2. Kundu Amar,et al (AC54) Work posture analysis of brick moulding operation in brick kiln industry and design intervention **Moderator:** Dini Wahyuni		**Parallel Session III** 1. Amarria Dila Sari, et al (AL187) Usability Analysis of Flight Reservation Website Using Repertory Grid Method 2. Erika Desyana Hefny, et al (AL189) Correlation Between The Form Of Ergonomical Risk And Musculoskeletal Remonstrance Which Is Caused By Notebooks 3. Amarria Dila Sari, et al (AL190) Analysis of Usability Level in Using Microsoft Word 2013 and Open Office Writer 3.4 **Moderator:** Johanna Renny Octavia
18.30	**Dinner @ Jaya Sabha, Hosted by The Governor of Bali**					

3rd DAY CONFERENCE PROGRAMME

October, 24 – 2014

Time	Theater Widya Sabha FK Unud 4th Floor	Auditorium Pascasarjana 3rd Floor
08.00	REGISTRATION	
08.30	**ROAD MAP PHYSIOLOGY** *Latest curricula application among medical students* 1. Paper from Indonesia University 2. Paper from Padjajaran University 3. Paper from Gadjah Mada University 4. Paper from Airlangga University 5. Paper from Udayana University **Moderator : Prof. I N. Adiputra**	**KEYNOTE SPEAKERS** 1. Dr. Evelyn Guatlin Tan (Ageing and Work Ability) 2. Dr. Angelika Herzig (Facilitating Effective Work Collaboration between Midwives and Doctors in the Delivery) **Moderator** : Professor Dr. Kazutaka Kogi **Presentation of APCHI 2015 :** Prof. Lim Kee Young
10.00	COFFEE BREAKS	
10.30	**KEYNOTE SPEAKERS** 1. Prof. Agik Supyayogi (Animal welfare for human, animal and environment health) 2. Dr.dr. Adi Teruna Effendi, SpPD (Nutrition Physiology) **Moderator : Prof. K. Tirtayasa**	*Free Paper Presentation*

3rd DAY FREE PAPER PRESENTATION
October, 24 – 2014

Time	Theater Widya Sabha FK Unud, 4th Floor	Auditorium Pascasarjana, 3rd Floor	Room 3.10 Pascasarjana, 3rd Floor	BPPS Room Pascasarjana, 3rd Floor	Meeting Room FK Unud, 3rd Floor	R.Sidang FK Unud, 4th Floor
10.30	*Keynote Speech*	**Parallel Session I** **Part 1.** 1. I Nyoman Adiputra, Et Al (AD57) Integrated Ergonomic Ship Approach Workshop For Empowering The Human Resources. A Bali's Case Of Cognitive Ergonomics Perspective. 2. I Nyoman Adiputra, et al(AD59) Biosecurity Implementation Of Broiler Smallholder Producers In Relation To Practical Ergonomic Improvement 3. I Made Sutajaya (AD60) Community Empowerment Through Ergonomics Training With Local Wisdom Oriented To Improve The Quality Of Sculptor Health In The Peliatan Village, Ubud, Gianyar, Bali **Moderator:** Heri Setiawan	**Parallel Session I** **Part 1.** 1. Ardiyanto, et al (AE77) Effect of Backpack Loads and Carrying Postures on Heart Rate Alteration 2. Pringgo Widyo Laksono, et al (AE73A) Analysis Of Thermal Comfort Assesment In The Classroom (Case Study: Classroom 303 Faculty of Engineering, Sebelas Maret University, Indonesia) 3. Erlinda Muslim, et al (AE74) The Effects of Breakfast Composition Based on Kcal Value to Cognitive and Physical Performance of Athlete Students **Moderator:** Hardianto Iridiastadi	**Parallel Session I** **Part 1.** 1. Sajidi Hadipoetro (AF89) Unsafe Act Motorcycle Riding as Determinant in Mudik Accident in Java 2. Maya Arlini Puspasari, et al (AF90) Designing Fatigue Assessment Technology Based on Oculomotor Variables as Fitness-for-duty for Driving 3. Boy Nurtjahyo Moch., et al (AF91) The Effect of Traffic Noise to Driver Alertness Performance of Visual Signal in Jakarta 4. Ni Made Sri Putri Purnamawati Ergonomic Intervention Increase Production of The Blacksmith "Kris Pajenengan" in Denpasar **Moderator:** Nora Azmi		

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Meeting Room** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
11.15		**Part 2.** 1. I Nyoman Adiputra, et al (AD58) Cognitive Ergonomics For The Sustained Prevention Of Avian Influenza In Balinese Community 2. Heri Setiawan, et al (AD61) Human Resources Empowerment Based on Total Ergonomics to Mapping and Development for Downstream Rubber Industries South Sumatera Province 3. Hari Purnomo, et al (AD63) Analysis Of Mental Workload At The Banking Company In Yogyakarta **Moderator :** I Made Sutajaya	**Part 2.** 1. Hardianto Iridiastadi (AE75) Measuring Mental Fatigue – A Review Based on Three Studies 2. Dr. Djamaluddin Ramlan, SKM. M.Kes (AE76) Pemakaian Tiang Infus Ergonomis Terhadap Kenyamanan Beraktivitas Pasien Rawat Inap Di Rsud Prof. Dr. Margono Soekarjo Dan Rumah Sakit Orthopedi Purwokerto 3. Swasti Wulanyani (AD55) Simulation Method For Measuring Multitasking Proficiency **Moderator :** I Ketut Suherman	**Part 2.** 1. Nora Azmi, et al (AF92) Working Conditions Measurement of Transjakarta's Drivers at Corridor 2 and 3 Using Physiological and … 2. Sriyanto, et al (AF93) Identification of Operator Mental Workload with Fault Tree Analysis Techniques To Reduce Risk of … 3. Ari Widyanti, et al(AF94) Increasing Productivity of Street Vendors at ITB' Neighbourhood through Ergonomics Application **Moderator :** Sajidi Hadipoetro		
12.00	**LUNCH BREAK**					

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Meeting Room** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
14.00	**Parallel Session I** 1. Ratna Indriawati, et al (AI139) Effect of Hypoxic Hypoxia Duration to The Erythrocyte, Hemoglobin, and Glucose 2. Zulkhah Noor, et al (AI140) Brain Gym Improve Sensory Reaction Time, Memory and Intelligence Quotient (IQ) of Elementary School Children in Region Hypothyroidism 3. Ikhlas Muhammad Jenie, et al (AI141) The comparison of maximal platelet aggregation in the presence of disperse primary and monolayer secondary HUVEC exposed to testosterone 4. Anita Tri Kusuma, et al (AI142) Reaction time in healthy female subjects in relation to monthly sexual cycle **Moderator:** Nurul. Mahmudati	**Parallel Session II** 1. Heri Setiawan (AD62) Ergonomincs Design of Physical Work Environment to Increase Productivity in Rubber Industry 2. Mutiara Maimunah (AD65) Improving Corporate Performance Through Gender Budgeting 3. Markus Hartono, et al (AD66) Incorporating customer emotional needs using Kansei Engineering and Kano model to support Customer Relationship Management: A case study in healthcare services **Moderator:** Hana	**Parallel Session II** 1. Tryadi W. Tumewu,et al (AB32) Designing The Exterior Form of Men Formal Shoe With Kansei Engineering Using Meaning Structure Approach. 2. Louvie Lambok A, et al (AE79) Effectivity Analysis on Electroencephalography and Electromyography Bio-Signal for Development Post-Stroke Patient Rehabilitation Device 3. Artayasa, I Nyoman (AE80) Anthropometry In Gamelan Jegog Bali 4. Hidehiro Kanagawa, et al (AE181) Proposal of Intellectual Productivity Evaluation Index and Quantitative Evaluation of Concentration Improvement Lighting **Moderator:** Kristanto Agung Nugroho	**Parallel Session II** 1. Ahmad Syukri, et al (AF96) Analysis of work characteristic effect and Head-Up Display (HUD) in risk behavior driver when reading messages 2. Ari Widyanti, et al (AF97) Increasing Productivity of Street Vendors at ITB' Neighbourhood through Ergonomics Application 3. Listiani Nurul Huda, et al (AF98) An Analysis of Anthropometric Design on The Chair and Table of Elementary … 4. A. Teguh Siswantoro, et al (AF99) Embedding Ergonomics' Subjects in Industrial Engineering Courses Enhanced the Internalization … **Moderator:** Wiwik Budiawan	**Parallel Session II** 1. Titis Wijayanto, et al (AK170) A comparison of physiological responses during exercise in hot environments with identical WBGT in … 2. Endang Mulyana, et al (AK172) Efek Interval Training Terhadap Percepatan Berat Badan, Kadar Adiponektin, IL-6 dan Nilai Indeks Lee Pada Tikus Model Obesitas: Interval Training … 3. Kartika Indah Sari,et al (AK172a) Effects of Soft-Diet Feeding with aerobik excercise on hippocampus in Wistar Rat 4. I Putu Adiartha Griadhi, et al (AI151) Balinese Cultural Dances Improves Flexibility Score Among Medical's Student of Udayana University **Moderator:** Kunjung Ashadi	**Parallel Session I** 1. Hartomo Soewardi, et al (AL191) Comparative Study: Ergonomics and Usability Analysis on the University … 2. Muh Fariz Qomarul Hadi, et al (AL192) Ergonomic Analysis on Carrying Sack Using Posture Evaluation Index (PEI) in Virtual Environment 3. Tuhina Dargan, et al (AL174) Towards better assessment of candidates by interviewers while recruitment: Empirical Research Findings and Suggestions 4. Dr Chris Gunn.(AL194) An Augmented Reality Tool Trolley Using Laser Projection **Moderator:** Erika Desiana H.
15.00	**COFFEE BREAK**					

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Meeting Room** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
15.15	**Parallel Session II** **Part 1.** 1. Nurul. Mahmudati, et al (AI143) Focal Adhesion Kinase (Fak) Expression In Influencing Bone Density By Exercise Training In The Female Young Rat For Decreasis Osteoporotic Risk 2. Adrien Jems Akiles Unitly, et al(AI145) Kebar's Grass Improves Spermatogenic Quantity And Spermatozoa Quality In Rats Exposed With Cigarette Smoke 3. Rachmawati,et al (AI146) The role of satellite cells in muscle injury 4. I Putu Adiartha Griadhi (AI151a) Overestimation of Basal Metabolic Rate that Resulted from Predictive Equation Compared with Indirect Calorimetry Measurement **Moderator:** Ratna Indriawati	**Parallel Session III** **Part 1.** 1. Markus Hartono, et al (AD67) Feasibility study of green restaurant business incorporating Kansei Engineering: A case study in grilled fish green floating restaurant 2. Hana, et al (AD68) Influence of Perfectionism on Work Performance: An Empirical Study in Change Blindness Test 3. Lilik Sudiajeng, et al(AD68) Model Of Integrated Water Resources Management In Denpasar Regency Through Ergonomics Ship Approach **Moderator:** Mutiara Maimunah	**Parallel Session III** **Part 1.** 1. Lobes Herdiman, et al (AE183) Modification Ankle Prosthetic Endoskeletal Below Knee With Appropriate Technology Application Through The Ship Approach (Systemic-Holistic-Interdisciplinary-Participatory) Low Cost And Functional 2. Kristanto Agung Nugroho, et al (AE185) Tool development for patient poststroke rehabilitation-based virtual reality 3. Ilham Priadythama, et al (AE186) Design of Slide Alignment Adapter on Below Knee Prostheses for Transtibial Amputee Gait Improvement **Moderator:** Linda Herawati G	**Parallel Session III** **Part 1.** 1. I Made Krisna Dinata, et al (AF101) Kajian Ergonomi Pada Tempat Wisata Pantai Labuan Sait Kabupaten Badung Bali 2. I Ketut Widana, et al (AF102) Ergonomic Study on the Economic Aspects of Transit Hotel Development at Bali Ngurah Rai Airport 3. M. Yusuf (AF103) Ergo-Agritourism Approach To Improving Safety And Comfort In The Agritourism Area **Moderator:** Edi Setiadi Putra	**Parallel Session III** **Part 1.** 1. Kunjung Ashadi (AG167) Sport Activities in the Hot Environment 2. Ratna Kusumawati (AG168) The Effect Of Elderly Gymnastics On Lung Vital Capacity In Elder People 3. Roman Ardian Goenarjo, et al (AG169) Body response to aerobic overtraining exercise: the study of the serum levels of growth hormone (GH), insulin-like growth factor I (IGF-I) and insulin-like growth factor binding protein 3 (IGFBP-3) of Wistar rat 4. Ni Made Dewantari, et al (AK164) Contribution Of Nutrition Related Substances As A Source Of Energy Macro Physical Fitness With Athletes Basketball **Moderator:** Titis Wijayanto	**Parallel Session II** **Part 1.** 1. Putu Ayu Asri Damayanti (AJ152) The Resistance Difference of Aedes aegypti to α-permethrin (pyrethroid) through Bioassay Test and Nonspecific Esterase Activity Assessment Between Denpasar and Badung regency 2. H Maheshwari, et al (AJ153) The role of fennel (Foeniculum vulgare Mill) infusion on estrous cycle and follicles development of white rats at productive age 3. Irkham Widiyono, et al (AJ154) Effects of Nutritional Status on Seminal Parameters of Male Kacang Goat 4. Prof. A. Purba Pencegahan dan pengobatan obesitas dengan berolahraga **Moderator:** Hartomo Soewardi

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Meeting Room** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
16.00	**Part 2.** 1. Rostika Flora (AI147) A Comparison Of Blood Lactate Levels And Heart Muscle Tissue Lactate Levels In Rats That Given Loading Anaerobic Physical Exercise 2. Martiem Mawi, et al (AI148) The Relationship Between Serum Malondialdehyde (Mda) Level And Atherogenic Index In Men And Women Aged … 3. Olivia Tantana, et al (AI149) The Relationship between Sex, Noise Intensity and Length of Exposure with The Risk of Noise Induced Hearing Loss due to … 4. I Ketut Tunas, et al (AK167) Appropriate EXERCISE PROGRAM TO INCREASE SPEED, accuracy, and constancy among … **Moderator:** Erico Lemuel	**Part 2.** 1. Erwin Maulana Pribadi (AD69) Studies of Indonesian Human Perception related with Effect of Global Warming (case sudy in 8 Cities in Indonesia) 2. Aulia Ishak (AD70) ntegrated Approach on Energy and Environment Management for Palm Oil Industry 3. Mangara M. Tambunan, et al (AD71) 4. Ir. Khawarita Siregar, MT (AD72) Analyze the Implementation Level of Occupational Health and Safety (OHS) Management Program and Hazards Control with Risk Assessment Approach at Palm Oil Mill PT. XYZ **Moderator:** DR. Lientje Setyawati Kusumaharta Maurits	**Part 2.** 1. Linda Herawati G, et al (AE188) Applied Ergonomics in Designing Communication Tool for Autism (PECS Method) 2. I Ketut Suherman, et al (AE73) Variation of Noise Level Have an Effect to Workload at Labour in Industry of Wood Processing 3. Muliarta, I M, et al (AE79a) Improvement Of Computer Working Condition Decrease Muscle Tension, Work Load, And Subjective Complaints Among Students Of Visual Communication Design Of Indonesia Art Institute Denpasar 4. Luh Made Indah Sri Handari Adiputra, et al (AD56) Fatigue And Work Engagement On Employees At Accounting Department In Sanglah Hospital Denpasar	**Part 2.** 1. Edi Setiadi Putra, et al (AF104) Penerapan Ergokultur Sunda Dalam Rancang Bangun Sarana Niaga Wisata Kuliner Di Kota Bandung 2. Jacob M. Ratu (AF106) Posture Work Analysis and Health Quality of Palmyra Farmers in Palmyra Juice Tapping Process 3. Listiani Nurul Huda (AF107) Ergonomic Analysis on the Worker Activity of Loose Palm Fruits-Collection 4. I Dewa Ayu Inten D.P.(AF108) Ergonomics Aspects In A Religius Ceremony; "Karya Pedudusan Agung" At Petak Village Gianyar Bali **Moderator:** I Ketut Widana	**Part 2.** 1. Ratna Kusumawati, et al (AG169) Pengaruh Ekstrak Royal Jelly Terhadap Peningkatan Daya Tahan Otot Dan Kekuatan Otot Lengan Pada … 2. Ike Rahmawaty, et al (AG170) Low intensity aerobic exercise in the afternoon significant decreased resistin expression gen on … 3. I Nengah Sandi, et al (AG170a) Energy Metabolism In Sports 4. Sawitri R Hadiati, et al (AG171) Exercise for Children with special needs : a Case study in the Yayasan Peduli … 5. Daniel Womsiwor, et al (AK163) Influence Of Physical Activity To Pulse Rate **Moderator:** Ratna Kusumawati	**Part 2.** 1. An-An Yulianti (AJ155) Physiology Condition Hematology And The Duration Of Reconditon Of Male Fat Tail Sheep That Transported From East Java To West Java 2. Irkham Widiyono , et al (AJ156) SOME BLOOD CHEMISTRY PARAMETERS OF KACANG Goats 3. Lovita Adriani, et al (AJ157) Decreasing Egg And Meat Fat Using Kombucha Tea In Laying Quails (Cortunix Cortunix Japonica) 4. W. Sayang Yupardhi (AJ158) Meat Physiology Of Cattle Forced Excessive Drinking Water And It Consumers Health **Moderator:** Debby D. Moniharapon

Time	**Theater Widya Sabha** FK Unud, 4th Floor	**Auditorium** Pascasarjana, 3rd Floor	**Room 3.10** Pascasarjana, 3rd Floor	**BPPS Room** Pascasarjana, 3rd Floor	**Meeting Room** FK Unud, 3rd Floor	**R.Sidang** FK Unud, 4th Floor
			Moderator: Lobes Herdiman			
17.00	**Parallel Session III** 1. Erico Lemuel Yonathan, et al (AI150) Correlation Between 24 Hours Caloric Intake And Breastmilk Lipid Concentration On Lactating Mother 2. Ronald Tarigan, et al Effectivity of Immunoglobulin Y Antilipase as a pancreatic lipase inhib. For prev. Of obesity 3. Muliarta (AG111) Administration of tamarillo Juice decreasing plasma MDA level among parking Men 4. dr. Luh Ratna Sundari, M.Biomed (AI151b) Oral Administered Of Vitamin E 400 IU Decrease Malondyaldehid (Mda) Level In Obesity Women **Moderator:** Rostika Flora	**Parallel Session IV** 1. DR. Lientje Setyawati Kusumaharta Maurits, et al (AD72) Ergonomic Considerations In Pre-Placement Examination 2. Hartomo (AD73) Customer Analysis of the Ergonomic Displays Design For Tourism Park Development In "Gunung Kidul" Regency **Moderator:** Aulia Ishak	**Parallel Session IV** 1. Astika yasa, Krisna Rapid entire body assessment (REBA) Analysis in Chili Plant Maintenance Process in Bangah Village, Tabanan District (AE) 2. Daryono, Krisna, Indah Ergonomic Study in Traditional Harvesting Rice at Denpasar(AE) Daryono 3. Kadek Saputra, Krisna Ergonomic Study Using Brush Cutter Machine to Cut Weeds Grass in Coffee Farm(AE) **Moderator:** Daryono	**Parallel Session III** 1. Wiwik Budiawan, et al (AF95) Data Warehouse and Application of Railway Accidents Investigation Development (Case Study: PT Kereta Api Indonesia Daop IV) 2. Ilham BAKRI (AF100) Effect of Personal Protective Equipment on the Physiological Responses of Different Body Weight Groups of Firefighters 3. Ni Wayan rusni et. Al., Ergonomic Problem in Supervision of the Babies Who are Learning to Walk(CdE) 4. Wayan Muliartini et al Ergonomic Study in The Laundry at Hospital "X" at Denpasar (H/ME) **Moderator:** Listiani Nurul Huda	**Parallel Session III** 1. Aminudin, et al (AK165) The Effect Of Active And Passive Warming Up On Blood Glucose And Lactic Acid Before Sub-Maximal Physical Activity 2. Leonardo Lubis (AK167) Response Of Long-Term Memory To Molecular Changes Of Bdnf In Hippocampus In Various Intensities Of Physical Activity 3. Yasir Banadji, et al (AK168) Physical Activity and Physical Fitness Characteristic of Fakultas Kedokteran Universitas … 4. Rizqy Aulia Cahyantari, et al (AK169) Effect of Duration of Work, Personal Protective Device and Smoking on Lung …. **Moderator :** Dewantari	**Parallel Session III** 1. Pieter Kakisina, et al (AJ159) Giving Effect Of Papaya Fruit Juice Overcooked (Carica papaya) Appearance of Home Uterine … 2. Debby D. Moniharapon (AJ160) Residual activity twigs of Aglaia odorata Lour extract and Dysoxylum acutangulum Miq. (Meliaceae) larvae OF Crocidolomia… 3. Dece Elisabeth Sahertian, et al (AJ161) Photostability Of Carotenoid Mesocarp Palm Fruit Extract (Elaeis Guineensis … 4. Mechiavel Moniharapon, et al (AJ162) Effect Of Fruit Juice Papaya (Carica Papaya) Young Appearance Of Ovarian … **Moderator:** W. Sayang Yupardhi
18.00	**CLOSING CEREMONY** WIDYASABHA THEATER ROOM, FK UNUD, 4TH FLOOR					

4th DAY CONFERENCE PROGRAMME

October, 25 – 2014

Time	Programme
08.00 – 10.00 WITA	Field Visit to Petiga Village
10.00 –13.00 WITA	Lunch at Beratan Lake (Bedugul)

INTRODUCING MODULAR DESIGN FOR SMEs IN THE FURNITURE INDUSTRY IN WEST SUMATRA PROVINCE

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ABSTRACT: Furniture is all day every day: we work, cook, eat, sit, sleep and store using furniture. Furniture industry in West Sumatra Province is still dominated by small and medium scale enterprises (SMEs).This study selects filing cabinet as the first sample product in modular design. Quality Function Deployment (QFD) is used in identifying customer requirements. It is a challenge for small and medium enterprises (SMEs) in Indonesia to create products that suit to the needs of customers with a competitive price. To overcome this problem, modular concept is introduced. The modular filing cabinet is made by combining modules that have been standardized. The standard modules are developed from functional components of reference products using Design for Manufacturing and Assembly (DFMA) Approach. The results get nine standard modules and developed 16 product variants.

Keywords: modular design, furniture, SMEs, QFD, DFMA, modules, variant

1 INTRODUCTION

Furniture is one of the means to functionally complement the room and have to give value to comfortable and fulfilling specific functions of an interior structure [1]. Furniture industry in Indonesia is dominated by small and medium scale enterprises (SMEs). However, the existence of the furniture-sector SMEs being threatened now because of the onslaught of overseas furniture products aggressively invades the local markets. If no preventive efforts under taken to overcome the bombardment of global competitive market, the existence of SMEs in furniture industry in Indonesia will be crushed by the presence of imported products.

In order to survive, SMEs need to know the trend of future furniture design and the change of customer voice to create products that suit to the needs of customers with a competitive price [2]. Furthermore, to cut long delivery time of products to the hands of customer is also another challenge. Therefore, creative efforts but easily done is necessary to introduce a new approach to SMEs in order to increase their competitiveness.

To produce a large variety of products at lower cost, modularity concept is becoming a solution. Modularity refers to the use of common units to create product variants. It aims at the identification of independent, standardized, or interchangeable units to satisfy a variety of functions [3]. According to Ulrich and Tung [4], the term of modular can be explained in two product characteristics. First, similarities between functional function and physical architecture in a design and second, minimize the interaction between the physical components that exist in a product [5].

Although modular product has been largely introduced and discussed in many area of interest, however, for SMEs in furniture industry in Indonesia, this concept is entirely new. The purpose of this study is to introduce the concept of modular design and how to realize this concept to get product variants. One type of furniture products i.e. filing cabinet is selected as sample in this study. The study starts from how to determine the customer needs, develop standardized modules and finally get the product variants of the filing cabinets composed from the modules. Ergonomics aspects i.e. anthropometric measurement is considered in order to give more convenient results of the final products.

2 METHODS

The steps performed in the design of a filing cabinet using modular concept is shown in Figure 1. This study involved 80 samples of students and office employees as respondents aged 19-50, who are in daily activities use filing cabinet to store their files. Questionnaire was the main technique to gather specific information from respondents. It is to identify the customer needs according to the design, the use and the function of filing cabinet. The questionnaire was designed based on David A. Garvin's di-

mensions of quality. Dimensions of quality used include aspects of performance, features, durability and aesthetics [6]. In addition to the four aspects, price is also considered as suggested by Umari [7]. Before a questionnaire can be made, a focus group representing the population being studied was set up for running some interviews to explore and highlight the possible key attributes in relation to use filing cabinet. This information was then used as a reference for preparing a questionnaire, while taking account some secondary information from related literature and previous research findings. Ready questionnaire was also tested to the group for clarification before being distributed.

Table 1 shows lists of customer needs attributes and Customer Interest Rate (CIR). CIR gives information to designers about what should be placed in the first priority if the customer needs have to translate into a design of a filing cabinet. From Table 1, it is seen that because variations in customer needs are fairly large hence it is difficult to accommodate all needs into one particular design. Therefore, when modular design is introduced, it will be a strategy to response to the wide variety of the customer needs.

Quality Function Deployment (QFD) is a tool that translates into customer preferences in the form of product attributes that are tailored to the characteristics of the customer. QFD is a systematic matrix that describes an approach to design a good product [8]. If the customer needs represent the voice of the customer, then the characteristic technique is representing the voice of the developer/producer (voice of developer). Technical characteristics are also called the technical response. Technical characteristics are obtained by discussions with parties who are skilled in the field of furniture. It is found that there are 7 main technical characteristics needed to respond to the customer needs in a filing cabinet. Those main characteristics are then elaborated into sub-characteristics.

Standard dimensions of filing cabinets are set according to BIFMA (Business Institutional Furniture Manufacturers Association) and results of anthropometric calculation. The anthropometric data used for the study can be seen in Table 2.

Table 2. Anthropometric Data Used

Antropometric Data	Code	Percentil	Value
Seated elbow height	Tsd	P50	23,15
Popliteal Height	Tpo	P50	44,22

Table 1.Customer Need Attributes

No.	Constumer Needs Attibutes	CIR
1	Filing cabinet is capable of storing files or documents that suits the needs	4.66
2	Cabinet that is capable of maintaining the confidentiality and security of important archives	4.64
3	Cabinets are sturdy and stable	4.59
4	Filing cabinets with an anti termite material	4.51
5	The racks ar strong enough to accommodate large quantities of files (not easily broken)	4.50
6	Filing cabinet doors can be easily opened and closed	4.43
7	Cabinets are able to simplify the search and retrieval of frequently used files	4.40
8	Filing cabinet with durable materials	4.40
9	Filing cabinet that has a height within reach of a hand	4.39
10	Filing cabinets with a stable price	4.39
11	The door handles are easy to hold and easy to be drawn	4.26
12	Cabinets with an affordable price	4.20
13	The size of the cabinet fits the size of the work space	4.18
14	The drawers of the cabinet are easily drawn	4.14
15	Filing cabinet that can store legal size paper (8.5 'x 14')	4.11
16	Filing cabinet that is capable of storing letter size paper (8.5 'x 11')	4.01
17	The height of the shelf can be adjusted (adjustable)	3.83
18	Cabinets with minimalist design	3.80
19	Filing cabinets can be moved (wheel provided)	3.74
20	There is a feature to store stationery	3.73
21	There is a feature to place a hanging folder	3.70
22	Filing cabinet that is equipped with work desk	3.58
23	The design of the cabinet's door	3.48
24	Color variations of the filing cabinet	3.46
25	Shelf that can be hung on the wall	3.39
26	Design of the work desk	3.39
27	Design of the door handles	3.38
28	Cabinet with a carved designs	3.25

3 MODULAR PRODUCT DESIGN

A product can be seen in functional and physical terms [9]. Modular design, as a special form of product design, aims to identify components with a high degree of interaction [10]. It begins with identifying the function and physical elements of reference products, component modifications, the design of standard modules and supporting components and finally designing product variants using standardized modules.

3.1 Identification of Function and Physical Element of Reference Products

Function elements mean operation and transformation activity that individually contribute to the overall performance of the product. The physical elements of a product are organized into several major physical building blocks. Identification of the product function is performed when develop House of Quality (HOQ) in the QFD method. Once the function elements of the filing cabinet are known, the

physical elements of the function determined. The function elements defined are:

1. Cabinet Function
2. Drawer Function
3. Table Function
4. The Hanging Folder Function
5. Paper Space Functions

3.2 Identification and Modification of Components with DFMA Approach

DFMA method is used to analyze reference products that have been decomposed into components of each function. This approach provides guidance to the design team in simplifying the product structure, to reduce manufacturing and assembly costs, and to quantify improvements. The practice of applying DFMA is to identify, quantify and eliminate waste or inefficiency in a product design [11].

In this study, DFMA is done for modify the number of components, component size or replace the component with other components that has the same functions in reference products of filing cabinet. Value of design efficiency; the term to calculate the ratio of the minimum number of components and the total assembly time, is used as determination to see the improvement of the proposed design compare to current design of reference products. Design efficiency values for the main five function elements are improved up to 32%.

3.3 Define Standards Modules

Module or in another term called a block may define as collection of interchangeable components that implement some functions of the product [12]. The size of a module is often compromised due to several factors, e.g., performance requirements, materials, functions and cost. In the design of filing cabinet, a module is composed by several components that have been standardized. There are nine standard modules for filing cabinet obtained and can be seen in Table 3.

Design of Filling Cabinet Variants Using Standard Modules

The last stage of the modular product design phase is done by designing the product variation by combining standardized modules. Number of product variants depending on the number of modules combined. Variation in product design considers several aspects such as the functions, ergonomics,

Table 3.Standard Modules

No	Module	Dimension (mm)			Information	No	Module	Dimension (mm)			Information
		l	w	h				l	w	h	
1	Module A 	730	400	390	This module is used to support the functions of the cabinet shelf. In order to make this module position exchangeable, the top of the module is hollowed as a footing for another module. There are legs attached to the bottom part of this module so that it can be combined with the same or other modules.	6	Module F 	730	450	50	This module serves as a base for filing cabinet. This base is used as a place to put wheels on.
2	Module B 	730	400	720	This module is used to support the functions of the cabinet. In addition to its function as a cabinet, this module can also serve as a buffer table on multiple product variants that will be designed.	7	Module G 	400	350	20	This module is composed as supporting for module C and D and useful as the footing for the drawer rails.
3	Module C 	330	400	175	This module is functioned as drawers. This module is composed of several components with standardized dimensions. Drawer modules can be used to store office supplies and personal documents.	8	Module H 	240	400	20	This is used as shelf partitions.
4	Module D 	420	400	350	This module is functioned for hanging folders that physicaly the same as module C, but larger in dimensions because this module is adjusted to the size of hanging folders.	9	Module I 	730	390	20	This module serves as a door for module A as well as for other modules and functions if required
5	Module E 	1500	730	20	This module is a supporting for table function. Combination of module E and module B will result in a filing cabinet equipped with a desk.						

aesthetics, without neglecting the main function of a filing cabinet itself. Some variants of filing cabinet that can be designed using standard modules. There are 16 product variants are obtained but only two of them are shown in this paper (Figure 1 and 2).

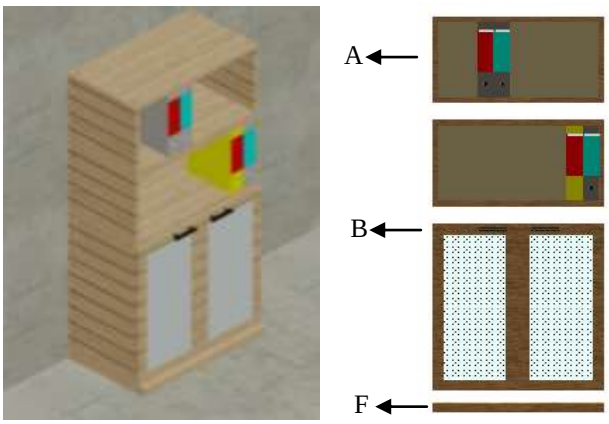

Figure 1. Illustration of Variant 1

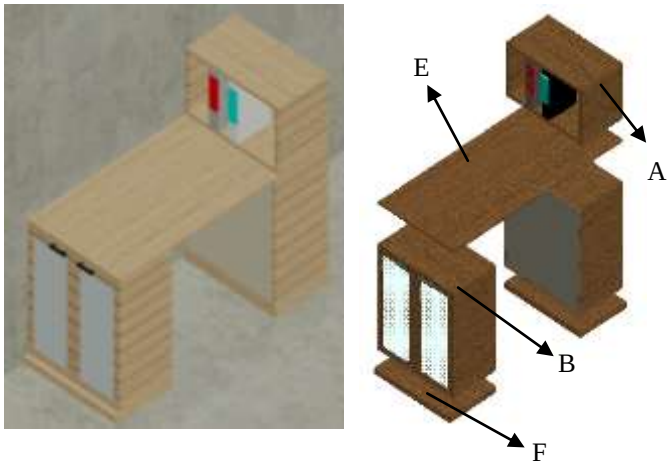

Figure 2. Illustration of Variant 12

4 DISCUSSIONS

4.1 Standard Modules and Supporting Components

The nine standard modules are divided into the basic module functions, auxiliary module and non-module. Basic modules include module A, B, C and D. Auxiliary module is an additional module that supports the function of the main module. Additional modules include module E, F, I. Free module is designed specifically to meet a particular function. Free module includes module G and H. The combination of these 9 modules can generate 16 product variants and accomplish the main functions of a filing cabinet according to the customer needs (Table 4). In addition, the combination of modules also generates other functions and variants like bookcase, TV stand and reading bench (Table 5).

Table 4. Number of Modules Used to Create Variants

No	Variant	Type of Module									Type of module used	Total Modules
		A	B	C	D	E	F	G	H	I		
1	Variant 1	2	1	-	-	-	1	-	-	-	3	4
2	Variant 2	3	1	-	-	-	1	-	-	-	3	5
3	Variant 3	1	2	-	-	-	1	-	-	-	3	4
4	Variant 4	2	4	-	-	-	2	-	-	-	3	8
5	Variant 5	2	1	-	1	-	1	1	-	-	5	6
6	Varian 6	6	2	-	-	-	2	-	-	1	4	11
7	Variant 7	3	1	4	-	-	1	1	-	1	6	17
8	Variant 8	3	1	4	1	-	1	2	-	-	6	12
9	Variant 9	5	-	-	-	-	2	-	-	-	2	7
10	Variant 10	3	-	-	3	-	1	3	6	-	5	21
11	Variant 11	-	1	-	-	-	1	-	-	-	2	2
12	Variant 12	1	2	-	-	1	1	-	-	-	4	5
13	Variant 13	2	2	-	-	1	1	-	-	-	4	6
14	Variant 14	7	-	-	-	-	-	-	-	-	1	7
15	Variant 15	2	-	-	-	1	-	-	-	-	2	3
16	Variant 16	6	-	-	-	-	-	-	-	-	1	6
Total		**48**	**18**	**8**	**5**	**3**	**16**	**7**	**6**	**2**		

Table 5. Functions Fulfilled by Each Variant

No	Variant	Functions in Filing Cabinet						Other Functions		
		Cabinet Function	Shelf function	Drawer Function	Hanging Folder	Table Function	Bookcase	Reading bench	TV stand
1	Variant 1	✓	✓	-	-	-	-	-	-
2	Variant 2	✓	✓	-	-	-	-	-	-
3	Variant 3	✓	✓	-	-	-	-	-	-
4	Variant 4	✓	✓	-	-	-	-	-	-
5	Variant 5	✓	✓	-	✓	-	-	-	-
6	Varian 6	✓	✓	-	-	-	-	-	-
7	Variant 7	✓	✓	✓	-	-	-	-	-
8	Variant 8	✓	✓	✓	✓	-	-	-	-
9	Variant 9	-	✓	-	-	-	-	-	-
10	Variant 10	-	✓	✓	-	-	✓	-	-
11	Variant 11	✓	-	-	-	-	-	-	-
12	Variant 12	✓	✓	-	-	✓	-	-	-
13	Variant 13	✓	✓	-	-	✓	-	-	-
14	Variant 14	-	✓	-	-	-	-	-	-
15	Variant 15	-	✓	-	-	-	-	-	✓
16	Variant 16	-	✓	-	-	-	-	✓	-

4.2 Anthropometric Consideration

Design of a product has to meet several aspects of the design. In order to make the product safe and convenient to use, it is necessary to pay attention to the ergonomic aspects. Variants are designed according to the size of human body and international standards of furniture design. Anthropometric data

considered in the design are sitting elbow height and popliteal height. These two anthropometric variables are used to determine the height of module B. Module B can serve as a table function in variant 12 and 13. Therefore the module height should be adjusted to the user posture. The dimension of sitting elbow height and popliteal height are obtained from Database of Adult Anthropometric Data, available in Ergonomics Laboratory, Andalas University, Indonesia. Allowance for shoes and clothes are added and the final dimension for Module B is 720 mm. When a table function is needed, Module F is added to the Module B results in the height of table surface 770 mm.

The Impact of Modular Products on the Furniture Industry

Modular concept in product design is believed as the short-cut for SMEs in the furniture industry in Indonesia to increase their competitiveness in global market. Simplification of product structure can lead to substantial savings in the assembly cost of parts. The ability of SMEs to provide a large variety of product design and deliver end products to the hands of customers in a short time also be a competitive advantage. Therefore, introducing this concept to SMEs in the furniture industry and follow-up in the form of technical and management training should be taken in the immediate future.

5 CONCLUSIONS

The research found 27 attributes of customer needs on filing cabinet design. These customer voices can be response satisfactorily if the SMEs in furniture industry in Indonesia are introduced with modular concept in designing products. Modules are the basic notion in modularity to produce a large variety of products. There are 9 standard modules developed consist of 4 basic modules (A, B, C and D), 3 auxiliary modules (E, F and I) and 2 free modules (G and H). From the 9 modules has been developed 16 product variants. It is believed when the modular design is introduced to SMEs in furniture industry in Indonesia, they will be ready for future challenges in the competitive furniture market.

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