

International
Service
Innovation
Design
Conference

ISIDC
2018

PROCEEDING

AGENDA

- 01 Regional design to think about strategic service innovation
- 02 Regional service design convergence research

10.17. ^{Wed} ~ 10.19. ^{Fri}

Venue National Intangible Heritage Center

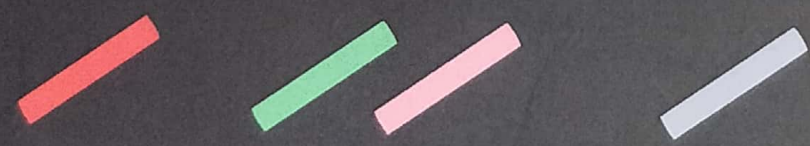
Hosted by
전라북도

Organized by
JBTP 전북테크노파크
JEONBUK TECHNOPARK

JBDC 전북디자인센터

전북대학교
CHONBUK NATIONAL
UNIVERSITY

Department of Industrial Design
Institute for Cultural Convergence Archives



ISIDC International
2018 Service
Innovation
Design
Conference

International Service Innovation Design Conference 2018

Proceeding

Theme history of ISIDC :

- Cultural Innovation and Life Design (2016)
- New Culture and Value (2014)
- Hotel Service Innovation & Design (2009, 2010)

ISIDC 2018 Theme : Intelligent design thinking for strategic service innovation

Date : October 17 - October 19, 2018

Place : International Trade Center (ITC) 1000, Dongguk-ro, Dongguk University, Seoul, Korea

Hosted by : Seoul National University

Organized by : School of Industrial Design, Seoul National University
Dept. of Industrial Design / Institute for Culture Convergence, SNU

ISIDC 2018

International
Service
Innovation
Design
Conference

ISIDC 2018 Organizing Committee

Co-organizing : The Research Center for Service Innovation Design Conference

Program Organizing Committee : Hong Wook Park (SNU), Seung-Ho Kim (SNU), and Young-Ho Kim (SNU)

Chief Editor : Cho Kwang-soo (SNU)

Creative Team : Choi Myoung-hui / Kim Gye-won / Kim Hye-nyung / Kim Hyun-woo

Editor : Kim Yong-geun / Kim Yong-dae

ISIDC 2018 / International Service Innovation Design Conference 2018

ISIDC is Asia's first conference in service innovation design. The biennial conference series was initiated by a group of multidisciplinary scholars from Japan, Korea, and Taiwan, led by Professor Kazuo Sugiyama. The group formed a planning council in 2006 to gather leading experts, professionals, and stakeholders in service innovation design.

The council hosted its first conference in Dongseo University, Korea in 2008. Since then, ISIDC has been organized in different cities in Asia:

- Busan, Korea (2008) - hosted by: Dongseo University
- Hakodate, Japan (2010) - hosted by: Future University of Hakodate
- Tainan, Taiwan (2012) - hosted by: National Cheng Kung University
- Kuching, Malaysia (2014) - hosted by: Universiti Malaysia Sarawak
- Chiangmai, Thailand (2016) - hosted by National Cheng Kung University

The ISIDC conference series has attracted and successfully gathered regional and international scholars and professionals alike, and served as the platform of knowledge exchange and networking for service innovation design.

Theme history of ISIDC :

- Cultural Innovation and Life Design (2016)
- New Culture and Value (2014)
- Holistic Service Innovation & Co-Creation Experience (2012)
- Service - Innovation - Design (2008, 2010)

ISIDC 2018 Theme : Indigenous design thinking for strategic service innovation

Date : October 17 - October 19, 2018

Place : National Intangible Heritage Center (95, Seohak-ro (896-1, Dongseohak-dong), Wansan-gu, Jeonju-si, Jeonbuk, Republic of Korea)

Hosted by : Jeollabuk-do

Organized by : Jeonbuk Technopark, Chonbuk National University
(Dept. of Industrial Design / Institute for Culture Convergence Archives)

ISIDC 2018 Organizing Committee

Co-organizing Chair Persons : Yoo, Jae-Gab (JBDC) / Chung, Sung-Whan (CBNU)

Program Organizing Committee : Hong, Jung-Pyo (CBNU) / Hong, Chan-Seok (CBNU) / Cho, Dong-Min (CBNU)

Chief Editor : Cho, Kwang-Soo (CBNU)

Creative Team : Choi, Myoung-Hun / Han, Chae-Won / Kim, Hwi-Nyeong / Kim, Hyun-Jung
/ Kim, Yong-Gu / Kwon, Jong-Dae

PAPER REVIEWERS

- Ahmad Azaini bin Abdul Manaf (Professor, Universiti Malaysia Sarawak, Malaysia)
- Cho, Dong-Min (Professor, Chonbuk National University, Korea)
- Cho, Jea-Sang (Chonbuk National University, Korea)
- Cho, Kwang-Soo (Professor, Chonbuk National University, Korea)
- Ding-Bang Luh (Professor, School of Art and Design, Guangdong University of Technology, China)
- Hong, Jung-Pyo (Professor, Chonbuk National University, Korea)
- Kenta Ono (Professor, Chiba University, Japan)
- Khairul Aidil Azlin Abd Rahman (Professor, Universiti Putra Malaysia)
- Lee, Jin-Ryeol (Professor, Chosun University, Korea)
- Lee, Sung-Pil (Professor, Dongseo University, Korea)
- Nazlina Shaari (Professor, Universiti Putra Malaysia)
- Ottavia Huang (National Cheng Kung University, Taiwan)
- Lee, Yong-Ki (Professor, Chosun University, Korea)
- Zhang Lin (Professor, School of Art and Design, Shandong University of Science and Technology, China)

CONFERENCE TIMETABLE

Time	Wednesday 17
8:00~9:20	Registration
9:20~10:20	Session 1
10:20~10:30	Break Time
10:30~11:50	Session 2
12:00~13:50	Lunch
14:00~14:20	Guest Introduction, Photo Time
14:20~15:00	Keynote 1 : Kazuo Sugiyama Service and Design
15:00~15:40	Keynote 2 : Luh, Ding-Bang Strategic Thinking for Service Innovation Design
15:40~16:00	Break Time
16:00~17:40	Session 3
Time	Thursday 18
8:00~9:20	Registration
9:20~10:20	Session 4
10:20~10:30	Break Time
10:30~11:30	Session 5
12:00~13:20	Lunch
13:20~14:40	Session 6
14:40~14:50	Break Time
14:50~16:10	Session 7

Wednesday 17

Regional Development & Service Design 1 (A Room-3Floor)				
Chair's Name : Ahmad Azaini bin Abdul Manaf				
Time				page
9:20 ~9:40	Putra, Kumara Sadana Suteja, Bertha Pudjibudojo, Jatje K.	Developt Eco-Tourism Village Silver Jewelry Based, Through Product & System Service Design	Indonesia	1-10
9:40 ~10:00	Liu, Si-Yang Pan, Young-Hwan Luo, Tao	The Methodology of Visual Interactive System Design: Based on Enhancing Tour Experience in a Coastal City	Korea	11-20
10:00 ~10:20	Seo, Ae-eun Hong, Jung-pyo Ha, Eun-young Chae, Hye-sung	Study on the Perspective Change of Participant and the Effect of Field-Based Participation Design : Focused on Agricultural Direct Sales Facilities	Korea	21-30
10:30 ~10:50	Cho, Kwang-Soo Seo, Ae-Eun Chae, Hye-Sung	Analysis of Design Status and Improvement plan of Agricultural Product Farm Stand	Korea	31-42
10:50 ~11:10	Satoshi UMEDA	The Reconstruction Activities by Private Enterprises and Influence on "Reconstruction Sense."	Japan	43-52
11:10 ~11:30	Ahmad Zuhairi Abdul Majid Hafeezur Rahman Mohd Yassin A.S. Hardy Shafii	A Review on Practicing Service Design Process for Product Design Students at Universiti Sains Malaysia	Malaysia	53-60
11:30 ~11:50	LI, JING Cho, Dong-Min	A Study on the User's Effect of MOBA Game Character Skin Experience - Focused on League of Legends	Korea	61-68
Regional Development & Service Design 2 (A Room-3Floor)				
Chair's Name : Nazlina Shaari				
16:00 ~16:20	Azaini Manaf Siti Shukhaila Shaharuddin Louis Laja Lee, Sung Pil	Attitudinal Factors in Hindering Community and Service Design Development in Suburban Village, Sarawak.	Malaysia	69-76
16:20 ~16:40	Khairul Aidil Azlin Abd Rahman Mohd Hafiz Talib	Design and Development of Compact Hydroponic Rack System for Small Urban Living.	Malaysia	77-84
16:40 ~17:00	Kim, Yong Se Yoo, Sukyeong Nukaew, Wanichaya Zhou, Kun	Structured Service Design Method for Business Innovation and Digital Transformation of Service Design	Korea	85-90
17:00 ~17:20	Keisuke Ota Tomotaka Tanaka	Study of the management of expressway construction from the aesthetic aspect	Japan	91-104
17:20 ~17:40	Ryoko MATSUZAKI Itaru TAKEDA	Transformation of the memorial service including the cemetery laws and the grave in Japan and Korea	Japan	105-112
Methodology & Service Design 1 (B Room-2Floor)				
Chair's Name : Yong-Ki Lee				
9:20 ~9:40	Daisuke Iseki Shota Amabe Kunpei Yamano Takeo Kato Yoshiyuki Matsuoka	'Proposition of M method system'	Japan	113-120
9:40 ~10:00	Kazutoshi Sakaguchi Miyuki Kawataka Seiko Shirasaka	A proposal of Human Resource Development Model for Service Design Creation	Japan	121-130
10:00 ~10:20	Chang, Shu-Hua	Applying service design to customer experiences in Taiwan's Creative Life Industry : A case study of the Jioufen Teahouse	Taiwan	131-140
10:30 ~10:50	Yu, Qinghua Yukari, Nagai Pei, Zhizhou	Utilizing Service Design Strategy to Enhance the Customer Experience: Based on the Survey of Helsinki Ceramic Product Selling	Japan	141-150
10:50 ~11:10	Toshiki Yamaoka	Extended mental model with logical and emotional aspects as the basement of service design	Japan	151-156
11:10 ~11:30	Chen, Yu-Chia Luh, Ding-Bang	Development of a Caring Strategy for Facilitating Preschool Children to Sleep	Taiwan	157-164
11:30 ~11:50	Nazlina, Shaari Khairul Aidil Azlin, A Rahman Nor Atiah, Ismail	Indigenous Biocultural Knowledge as a Key Indicator in Sustainable Development of Textile Natural Dyeing Process	Malaysia	165-172

Time	Methodology & Service Design 2 (B Room-2Floor) Chair's Name : Lee, Sung Pil			page
16:00 ~16:20	Wu, Chi-Hua Luh, Ding-Bang	Analysis on Operator's Cognitive Structures in Different Idea Generation Activities	China	173- 180
16:20 ~16:40	Yu, Oishi Miyuh, Miyazaki Shigeru, Furuya Hitoshi, Sawada	Architectural Index of the Platforms on Services	Japan	181- 190
16:40 ~17:00	Lee, Yong-Ki	Service Design 3.0 – A Framework for Service Design Research, Education, and Practice	Korea	191- 200
17:00 ~17:20	Alvarez, Jaime Nishimura, Hidekazu	Revisiting the concept of 'function': A conceptual expansion for product, service and system innovation	Japan	201- 208
Fashion & Education & Service Design (C Room-2Floor) Chair's Name : Khairul Aidil Azlin Abd Rahman				
9:20 ~9:40	Raja Iskandar Shazrim Shah Nazlina Shaari	'Formative Conceptual Framework On Models Of Teaching Strategies In Fashion Design Course'	Malaysia	219- 228
9:40 ~10:00	Nani Hartina Ahmad Nazlina Shaari Noor Azizi Mohd Ali Muhammad Pauzi Abd Latif	A Study on Identifying Patterns and Characteristic of Checked Punca Potong Cloth (CPPC) Weaving: A Systematic Review	Malaysia	229- 234
10:00 ~10:20	Li wei Ruan Xiaoyin	On Simulation, Simulacrum, and Emotional Expression — Spy in the Wild from the Jean Baudrillard's Point of View	China	235- 238
10:30 ~10:50	Chen, Chin-Chuan Chen, Tien-Li	Design Thinking Teaching Equipment Usability Assessment—Using National Taiwan University as an Example	Taiwan	239- 246
10:50 ~11:10	Yoo, So-Wol Yun, Bong-Shik	Study on UI / UX System of AR based On/Off-line Interworking Education Platform	Korea	247- 254
11:10 ~11:30	Yusof, Ummu Hani Wan Mohamad, Wan Syukriah	'Selayang Community College Students' Acceptance towards the use of Padlet in Games Art Course'	Malaysia	255- 266
11:30 ~11:50	Wang, Minjie Lee, Ji-Hyun	Stakeholder Analysis for See Now Buy Now Model and Its Inspiration to Chinese Fashion Brands	Korea	267- 274

Thursday 18

Products & Service Design 1 (A Room-3Floor)				
Time	Chair's Name : Lee, Jinryeol			page
9:20 ~9:40	Makiko MIYAIRI Kazutoshi SAKAGUCHI	The Consideration and Practice of UX Design Approach for Promotion of Using Service Robots	Japan	275- 282
9:40 ~10:00	Liulin Fangxing Pan Young-Hwan	Research on the Interaction Design Evaluation System for Intelligent Partner Robot Designed for the Elderly	China	283- 290
10:00 ~10:20	Ui Yoshimi Harada Tomoko Nagao Toru	'Development of an excretion detection sheet with a learning function'	Japan	291- 300
10:30 ~10:50	Kang, Chang -Youn Lim, Hyo-Seon Lee, sil-gi	Power strip Design Development Case Study Applying Cognitive Affordance with a :Focus on Feedback Information Using Light	Korea	301- 316
10:50 ~11:10	Siti Zubaidah Ibrahim A. Zuhairi A. Majid	Intercity Express Bus Seatbelt Design Awareness in Peninsular Malaysia	Malaysia	317- 324
11:10 ~11:30	Wyna Herdiana	Modular And Knockdown Furniture Design Utilizing Mortise Tenon Joint For Expandable Housing	Indonesia	325- 332
Products & Service Design 2 (A Room-3Floor)				
Chair's Name : Ottavia Huang				
13:20 ~13:40	Feng, Sisi Lee, Ji-Hyun	Prototype Design of Jinan Mobile Tourism Information Service Platform	Korea	333- 340
13:40 ~14:00	Huang, Chieh-Ju Wang, Sheng-Ming Cheng, Kai-Wan	Space Syntax Analysis for Smart City Service Design in Fengchia Night Market	Taiwan	341- 350
14:00 ~14:20	Park, Sojin Lim, Jonghun Lee, Da-eun Yeo, Jeongjin Park, Hyemin Jang, Jae Kyung Yang, Yoonseok	An Energy Self-Sustainable Wireless Sensor System Based on a Microbial Fuel Cell (MFC) and Energy Harvester (EH)	Korea	351- 356
14:20 ~14:40	Lee, Hee-Young Cho, Kwang-Soo Hong, Jeong-Pyo	'A study on the black box design using collective intelligence analysis'	Korea	357- 370
Healthcare & Service Design (B Room-2Floor)				
Chair's Name : Kenta Ono				
9:20 ~9:40	Oaira Yoshimasa Okazaki Akira Isotani Shuji Hattori Junko	Development of a tool to support "Patient-Centered Medicine"	Japan	371- 376
9:40 ~10:00	Nurhikma Binti Mat Yusof YM Dr Raja Azmeer Bin YM Raja Effendi Dr Saiful Hasley Bin Ramli Dr Mohamad Shahrizal Bin Dollah Dr Mohd Faiz Bin Yahaya Prof Madya Dr Jusang Bolong Dr Ahmad Zamir Bin Che Daud	Creation Attributes of Assistive Technology in Rehabilitation Setting : A Scoping Review	Malaysia	377- 384
10:00 ~10:20	Yi DING Jian DU Yasushi TOGO	Demand Coverage of Smartphone-based Self - Care Management Service in China & Japan	Japan	385- 394
10:30 ~10:50	Jian DU Yi DING	Development of an Index for Evaluating Young People's Self - Care Management Demands	Japan	395- 404
10:50 ~11:10	Liu Jing He Kui	The investigation of the artists' career development service in the UK - Take London and beyond for example	United Kingdom	405- 414
11:10 ~11:30	Xiong Zhong Hua Hong Chan Seok	Research on illustration design based on children's psychological cognition	Korea	415- 424

Time	Management & Service Design (A Room-3Floor) Chair's Name : Ottavia Huang			page
14:50 ~15:10	Chen, Chi-Hsiung Lin Shih-Ching Hsieh, Yu-Ling	A Preliminary Study on the Brokerage Service Model of Taiwanese Designers	Taiwan	425- 432
15:10 ~15:30	Osawa, Takao	'Management Case Study for Reforming a Corporate Design Organization' Case study of Hitachi, Ltd. as a reformation of a corporate design organization in a conglomerate company	Japan	433- 446
15:30 ~15:50	Chi-Hsiung Chen Fang-Cheng Hsu	A Study on a Matching-Service Platform of Design Worker with Real-Name Registration and Hourly Wage	Taiwan	447- 454
15:50 ~16:10	Ottavia, Huang Luh, Ding-Bang Shiann-Far Kung	Bridging the Conversation between Chickens and Ducks: The Role of Bridgers in Cross-cultural Design-thinking Workshop	Taiwan	455- 456
Visual, Media & Service Design 1 (B Room-2Floor) Chair's Name : Cho, Dong Min				
13:20 ~13:40	Sun Hongyang Hong Chan-Seok	A Study on the Value of the Shapes and Colors of Traditional Chinese Graphics on Logo Design	Korea	457- 466
13:40 ~14:00	Hwee Ling, SIEK	Communication Failure of Domestic Graphic Designers	Malaysia	467- 476
14:00 ~14:20	Lee, Keun-Ha Chung, Sung-Hwan	Effects of the Food Packaging Safety Design on Brand Attitudes	Korea	477- 488
14:20 ~14:40	Jinryeol Lee	Suggestion of Value Chain Model for Design Firms	Korea	209- 218
Visual, Media & Service Design 2 (B Room-2Floor) Chair's Name : Cho, Dong Min				
14:50 ~15:10	On, Yu-Yeon Cho, Dong-Min	A Study on the Level of Self Character Identification and Game Flow according to Game User Type	Korea	489- 498
15:10 ~15:30	Li, Zhu Xiangyang Xin	More Than the Tool: the Role of Metaphor in Design	China	499- 502
15:30 ~15:50	Yang Ji-won Lim Hyo-seon Lee Jin-ryeol	'Development of Brand Personality Map(B.P.M)for Brand Differentiation'	Korea	503- 510
15:50 ~16:10	Chi-Hsiung Chen Ting-Jie Wang	A Study on Service Innovation Strategy for the Classical art teaching-Taking "Calligraphy teaching"as an Example	Taiwan	511- 520

Wednesday 17 ~ Thursday 18
Poster

Name	Title	page
AN Wa XIN Xiangyang	Change of lifestyle through design: Behavior and experience perspective.	521-530
Cho, Kwang Soo Cho, Dong Min Cho, Un Dae	Proposal on Education Methodology for Service Design Education	531-536
Park, Mee -Jeong Jeon, Jeong -Bae Jang, Do-Dam Kim, Eun-ja	Assessing Effects of Rural Tourism Villages Policy Design of South Korea based on Big-data	537-546
Kondo, Akira Kondo, Naoko	'Consideration of Prior Service Evaluation Website Design' Information Design of Service Experience	547-552
López Zendejas, Sofia Watanabe, Shinji Álvarez Jaime	Research about innovation opportunities in the medical device industry through Japan-Mexico Bilateral Collaboration	553-562
Manhai, Li Xiangyang, Xin	An Approach to the Wicked Problems in Design: Case Studies on Data-driven Companies	563-570
Hong, Jung-Pyo	The Design Possibility of New Area	571-574
Han, Chaewon Hong, Jung-Pyo	The Sixth Industry Elements towards Farm Design Development	575-580

Modular And Knockdown Furniture Design Utilizing Mortise Tenon Joint For Expandable Housing

Wyna Herdiana (wynaherdiana@yahoo.co.id)

Faculty of Creative Industry, University of Surabaya

Abstract: Population density caused the limited residential area. Narrow land area results in small houses design for the residents, especially the small young family that needs a proper house with minimum budget. This framed problem justifies the need for alternative housing in which one of them is Expandable Housing. Expandable housing is a housing concept that a house can be developed step-by-step in accordance with the owner's current needs and budget. The possible development could be the building expansion in both horizontal and vertical construction, with the land area to take into consideration. Together with that, the furniture selection has to be in correspondence to the problem. There is a need of ease for both installation and knockdown, adding-on, with acceptable price and high mobility of the furniture. Furthermore, this research aims to invent furniture that could solve the problem stated above. The research resulted in a modular furniture system with a capability to adapt to any size of space, big or small. Rattan material was chosen to provide lightness due to the mobility feature and low-cost strong point. Moreover, Indonesia has been known as the biggest rattan producer but in spite of that, not many furniture designs utilized rattan. Where as ecologically, utilizing rattan could help improve the quality of forestry life cycle. This research utilized qualitative, quantitative and experimental method. The experiment was executed to test both the material and the mortise tenon joint for the knockdown system. The final results are the rattan furniture designs with modular tear down system such as living room table, chairs, and shelf. The main concept in this design is to make aesthetic furniture, efficient and compact (can adjust in any shape and size of space).

Key words: Rattan Furniture, Mortise Tenon.

1. Introduction

1.1. Research Background and Objective

Population density has resulted in the limitation of dwellings, the narrow land makes the urban community nowadays only able to have a small house especially for young families who wanted a family dream house with a minimum cost but decent for staying. This underlies the alternative resident for the city community one of which is growing home. The growing home can be defined as a house that can be build gradually according to the needs and cost of the owner, it can be the increment of building masses to the side whenever the owned land is large enough, or a building floor raise, especially for buildings on narrow land. This type house become an interest among the middle level economy community because the construction can be done gradually. Similary, in terms of furniture selection, growing home owners will choose and buy furniture that provides ease in the process of overhaul, additions, cheap prices and mobility if their home plus building area is due to the size of the old furniture which is not fit in the new room¹⁾

This study uses rattan material because this type of material is inexpensive because of its massive amount in Indonesia, enviromentally friendly that has the characteristics mainly flexible so easily to curve and difficult to be broken. Rattan also has a light weight so that rattan products easily moved, this is the underlying purpose of this research which is designing furniture that is lightweight, easy to concise and easy to move. The problem faced is the easily flexible nature of the rattan material, making structures and construction for rattan making furniture using additional connctors or additional support and permanent locks for the legs in order

1) Dewangga, Stevanus. (2017). Design of Modular Furniture with Rattan Material for Home, University of Surabaya. Bachelor Degree Final Project.

to strengthen the furniture when seated. The structure used in the majority of rattan furniture that sold in the market today used cross structure because it is the most powerful and tested structure so that the furniture is not shaken when used, with the cross structure then the stacking process is also not optimal space utilization, storage and concision process. In today's rattan furniture industry, the majority uses bonding that increase the processing time and there is recent innovation in the rattan field especially the connectors²⁾. This research will focus on he modular design and knockdown furniture with connectors experiments, structures, the use of material combinations and shapes that produce several variations of form and function of the designed modules.

2. Theoretical Studies

2.1. Rattan

Rattan is a natural material that is flexible, has an attractive shape and lightweight. In addition, rattan is a natural fiber that is widely used as industrial raw materials. In general, rattan is a type of sustainable material that has the main flexible characteristics and so easily to be curved. Rattan is difficult to break and has strenght four times stronger tha wood. Each type of rattan has different strenghts and flexibility. In Indonesia there are eight genera of rattan consisting of approximately 300 to 350 species. Almost 80 % of the world's need for rattan is supplied by Indonesia, but it also earns the recognition as the best rattan producer that dominates the world rattan use³⁾.

Rattan is a raw material that has a very high economic value in Indonesia. Having an environmentally friendly and sustainable nature, rattan plants grow only in the tropics. With a harvest process that does not damage the environment, because basically rattan is parasitic to other plants, so it must be cut down. And the processing that does not require sophisticated technology, rattan is a suitable raw material for small-medium industries⁴⁾.

2.1. Tenon Cutter System

This knockdown system is made based on overhaul system that can be done easily. Furniture that uses this system is usually in form of parts that must be assembled in accordance with the included instructions. As for the binder used is a nut, bolt, or screw. The connector used is a tenon cutter connection system. The connection can be made vertically or horizontally. Tenon cutter system has a concept like a socket where there are parts consist of house and plugs. This system has advantages of the same hole diameter and connector for all rattan rods, which is 18 mm, easily removable and reassembled. Rattan used is reddish rattan rods such as tohiti type so it is difficult to curve⁵⁾.

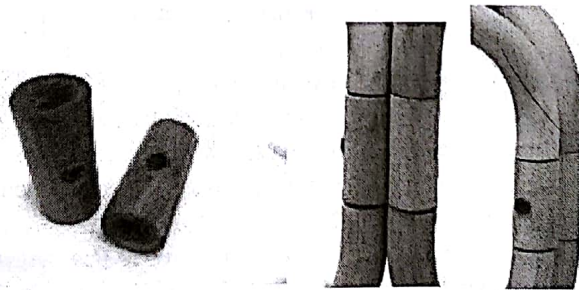


Figure 1. Rattan dowel connection

2) Biantoro, Ihsan and Zulaikha, Ellya. (2017). Experiments of the Rattan Connetion System for the Development of rattan Seating Facility, Vol.16, No.1. Retrieved from <http://iptek.its.ac.id/index.php/idea/article/view/2833>.

3) Hartanti, Grace. (2012). The Development of Rattan Materials and its Use in The World of Interior Design. HUMANIORA, Vol. 3, No. 2. Retrieved from <http://journal.binus.ac.id/index.php/Humaniora/article/view/3354>.

4) Adiguna, Ricky and Sriwarno, Andar. (2015). Application of Spring Rattan System in Furnished-Release Furniture Design, Journal of Bachelor Degree of Art and Design, Vol 4, No.1. Retrieved from <http://jurnal-s1.fsr.itb.ac.id/index.php/product/article/view/577/495>.

5) Hanjaya, Bernard. (2017). Design Booth for Exhibition with Rattan Material, University of Surabaya, Bachelor Degree Final Project.

Based on the exploration of rattan structure there is another innovation of the rattan joint which consists of the two main modules with simple form resembling the letters 'U' and 'X'. Rattan used is tohiti rattan with a diameter of 28–30 mm. the connection techniques is done on the modules part made by embedding cylindrical dowel wood.

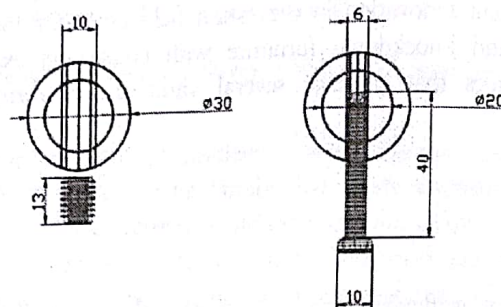


Figure 2. Knock-down rattan fittings

The connector is made of mahogany wood material that has a cylindrical hole at both ends as a place to plug the rattan module. Cylindrical connectors are combined with each other by using of a special knockdown nut-bolt⁶⁾.

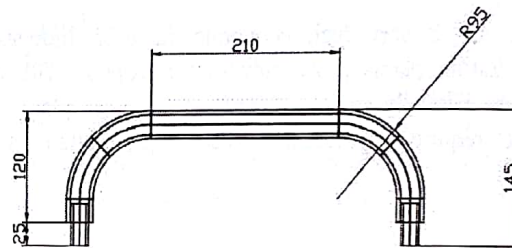


Figure 3. Dowel Rattan Connection Structure

2.1. Empirical Research

The main concept in this design is to make aesthetic furniture, efficient and compact (can adjust in any shape and size of space). To achieve these objectives, the research method, namely: experiment on structure, material experiment, observation and interview.

Initial experimental process is to study the characteristics of rattan material to determine the appropriate type and thickness of rattan, because the designed product must be efficient and can be moved easily, the exploration of the structure and the form of the dynamic connection needs to be done several experiments to achieve the results of connectors that can be dismantled fast and easily. For the used by comparing several connection systems that have been previously investigated by the previous researcher with experiments using dowel power on the tenon cutter system, the pilot stage using the connection and in accordance with the knockdown system applied to the furniture.

The interconnection system uses a tenon cutter system where using this system makes it possible to make connections both vertically and horizontally. How to install it is very easy to use and applied. This system has advantages such as the same hole diameter and joint for all rattan rods, which is 18 mm, easily removable, fitted and strong enough for the frame structure.

6) Maharani, Niken and Handojo, Oemar. (2013). Exploration of structure and Combination of Rattan Furniture Products, Journal of Bachelor Degree of Art and Design, Vol.1, No.1. Retrieved from <http://jurnal-s1.fsr.d.itb.ac.id/index.php/product/article/view/81/72>.

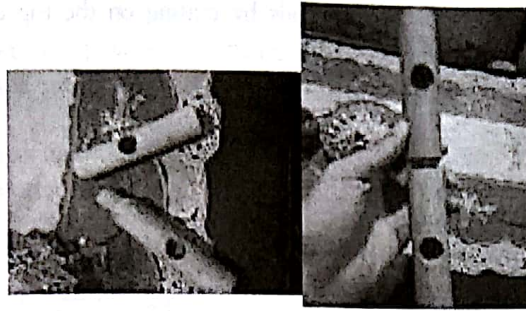


Figure 4. Tenon Cutter System in Rattan

4. Conclusion

The form used refers to the style of modern mid-century style where the style of this design has a special geometry shape, distinct aesthetic, emphasizing the use of natural materials, contemporary patterns, functional and simplified form. Mid-century design style itself is more emphasize on original natural materials to be seen more striking in the room.

Design Concept:

- Usability, a product made using rattan material that is designed using an easily use tenon cutter system during overhaul process. In addition, the use of light weight and flexible rattan makes furniture products easy to move and carry.
- Environmentally friendly, easy to use furniture design using the main material which is rattan natural material that has a short and eco-friendly lifecycle.

Product 1:

From the main modules that arranged will have 3 different functions: as a table, chair and shelf.



Figure 5. Main Module



Figure 6. Main Module Being a Table

The main module can be combined with glass to be used as a table by placing the glass on the top of the main module that has been arranged in a row.



Figure 7. Main Module Being a Chair

The main module can be combined with cushion pads by putting on the top of the main module arranged in a row.



Figure 8. Main Module Being a Rack

The main module is arranged up and locked thus it is not shift or detach. Rack arrangements can be added up or sideways.

Product 2:

Hanging rack, has 2 function which are the top is used as a shelf to hang clothes by using hanger, the bottom of the shelf can be used to put objects or clothing folded up.



Figure 9. Hanging Rack and Stacking Shelf with Knockdown System

From modules that have been created can be combined into larger furniture and can load more goods or contents.

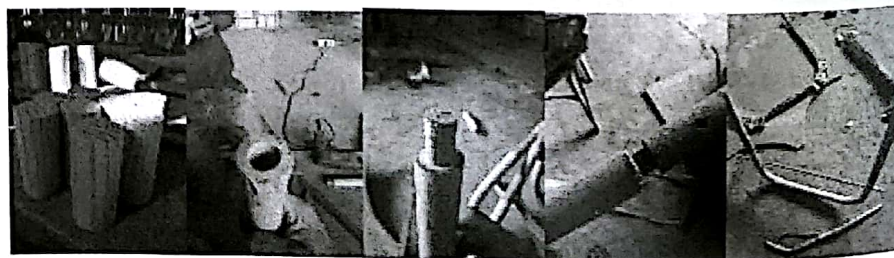


Figure 10. Experiment of Tenon Cutter System

Tenon Cutter System:

1. Measurement and dowel from woods to make the connection part of each rattan segment. Selection of materials using matoa wood and measurement include length and diameter of wood and rattan to be used.
2. Milling process for making holes and leveling of wood diameter of connector by using lathe to produce equivalent diameter. The hole in the middle of the joint is planted for interconnectors lasing.
3. Drilling the surface diameter for the connector's peg between the segments. After the hole has been made, then the hole is inserted dowel which function is as peg between the connection.
4. To construct the rattan segment lathed with a wooden joint that has been soaked in a hydrogen peroxide (H_2O_2) become the leveled form.
5. The bolt used is moritop bolts with 35 mm rotational depth.

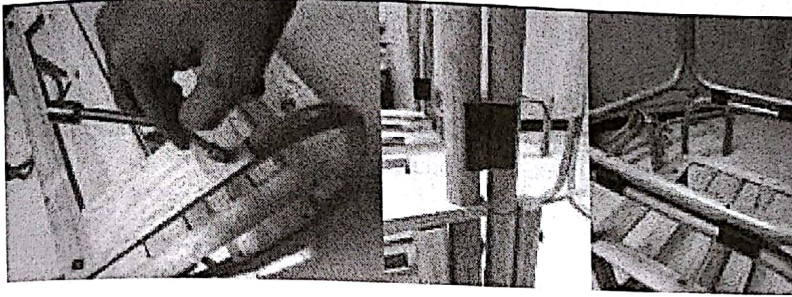


Figure 11. Knockdown System

Knockdown System:

This shelf product can be dismantled with knockdown system. Overhauling system using dowel system by rotating and then loosened so that the inter parts can be released. The locking system uses two kinds of bolts, namely a steel bold with a diameter of 6 x 35 mm that goes into the dinaset and drill bolts 6 x 8 mm for frame structure reinforcement so as not to waver when assembled. The hole in the middle of the joint is planted for interconnecting lasing.

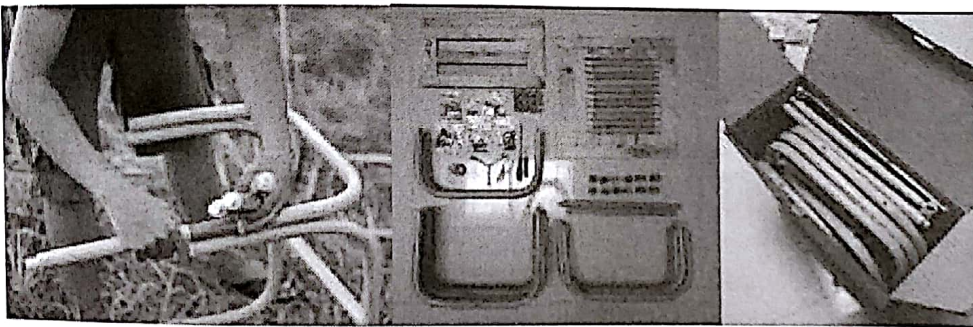


Figure 12. Packaging System

Here are all parts of the product that has been dismantled and packaged. The discharging requires 2 tools namely a screwdriver plus and wrench 12 to open screws and bolts.

5. Research Limitations and Future Studies

From this research provide some alternative development that can be done for further research. These developments include innovations in production supports tools, cheaper tools but the same functions and advantages, stronger rattan connection structure systems and shorter knockdown systems. This research can still be developed at a higher stage for production in the rattan industry as a mass-produce product.

REFERENCES

1. Adiguna, Ricky and Sriwarno, Andar. (2015). Application of Spring Rattan System in Furnished-Release Furniture Design, Journal of Bachelor Degree of Art and Design, Vol 4, No.1. Retrieved from <http://jurnal-s1.fsrđ.itb.ac.id/index.php/product/article/view/577/495>
2. Biantoro, Ihsan and Zulaikha, Ellya. (2017). Experiments of the Rattan Connexion System for the Development of rattan Seating Facility, Vol.16, No.1. Retrieved from <http://iptek.its.ac.id/index.php/idea/article/view/2833>.
3. Dewangga, Stevanus. (2017). Design of Modular Furniture with Rattan Material for Home, University of Surabaya, Bachelor Degree Final Project.
4. Hartanti, Grace. (2012). The Development of Rattan Materials and its Use in The World of Interior Design. HUMANIORA, Vol. 3, No. 2. Retrieved from <http://journal.binus.ac.id/index.php/Humaniora/article/view/3354>.
5. Hanjaya, Bernard. (2017). Design Booth for Exhibition with Rattan Material, University of Surabaya, Bachelor Degree Final Project.
6. Maharani, Niken and Handojo, Oemar. (2013). Exploration of structure and Combination of Rattan Furniture Products, Journal of Bachelor Degree of Art and Design, Vol.1, No.1. Retrieved from <http://jurnal-s1.fsrđ.itb.ac.id/index.php/product/article/view/81/72>.