CORE
Metadata, citation and similar papers at core.ac.uk
Provided by University of Surabaya Institutional Repository

Usability of multimedia-based technology in situational judgment test: literature review and survey on millennial generation

F Handani[1], E Yuliandari[2], and M P Elisabeth[2]

[1]Department of Informatics Engineering, Universitas Surabaya, Raya Kalirungkut, Surabaya, 60293, Indonesia
[2]Department of Psychology, Universitas Surabaya, Raya Kalirungkut, Surabaya, 60293, Indonesia

Abstract. In predicting and determining people's careers, various instrumentation and tools can be used. Instrumentation with descriptive stories and role plays is suitable to describe the conditions and situations of respondents. Situational Judgment Test (SJTs) is one of the tools that are used to see a person's tendency to act in certain situations. The research topic of SJTs is increased in the last few years. Most of them explore and investigate the validity of SJT such as the scoring method. However, only a few topics discuss the form of SJTs tools and questions. This study investigates the benefit of using a computer-based test and exploration of multimedia-based technology to enhance SJT. This study examines kinds of literature about SJTs topic and discusses related technology in STJs nowadays. This study also analyses what various parameters of digital media like a type of media and device, affection of sounds in the video, the user experience with media, and duration of video are the parameter. This research also collects 209 respondents to find out interaction between millennial generations and multimedia nowadays. The aim of this paper is to improve STJs' contents using multimedia-based technology.

1. Introduction

Situational Judgement Tests (STJs) is one of psychology test to assess respond of the respondent according to a certain situation [1]. Usually, STJs is used as a prerequisite in the company's recruitment process. STJs has some items with various situations that respond must choose an action. Questions are usually written in narrative form. This is an example of STJs Questions: "You are sent to attend a meeting with the client. But, next week you have a project deadline. What do you want to do? A) Attend this meeting. B) Asked your supervisor about the priority of a project. C) Decline to attend this meeting". Respondent is asked to evaluate this situation according to the respondent's experience, competence, and knowledge.

Since the early 2000s, the Computer-Based Test (CBT) is founded in the USA [2]. The first generation of CBT is used in education and certification environment. Psychology is also affected by this invention especially for a psychology test. The Questions of the test is not only static question but also dynamic question like video, sound, and animation driven-by multimedia. Recent technology has made the development and delivery of the multimedia more practical. But there is one challenge in the early 2000s, we can't easily find and distribute audio, video, and animation because the computer and internet infrastructure doesn't develop evenly worldwide.

Nearly 2010s, development infrastructure and internet network increase rapidly [3]. Many companies compete to provide multimedia channel both free and paid subscriptions. Based on a survey of IT practitioner community, social media and internet usage rates are growing rapidly. This survey collects 143,26 million active internet users in 2017 (increase 7.9% from the previous year). Most of the respondent access website than contains multimedia content. This survey shows 5 top channel such as YouTube, Facebook, Whatsapp, Instagram, and LINE. Similarly, in Indonesia, media channel around the world has streaming to distribute their information with video and image. This Millenial Generations is the biggest multimedia consumer through internet. Multimedia in STJs can be assumed that the right solution for measuring situation judgment test.

This paper is designed to provide the reader with an overview of current research in STJs. For researchers, this paper shows the current media used in STJs. For practitioners, the paper provides an alternative solution to make STJs content more dynamically with multimedia. First, we introduce briefly about usability computer-based-test in STJs. Second, we collect the current data about interaction human with multimedia from the millennial generation. We chose this generation because STJs will be implemented on recruitment process which most of the participants are Millenial. With Multimedia STJs, recruitment process can be improved to assess interest of participants.

2. Related Studies

This section, we describe the knowledge of STJs, implementation STJs Computer-Based Testing in STJs case and examine multimedia parameters to enhance STJs.

2.1. Situation Judgement Test

Many researchers told about the history of STJs. Whetzel [1] explained that STJs is already used in 1926. The subtest called: "Judgement in Social Situations". The test applied to several environments like education and management. STJs as selection tools are used in the US and Europe. The main issue of STJs is to estimate the reliability of STJs. Based on Whetzel, there are many contributions to STJs research topics. Research concerning differences between responses instruction in STJs and STJs content. It's happened because of the lack of information in narrative textual and gap between the respondent's knowledge and the examiner's knowledge. The usability of multimedia like images can be minimalized this gap. With computer-based in STJs, the examiner can handle the heterogonous respondents. The examiner can make custom question group depends on the measurement goal.

2.2. Quality Measurement of Multimedia

Multimedia is information that has an interactive computer-based transition. These media combine two or more media components: textual, pictures, video, audio, motion, 3D object and psychology effect. The aim of multimedia is to simplify the communication between broadcaster and audience.

The quality of a multimedia product [4] divided into 2 types: internal parameter and external parameter. For 2-D images, the internal parameter can be easily measured. The dimension of images that will be produced is *Pixels*. The number of effects applied in original images is *Special Effects*. Images are typically composed set of layers, which have one or more text or images. This measurement is *Layer and Object/Symbol.* Another technique of internal parameters: contrast, gradation, edge sharpening, color vibrancy, and harmony. The external parameters are usually seen from the psychological effect of the audience. If the symbol or picture in the images very crowded, the audience confused and not interested. If the duration of video or audio is too long or too short, the message can't be conveyed to the audience. Nowadays, the usability of multimedia increases rapidly. The recent technology such: internet and IoT, make multimedia become primary needs.

Akhtar, [5] explained that there are 3 sections about "Quality Measurement in Multimedia": Quality of Service (QoS), Quality of Experience (QoE) and Quality of Perception (QoP). QoS is determined by technical of media such: frame-per-rate, bandwidth, file size, and dimension. QoE is determined by human cognitive e.g, habits, feelings, requirements and expectations. QoP is parameters to measure how human ability to analyze, synthesize and take action from multimedia content.

Each quality is designed to produce audio and video signals to be acceptable and pleasant to a human observer. Understanding how human observer view/hear, interpret and respond to visual/audio stimuli

would help to formulate the questioner especially STJ's question. Visual perception is the ability to interpret the surrounding environment that we see before. Visual attention is influenced by cognitive thinking. Auditory perception is regulated by two prominent elements: auditory masking and binaural hearing [6]. For a better assessment, we must know the factor that influencing audiovisual multimedia. First, **Human Influential Factors** based on physical/mental condition (gender, age), demographic and socioeconomic background. Second, **Technological Influential Factors** depends on the QoS of technical media such as file size, bandwidth, screen resolution, and framerate. Third, **Contextual Influential Factors** describes situational ambient properties to indicate how a user may perceive the multimedia content.

3. Research Method

In this research, we studied the literature and collected data from respondents with the survey.

3.1. Systematic Mapping Study

We used a systematic mapping study methodology to explore the latest research in STJ and exploration of multimedia to enhance STJ. This research method is based on the Guideline Systematic Mapping Study by Petersen [7]. We adapted and applied the systematic mapping approach to STJs research. The process begins from the definition of research questions, conducting the search for relevant paper, screening of paper, keywording using abstracts, keywords, and titles, and data extraction.

Research questions of this research:

- How many research papers about Computer-based in STJs?
- What does the topic and issue of Computer-based in STJs?
- What does the multimedia issue of Computer-based testing?

The search repositories are http://www.sciencedirect.com/ and http://ieeexplore.ieee.org/. These two digital libraries are chosen due to the limitation of access from our institution and related topics about software and psychology. The search keywords are defined as follows:

- Situational Judgment Test ("situational judgment test" OR "situational judgment test")
- Computer-Based-Test in Situational Judgement Test ("computer-based test" AND "situational judgment test")
- Multimedia in Computer-based Testing ("multimedia" AND "Computer-based testing")

All of the keywords are used as a search query in two repositories to find journals or articles related to topics. Range finding literature between 2015-2019. The search result can be shown in table 1.

Table 1. Search result of this research

Keyword	IEEE Xplore		Science Direct		Sub-Total	Paper Selections
	Conference	Journal	Chapter Book	Reference Work		
Situational Judgment Test	3	72	5	25	105	12
Computer-Based Test in STJs Test	3	2	0	1	6	3
Multimedia in Computer-based Testing	3	17	1	3	20	2
Total						**17**

After finding this data we screening for relevant paper based on abstract, keyword, titles and journal. The various journal according to this research is Computer & Education, Computer in Human Behavior, Procedia Computer Science, Learning and Instruction, Individual Differences, Human

Resources Management Review, International Journal of Intercultural Relations, Organizational Dynamics, Learning and Individual Differences.

3.2. Collecting Data

To collect the information from the millennial generation, we make a questioner about interaction with media. The question according to this framework (Table 2). This framework is based on the Quality Factor of Multimedia Assessment.

Table 2. Survey Framework

No	Parameter	Description
1	Human Factor: age	information about the respondent's age
2	Human Factor: sex	information about respondent's sex
3	Human Factor: culture influence	information about respondent's culture and way of thinking
4	Technical Factor: Form of Device/Media	Technical Information about the model of media, screen resolution, etc.
5	QoE: User Experience with Media	Quality of Experience: interactive, addictive, pleasant, level of accessibility, etc
6	QoP: Human Interaction with Media	Knowledge of respondent with the media environment

4. Result and Discussion

4.1. Answer Research Question: How many research papers about Computer-based in STJs?

As of January 2015, the total number of a research paper contains "Situational Judgment Test" and "Usability Computer-Based Test" is 17 based on ScienceDirect and IEEE Xplorer.

4.2. Answer Research Question: What does the topic and issue of Computer-based in STJs?

Keyword "Situational Judgment Test" and "Situational Judgement Test" has similar results in ScienceDirect. Researchers have shown that STJs can be applied in many cases: military [8, 9], workplace [10] [11], education environment [12] [13] [14] and social phenomena [15]. There are also analyze the process and tools of STJs with new personality measurement and media [11] [16] [17] [18] [19]. Kiessling developed and validation CBT based on STJ to assess student's communication skill [20].

Research "Situational Judgment Test" in IEEE Explorer extends a lot of implementation that applied media in STJs. Chen developed a machine to simulate automated personality perception [21]. Personality perception can be grabbed by video-based STJs. With the invention of Chen, STJs can be more innovative in role-playing with video support. The other research, Reinerman-Jones purposed a new approach to assessing complex decision making with STJs concept. [22]. Arini used the STJs to cluster people regarding the trust behavior in Sinabung's eruption [23]. Airi makes a survey and clusters the people with STJs that to build a conceptual model of trust behavior in Indonesia.

4.3. Answer Research Question: What does the multimedia issue of Computer-based testing?

Multimedia give examiner power of creativity to make questions. Basu [24] explained that multimedia can explore the perceptual skill of the participant. The student can integrate these visual items with analysis and problem-solving skill. In this Basu case, the teacher can make 3D images as the question of 3D mathematics. [25]. The challenges in this research are: adaptive testing based on participant skill, develop CBT with the wireless device and designing effective multimedia so the assets can be reusable.

4.4. Result of Survey: Respondent's Profile

This survey collects 209 respondent's data. The distribution of respondents in this STJs: 73 respondents studied in Engineering, 136 respondents studied in Psychology. The gender ratio between male and female is 34, 45 %: 65,55%. The dominating age of respondent is 19-20 years old with 108 respondents. 67% of the respondent's social influence was dominated by East Java.

4.5. Result of Survey: Form of Digital Media in STJs

Evaluation form that fits with STJs according to total participants (explained with order): 1) Multiple-choice with a narrative case study (52,1%) ; 2) Essay with anything type of question (50,7%) ; 3) Multiple-choice with Interactive Videos (50,2%); 4) Multiple-choice with audio (40,1%). Based on the participant's discipline, "Essay with anything type of question" and "Multiple-choice with a narrative case study" are favorite for Psychology students. But for Engineering students, "Multiple-choice with a narrative case study and interactive videos" is the favorite one. For engineering students, "essay" isn't the favorite one.

To assess behavior human according to describe a certain situation, more than 50% of participants argue that "Online Application" and "Online Games" are fit to measure personality. With games, the participant is unconsciously assessed by the system. This concept usually calls Gamification. The key to making successful gamification is how to improve user engagement.

4.6. Result of Survey: Quality of Experience with Media

Respondent explains that images and video can help them to understand the information. More than 70% agree with this statement. If only a narrative statement, participants not strong enough to understand the intent of the problem. Participants assess the effect of using audiovisual to equalize the examiner's perception is influential. Participants need a private environment in listening to this media. 75% of participants prefer to use a headset/headphone when listening to audio/video rather than using a loudspeaker. They can easily be distracted with another sound that not related to the test. 60% of participants feel that 15-40 seconds video is enough to describe the event or situation.

4.7. Result of Survey: Quality of Perception with Media

Nowadays, the millennial generation is more critical in consuming audiovisuals than the previous generation, especially images or videos. 50% of participants will guess first the meaning of an image rather than directly accepting the information from the image. The number of colors in an image for some people does not interfere with concentration. This depends on the perceptions of each participant.

5. Conclusion

Based on the literature survey, multimedia can improve the form of questions form. The question can describe easily and clearly with multimedia. Audio and video are media that are suitable for question makers in describing situations. Millennials generations are also very familiar with audio and audio technology. They is easier to understand the meaning of an image and video than with description text.

To build a multimedia STJs that suitable for Millenial Generation, we should give a privacy and a convenient atmosphere test. Millennial Generation Concentrations are more easily disturbed by sounds that are not relevant to the test. Millennials have no problem using smartphones or computers in the test. Each test device is equipped with a headset so that the sound from the video or audio reaches each participant. The duration of the video needs to be considered so that the participants do not spend time working on one particular question.

6. References

[1] Whetzel D L and McDaniel M A 2009 Situational judgment tests: an overview of current research *Hum. Resour. Manage. Rev.* no. 19 pp 188-202

[2] Bennett R, Goodman M, Hessinger J, Kahn H, Ligget J, Marshall G and Zack J 1999 Using multimedia in large-scale computer-based testing programs *Comput. in Hum. Behav.* no. 15 pp 283-294

[3] Fidel G 2019 5 digital marketing channels that work best in Indonesia," Tech in Asia, Friday July 2019.

[4] Cowderoy A 1999 Size and quality measures for multimedia and website production, The Multimedia House of Quality Ltd, Reading

[5] Akhtar Z and Falk T H 2017 *Audio-Visual Multimedia Quality Assessment: A comprehensive Survey* (Canada: IEEE)
[6] Blauert J 1999 *Spatial Hearing: The Psychophysics of Human Sound Localization* (USA: MIT Press)
[7] Petersen K, Feldt R, Mujtaba S and Mattsson M 2008 *Systematic Mapping Studies in Software Engineering* (Italy: 12th International Conference on Evaluation and Assessment in Software Engineering)
[8] Matthews G, Reinerman-Jones L E, Shawn Burke C, Teo G W and Scribner D R 2018 Nationalism, personality, and decision-making: evidence from an SJT for military multi-national teaming scenarios *Pers. and Individ. Differ.* no. 127 pp 89-100
[9] Miller J W and Tucker J S 2015 Addressing and assessing critical thinking in intercultural contexts: investigating the distance learning outcomes of military leaders *Int. J. of Intercult. Relations* no. 48 pp 120-36
[10] Davis J, Griffith J A and Thiel C E 2015 Development and validation of a measure for emotion regulation at work: introducing the workplace emotion regulation preference inventory (WERPI) *Pers. and Individ. Differ.* no. 85 pp 245-50
[11] Apers C and E. Derous 2017 "Are they accurate? Recruiters' personality judgments in paper versusvideo resumes," *Comput. in Hum. Behav.* no. 73 pp 9-19
[12] Presbitero A 2016 Culture shock and reverse culture shock: the moderating role of cultural intelligence in international students' adaptation *Int. J. of Intercult. Relations* no. 53 pp 28-38
[13] Kim L E and MacCann C 2016 What is students' ideal university instructor personality? Aninvestigation of absolute and relative personality preferences *Pers. and Individ. Differ.* no. 102 pp 190-193
[14] Niessen A S M, Meijer R R and Tendeiro J N 2017 Measuring non-cognitive predictors in high-stakes contexts: the effect of self-presentation on self-report instruments used in admission to higher education *Pers. and Individ. Differ.* no. 106 pp 183-189
[15] Fisher G G, Truxillo D M, Finkelstein L M and Wallace L E 2017 "Age discrimination: Potential for adverse impact and differential prediction related to age," *Hum. Resour. Manage. Rev.* no. 27 pp 316-327
[16] Randall J G and Villado A J 2017 "Take two: sources and deterrents of score change inemployment retesting," *Hum. Resour. Manage. Rev.* no. 27 pp 536-53
17] Reeve C L, Scherbaum C and Goldstein H 2015 Manifestations of intelligence: Expanding the measurement space to reconsider specific cognitive abilities *Hum. Resour. Manage. Rev.* no. 25 pp 28-37
[18] Brown M I, Ratajska A, Hughes S L, Fishman J B, Huerta E and Chabris C F 2019 The social shapes test: a new measure of social intelligence, mentalizing, and theory of mind *Pers. and Individ. Differ.* no. 143 pp 107-117
[19] Stoeffler K, Rosen Y, Bolsinova M and Davier A A v 2019 Gamified performance assessment of collaborative problem solving skills *Comput. in Hum. Behav.*
[20] Kiessling C 2016 Development and validation of a computer-based situational judgement test to assess medical students' communication skills in the field of shared decision making *Patient Educ. and Couns.* **99** no. 11 pp 1858-64
[21] Chen L, Zaromb F, Yang Z, Leong C W and Martin-Raugh M 2017 *Can A Machine Pass A Situational Judgment Test Measuring Personality Perception?* (San Antonio, Texas: Seventh International Conference on Affective Computing and Intelligent Interaction Workshops and Demos (ACIIW))
[22] Reinerman-Jones L and Teo G 2016 *Assessing Multidimensional Complex Decision Making with Situational Judgment Tests* (San Diego: 2016 IEEE International Multi-Disciplinary Conference on Cognitive Methods in Situation Awareness and Decision Support (CogSIMA))

[23] Arini H M, Bedford T, Quigley J and Burns C 2017 *Clustering People Trust Behavior in Emergency Evacuation: Evidence from Sinabung Volcano Eruption* (Las Vegas: 2017 Winter Simulation Conference (WSC))

[24] Cheng I and Basu A 2006 *Improving Multimedia Innovative Item Types for Computer Based Testing* (San Diego: 8th IEEE International Symposium on Multimedia (ISM'06))

[25] Basu A, Cheng I, Prasad M and Rao G 2007 *Multimedia Adaptive Computer based Testing: An Overview* (Beijing: 2007 IEEE International Conference On Multimedia and Expo)

UBAYA
UNIVERSITAS SURABAYA

PROCEEDINGS BOOK

Enhancing Engineering Innovation Towards A Greener Future

InCITE 2019

INTERNATIONAL CONFERENCE ON INFORMATICS, TECHNOLOGY, AND ENGINEERING

InCITE Secretariat
Faculty of Engineering
Universitas Surabaya
Jl. Raya Kalirungkut
Surabaya 60293
INDONESIA

Phone +62 31 298 1150
Fax. +62 31 298 1151

incite@unit.ubaya.ac.id
incite.ubaya.ac.id

EDITOR:

Asst. Prof. Nemuel Daniel Pah, Ph.D.
Assoc. Prof. Markus Hartono, Ph.D.
Assoc. Prof. Oki Muraza, Ph.D.

PUBLISHER:

UNIVERSITAS SURABAYA
Jl. Raya Kalirungkut
Surabaya 60293
Phone. (62-31) 298-1344
E-mail: ppi@unit.ubaya.ac.id

InCITE 2019

PROCEEDING BOOK OF INTERNATIONAL CONFERENCE ON INFORMATICS, TECHNOLOGY AND ENGINEERING 2019

Enhancing Engineering Innovation Towards A Greener Future

A collaborative activity jointly organised by:

FACULTY OF ENGINEERING
UNIVERSITAS SURABAYA

THE UNIVERSITY of ADELAIDE

InCITE 2019

INTERNATIONAL CONFERENCE ON INFORMATICS, TECHNOLOGY, AND ENGINEERING

22-23 AUGUST 2019

PROCEEDINGS BOOK

Enhancing Engineering Innovation Towards A Greener Future

EDITOR:

Asst. Prof. Nemuel Daniel Pah, Ph.D.
Assoc. Prof. Markus Hartono, Ph.D.
Assoc. Prof. Oki Muraza, Ph.D.

PUBLISHER:
UNIVERSITAS SURABAYA

UBAYA
UNIVERSITAS SURABAYA

InCITE 2019

A collaborative activity jointly organised by:

FACULTY OF ENGINEERING
UNIVERSITAS SURABAYA

THE UNIVERSITY of ADELAIDE

INTERNATIONAL CONFERENCE ON INFORMATICS, TECHNOLOGY, AND ENGINEERING

22-23 AUGUST 2019

PROCEEDINGS BOOK

Enhancing Engineering Innovation Towards A Greener Future

VENUE:
THE ANVAYA BEACH RESORT BALI
Jl. Kartika Plaza, Tuban, Kuta,
Kabupaten Badung, Bali 80361
Phone : (+62361) 2090477
www.theanvayabali.com

PUBLISHER:
UNIVERSITAS SURABAYA
Jl. Raya Kalirungkut
Surabaya 60293
Phone. (62-31) 298-1344
E-mail: ppi@unit.ubaya.ac.id

Faculty of Engineering - Universitas Surabaya

Preface

Welcome Remarks,
Chair of the Steering Committee

It is a great pleasure to welcome all of you to Bali and to the International Conference on Informatics, Technology, and Engineering 2019 (InCITE 2019) held by the Faculty of Engineering, University of Surabaya (UBAYA) in collaboration with The University of Adelaide, Australia and Sirindhorn International Institute of Technology (Thammasat University), Thailand. The first InCITE has been successfully held in Bali, Indonesia in 2017. We are very delighted to host the second InCITE here in Bali, Indonesia again.

There are more than 75 presentations in this conference. We welcome leading experts not only from Indonesia, but also from different parts of the world. The experts will share the knowledge and experiences in the fields of informatics, technology, science, and engineering. The main theme of this conference is **Enhancing Engineering Innovation Towards A Greener Future** in response to several world challenges including sustainable development, global convergence of information and communications technologies, climate change and global warming as well as the depletion of unrenewable natural resources. We hope this conference will provide you a good opportunity to get to know each other better and consolidate bonds of friendship and mutual trust.

We would like to express our sincere gratitude to the Keynote and Plenary speakers, International Scientific Committee, Steering Committee, and Organising Committee for their huge efforts to make this conference successful.

Thank you all for your support and attendance at InCITE 2019. Please enjoy the conference and Bali !

Asst. Prof. Djuwari, Ph.D.

Preface

Welcome Remarks,
Chair of The Organizing Committee

Welcome to Bali, Indonesia to all delegates and presenters. It is my pleasure and privilege to welcome all of you to the 2nd (second) International Conference on Informatics, Technology, and Engineering 2019 (InCITE 2019) held by the Faculty of Engineering, University of Surabaya (UBAYA) in collaboration with The University of Adelaide, Australia and Sirindhorn International Institute of Technology (Thammasat University), Thailand.

InCITE 2019 has received more than 75 papers to be presented in this conference. All papers represent four following parallel clusters: Green Design and Innovation, Green Manufacturing and Green Processes, Power System and Green Energy Management, and The Role of IT in Innovation Enhancement. Each cluster supports the main theme of the conference, which is **Enhancing Engineering Innovation Towards A Greener Future.** The engineering innovation is the key to increase our awareness in maintaining the sustainable growth and development in the world.

The Organising Committee of InCITE 2019 would like to express our sincere gratitude for the tremendous supports and contributions from many parties. The supports from The Faculty of Engineering of UBAYA, keynote and plenary speakers, our International Scientific Committee, the Steering and Organising Committees are really acknowledged.

The last but not the least, thank you for your supports, enjoy the conference and we hope through this meeting all of you can extend your networks and collaborations.

Asst. Prof. Putu Doddy Sutrisna, Ph.D.

Conference Organizers

SCIENTIFIC COMMITTEE

- Prof. Willy Susilo, Ph.D. (University of Wollongong, AUSTRALIA)
- Prof. Dr. Anton Satria Prabuwono (King Abdulaziz University, SAUDI ARABIA)
- Assoc. Prof. Oki Muraza, Ph.D. (King Fahd University of Petroleum & Minerals, KINGDOM OF SAUDI ARABIA)
- Prof. Ravindra S. Goonetilleke, Ph.D. (Hong Kong University of Science & Technology, PRC)
- Assoc. Prof. Tan Kay Chuan, Ph.D. (National University of Singapore, SINGAPORE)
- Asst. Prof. Aldy Gunawan, Ph.D. (Singapore Management University, SINGAPORE)
- Asst. Prof. Hendry Raharjo, Ph.D. (Chalmers University of Technology, SWEDEN)
- Assoc. Prof. Dr. A. F. M. Saifuddin Saif (American International University, BANGLADESH)
- Asst. Prof. Itthisek Nilkhamhang, Ph.D. (Sirindhorn International Institute of Technology, THAILAND)
- Assoc. Prof. Akawut Siriruk, Ph.D. (Suranaree University of Technology, THAILAND)
- Assoc. Prof. Avirut Chinkulkijniwat, Ph.D. (Suranaree University of Technology, THAILAND)
- Assoc. Prof. Peerapong Uthansakul, Ph.D. (Suranaree University of Technology, THAILAND)
- Assoc. Prof. Dr. Andi Cakravastia Arisaputra Raja (Institut Teknologi Bandung, INDONESIA)
- Assoc. Prof. Dr. Anas Maruf (Institut Teknologi Bandung, INDONESIA)
- Assoc. Prof. Yassierli, Ph.D. (Institut Teknologi Bandung, INDONESIA)
- Prof. Dr. Ali Altway (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Dr-Ing. I Made Londen Batan (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Assoc. Prof. Setiyo Gunawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Renanto Handogo, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Mauridhi Hery Purnomo, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Nur Iriawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. I Nyoman Pujawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Asst. Prof. Budi Hartono, Ph.D. (Universitas Gadjah Mada, INDONESIA)
- Prof. Sarjiya, Ph.D. (Universitas Gadjah Mada, INDONESIA)
- Asst. Prof. Nemuel Daniel Pah, Ph.D. (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Markus Hartono, Ph.D (Universitas Surabaya, INDONESIA)
- Prof. Joniarto Parung, Ph.D. (Universitas Surabaya, INDONESIA)
- Prof. Lieke Riadi, Ph.D. (Universitas Surabaya, INDONESIA)

Conference Organizers

STEERING COMMITTEE

Chair:

Asst. Prof. Djuwari, Ph.D.

Honorary Members:

Prof. David Lewis, Ph.D.
Prof. Joniarto Parung, Ph.D.
Prof. Lieke Riadi, Ph.D.
Asst. Prof. Dr. Steve Kardinal Jusuf
Asst. Prof. Dr. Itthisek Nilkhamhang

Members:

Assoc. Prof. Amelia Santoso, Ph.D.
Mr. Agung Prayitno
Assoc. Prof. Emma Savitri, Ph.D.
Assoc. Prof. Markus Hartono, Ph.D., CHFP.
Assoc. Prof. Budi Hartanto, Ph.D.
Mr. Sunardi Tjandra
Assoc. Prof. Eric Wibisono, Ph.D.
Asst. Prof. Nemuel Daniel Pah, Ph.D.
Assoc. Prof. Elieser Tarigan, Ph.D.
Assoc. Prof. Jaya Suteja, Ph.D.
Prof. Joniarto Parung, Ph.D.
Assoc. Prof. Hudiyo Firmanto, Ph.D.
Assoc. Prof. Restu Kartiko Widi, Ph.D.

ORGANIZING COMMITTEE

Chair	:Asst. Prof. Putu Doddy Sutrisna, Ph.D.
Vice Chair	:Dr. Delta Ardy Prima
Secretary	:Ms. Aprilia Karina
Treasurers	:Ms. Dhiani Tresna Absari
Secretariat	:Maria Agatha E.Gunawan, Ph.D.
	Asst. Prof. Lanny Sapei, Ph.D.
	Mr. Rahman Dwi Wahyudi
	Ms. Yenny Sari
	Ms. Yuana Elly Agustin
	Ms. Susana Limanto
	Ms. Monica Widiasri

Conference Organizers

Program	:Mr. Yunus Fransiscus
	Ms. Melissa Angga
	Mr. I Made Ronyastra
	Mr. Henry Hermawan
	Mr. Felix Handani
	Ms. Indri Hapsari
	Mr. Mochammad Arbi Hidayat
Website	:Mr. Daniel Soesanto
	Mr. Marcellinus Ferdinand Suciadi
Design	:Ms. Tyrza Adelia
Sponsorship	:Assoc. Prof. Susila Candra, Ph.D.
Logistic:	Mr. Arief Rachman Hakim
	Mr. Muhamad Yulham Effendy

REVIEWER

- Prof. David Lewis, Ph.D. (University of Adelaide, AUSTRALIA)
- Prof. Willy Susilo, Ph.D. (University of Wollongong, AUSTRALIA)
- Dr. Jingwei Hou (University of Queensland, AUSTRALIA)
- Asst. Prof. Hendry Raharjo, Ph.D. (Chalmers University of Technology, SWEDEN)
- Prof. Dr. Anton Satria Prabuwono (King Abdulaziz University, SAUDI ARABIA)
- Assoc. Prof. Oki Muraza, Ph.D. (King Fahd University of Petroleum & Minerals, KINGDOM OF SAUDI ARABIA)
- Prof. Dr. Winarto Kurniawan (Tokyo Institute of Technology, JAPAN)
- Dr. Wahyudiono (Nagoya University, JAPAN)
- Prof. Ravindra S. Goonetilleke, Ph.D. (Hong Kong University of Science & Technology, PRC)
- Asst. Prof. Dr. Steve Kardinal Jusuf (Singapore Institute of Technology, SINGAPORE)
- Assoc. Prof. Tan Kay Chuan, Ph.D. (National University of Singapore, SINGAPORE)
- Asst. Prof. Aldy Gunawan, Ph.D. (Singapore Management University, SINGAPORE)
- Assoc. Prof. Dr. A. F. M. Saifuddin Saif (American International University, BANGLADESH)
- Asst. Prof. Itthisek Nilkhamhang, Ph.D. (Sirindhorn International Institute of Technology, THAILAND)
- Assoc. Prof. Akawut Siriruk, Ph.D. (Suranaree University of Technology, THAILAND)
- Assoc. Prof. Avirut Chinkulkijniwat, Ph.D. (Suranaree University of Technology, THAILAND)
- Assoc. Prof. Peerapong Uthansakul, Ph.D. (Suranaree University of Technology, THAILAND)
- Asst. Prof. Dr. Phuong Lan Tran Nguyen (Can Tho University, VIETNAM)
- Assoc. Prof. Dr. Anas Maruf (Institut Teknologi Bandung, INDONESIA)
- Dr. Khoiruddin (Institut Teknologi Bandung, INDONESIA)
- Assoc. Prof. Dr. Veinardi Suendo (Institut Teknologi Bandung, INDONESIA)

Conference Organizers

REVIEWER

- Assoc. Prof. Dr. Andi Cakravastia Arisaputra Raja (Institut Teknologi Bandung, INDONESIA)
- Assoc. Prof. Yassierli, Ph.D. (Institut Teknologi Bandung, INDONESIA)
- Assoc. Prof. Dr. Judy Retti B. Witono (Universitas Parahyangan, INDONESIA)
- Asst. Prof. Budi Hartono, Ph.D. (Universitas Gadjah Mada, INDONESIA)
- Prof. Sarjiya, Ph.D. (Universitas Gadjah Mada, INDONESIA)
- Asst. Prof. Dr. Hendri Himawan Triharminto (Akademi Angkatan Udara Yogyakarta, INDONESIA)
- Assoc. Prof. Dr. Djoko Budiyanto Setyohadi (Universitas Atmajaya Yogyakarta, INDONESIA)
- Prof. Dr. Ali Altway (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Renanto Handogo, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Mauridhi Hery Purnomo, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Nur Iriawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Asst. Prof. Astria Nur Irfansyah, Ph.D.(Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. Dr-Ing. I Made Londen Batan (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Assoc. Prof. Setiyo Gunawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Prof. I Nyoman Pujawan, Ph.D. (Institut Teknologi Sepuluh Nopember, INDONESIA)
- Asst. Prof. Rr. Poppy Puspitasari, S, Ph.D (Universitas Negeri Malang, INDONESIA)
- Asst. Prof. Ratna Surya Alwi, S.T., M.Si., Ph.D (Universitas Fajar Makassar, INDONESIA)
- Prof. Joniarto Parung, Ph.D. (Universitas Surabaya, INDONESIA)
- Prof. Lieke Riadi, Ph.D. (Universitas Surabaya, INDONESIA)
- Asst. Prof. Nemuel Daniel Pah, Ph.D. (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Markus Hartono, Ph.D (Universitas Surabaya, INDONESIA)
- Asst. Prof. Dr. Hazrul Iswadi (Universitas Surabaya, INDONESIA)
- Asst. Prof. Gunawan, Ph.D (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Dr. Evy Herowati (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Dr. Amelia Santoso (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Eric Wibisono, Ph.D. (Universitas Surabaya, INDONESIA)
- Asst. Prof. Dr. Joko Siswantoro (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Dr. Budi Hartanto (Universitas Surabaya, INDONESIA)
- Asst. Prof. Dr. Delta Ardy Prima (Universitas Surabaya, INDONESIA)
- Asst. Prof. Jimmy (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Lisana (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Dr. Emma Savitri (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Restu Kartiko Widi, Ph.D. (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Akbarningrum Fatmawati (Universitas Surabaya, INDONESIA)

Conference Organizers

REVIEWER

- Assoc. Prof. Akbarningrum Fatmawati (Universitas Surabaya, INDONESIA)
- Asst. Prof. Putu Doddy Sutrisna, Ph.D. (Universitas Surabaya, INDONESIA)
- Asst. Prof. Djuwari, Ph.D. (Universitas Surabaya, INDONESIA)
- Asst. Prof. Elieser Tarigan, Ph.D. (Universitas Surabaya, INDONESIA)
- Assoc. Prof. The Jaya Suteja, Ph.D (Universitas Surabaya, INDONESIA)
- Assoc. Prof. Dr. Susila Candra (Universitas Surabaya, INDONESIA)
- Asst. Prof. Sunardi Tjandra (Universitas Surabaya, INDONESIA)
- Asst. Prof. Yuwono Budi Pratiknyo (Universitas Surabaya, INDONESIA)

CONFERENCE ORGANIZING COMMITTEE:
FACULTY OF ENGINEERING, UNIVERSITAS SURABAYA
DEAN BUILDING TB 2, RAYA KALIRUNGKUT
SURABAYA, 60293, INDONESIA
PHONE: +62-31-2981150, FAX: +62-31-2981151
E-MAIL: incite@unit.ubaya.ac.id
WEBSITE: https://incite.ubaya.ac.id; http://teknik.ubaya.ac.id

Table of Content

Preface **i**

Conference Organizers **iii**

Table of content **viii**

Green Design and Innovation

A Systematic Literature Review for Developing Sustainability Assessment Tool: Formulating the State of the Art and Future Direction

Y Sari, A Hidayatno, A Suzianti, M Hartono A-1

Perceived Kansei and Performance-Based Usability Impact on Satisfaction for Web-Based Applications

M Hartono A-8

Passive Design Implementation as Sustainable Development Approach on Vertical Housing Case Study: Sentra Timur Residence

T Riotama and H Herdiansyah A-14

Development and Usability Evaluation of Virtual Guide Using Augmented Reality for Candi Gunung Gangsir in East Java

I M Ronyastra, I Hapsari and F P Pani A-19

Combined Structural Equation Modelling – Artificial Neural Networks Model for Predicting Customer Loyalty

M A Hadiyat A-25

How the Indonesian Ecologically Conscious Millennials Value Upcycled Clothing?

C A P Parung A-31

Animated Video as Health Promotion Tool for Community Supplementary Feeding

S Limanto, Liliana, S Purba and M Oeitheurisa A-37

Slow - Fashion: Case Study of Tenun Sesek as Local Wisdom from Pringgasela, East Lombok, West Nusa Tenggara
N Juniati A-43

Expertise-based decision makers' importance weights for solving group decision making problems under fuzzy preference relations
E Herowati A-49

Measurement of Student Satisfaction and Loyalty Using Service Quality Model for Higher Education (HedQual) at Industrial Engineering Department University of Pelita Harapan
N Hartono, Laurence and B F Tjahjadhi A-56

Development Initial Model of Intention to Use Halodoc Application Using PLS-SEM
N Hartono, Laurence and T O Tedja A-63

The Role of Ergomomics in Suporting Supply Chain Performance in Manufacturing Companies: a Literature Review
Sampouw N and Hartono M A-71

Green Dynamic Capability for Enhancing Green Innovations Performance in a Manufacturing Company: a Conceptual Framework
R Amaranti, D Irianto and R Govindaraju A-77

Kansei Engineering Application in Redesigning Carica Packaging to Support Local-Small Industry in Central Java
H Prastawa, M Mahachandra and D A Harman Donida A-84

Organic-Inorganic Nanocomposite Membranes for Molecular Separation and Bioapplications
J Hou, P D Sutrisna, L Li, V Chen A-90

Fluazinam Potential as a Fungicide in Liquid Culture System for the Growth of Haematococcus pluvialis Microalgae
J R Witono, V Novianty, H Santoso, A Miryanti and A J Kumalaputri A-95

Tensile properties of kenaf fiber by alkalinization treatment: effect of variations in concentration
Ismojo, K A Zahidah, E Yuanita, E Kustiyah and M Chalid A-103

Green Manufacturing and Green Processes

Regulatory Performance of Two Different Tuning Method for Milk Cooling Control System
R Agustriyanto B-1

A Review of a Machine Design of Chocolate Extrusion Based Co-Rotating Twin Screw Extruder
P Pitayachaval and P Watcharamaisakul B-7

An Empirical Study of How the Deployment of Lean Sigma Can Reduce Its Enemies: Waste, Overburden and Defect
Y Sari, E Wibisono and I Pangkiey B-14

Controlled Release Fertilizer Based on Starch Chitosan Encapsulation
E Savitri, E Purwanto, A N Kodrat and E Yonathan B-20

Assessing Materials from Hoarded Mobile Phones: Hidden E-Waste Subject for Reverse Logistics
R Siring, H Herdiyansyah, R D Kusumastuti and A E Lucianto B-26

Optimisation of Subtractive Rapid Prototyping Process Parameters Using Response Surface Methodology
T J Suteja and M A Hadiyat B-32

A Kinetic Study of Oil-in-Water Emulsion Formation Stabilized by Rice Husk Ash and Lecithin
L Sapei, S W Kurniawan and A P Siantoro B-38

Improvement of Salt Raw Material Procurement and Inventory Planning at Bitung
I Hapsari, D N Prayogo, C M G Liembath B-44

Price and Inventory Policy Strategy Model in a Price Sensitive Dual Channel Supply Chain Structure Considering Product Substitution
R Y H Silitonga and N Christina B-50

Tofu Wastewater Treatment Through a Combined Process of Coagulation-Flocculation and Ultrafiltration
P Prawati, A Oktariany, S S Putri, I Aditya and S Kartohardjono B-56

Risk-Based Sustainability Balanced Scorecard to Prioritize Integrated Improvement and to Consider High Level Structure
R D Wahyudi, Y Sari, E Wibisono, F Rafael and A F Tanujaya B-63

Effect of NR-g-cellulose Coupling Agent into NR-Cellulose Composite Dispersibility and Its Physical Properties
H Handayani, A Cifriadi, A S Handayani, M Chalid, S Savetlana, M Christwardana B-69

Carbon Emission Modelling in Container Terminal Operations Planning Using a System Dynamics Approach
D N Prayogo B-75

The Effect of Soygurt Fortification with Black Rice Bran Extract Anthocyanin in Hyperlipidemia Wistar Rats (Rattus norvegicus)
E P Nurlaili, S Hartati and Nurhidajah B-81

Container Storage Tariff Policy Analysis Using Combining Game Theory and System Dynamics Approach
A G Budianto and B Wirjodirdjo B-87

Formulation and Characterization of Chitosan-Alginate Freeze Dried Matrices Loaded with Oleoresin Extract of Red Ginger
E A Krisanti, A Safiya and K Mulia B-93

Preparation and Characterization of Polyvinyl Alcohol-Chitosan-Tripolyphosphate Hydrogel for Extended Release of Anti-Tubercolosis Drugs
K Mulia, S A Chadarwati, A J Rahyussalim and E A Krisanti B-101

Effects of Initial Concentration, Adsorbent Mass, pH and Temperature to Personal Care Products Waste Removal with Activated Carbon as Adsorbent
H R Priyantini, L Riadi, C Effendi, F Effendi and A Mitayani B-111

Surface Roughness Analysis Using Sound Signal in Turning of Mild Steel
Anayet U Patwari, Anas Azmayeen Zamee, Mehedi Hasan Bhuiyan and Sultan Mahmud Sakib B-117

Environmental Life Cycle Costing of Boiler System: a Case Study
C A Sulistio, Laurence, N Hartono and J Hanafi B-123

The Integration of Social Responsibility into Business Operation: Case Study of Indonesian Manufacturing Industry
E D Rinawiyanti, C Huang and S As-Saber B-128

Solubility Correlation of Azobenzene Derivatives in Supercritical Carbon Dioxide: a Short Review
Ratna Surya Alwi and Andi Sry Iryani B-134

Xylanase Production from Combined Reutealis trisperma with Potato Dextrose Broth by Tricodherma reesei: Effect of Pretreatment
Y E Agustin, L Riadi and T P Utami B-140

Power System and Green Energy Management

Analysis of the Potential of Solar Panel Implementation Towards Green Affordable Housing Development
A E Lucianto and H Herdiansyah C-1

Integration of Biogas Technology into Goat Farming to Achieve Zero Waste System: Effect of Substrate Composition and Concentration
K Cahyari C-7

Single-Phase DC-AC Inverter with Low Power Dissipation with Transformer and Filter for Photovoltaic-Based Home-Scale Electric Power System
I Hidayat, F Samman and R Sadjad C-11

The Influence of Water and Catalyst Leach Process toward Propane Oxidation on MoVTeNb Catalyst
R K Widi C-21

Gas Sensitive Properties Of ZnO Nanorods Formed on Silicon and Glass Substrates
V Petrov, A Starnikova, Y Varzarev, K Abdullin and D Makarenko C-27

The Study of The Properties of Lead Zirconate-Titanate Films on Silicon Substrate After Halogen Lamps Rapid Thermal Annealing
V Petrov, A Kamentsev, V Polyakov and Y Varzarev C-33

Temperature Dependence of Electrical Properties of ZnO Nanorods Array
V Petrov, Y Varzarev and K Abdullin C-37

Utilization of Rice Straw and Used Paper for the Recycle Papermaking
N Suseno, T Adiarto, M S P Tentoea and V E Sugihartono C-41

Mass Transfer Kinetic Model and Removal Capacity of Acid Blue 29 Adsorption onto Activated Carbon
P Setyopratomo, H R Priyantini and R Agustriyanto C-47

Effects of Electroculture on Shoot Proliferation of Garlic (Allium sativum L.)
VL Manguiam, A M Margate, R D Hilahan, H G Lucin, K R Pamintuan, A Adornado C-53

The Use of Pyrolusite to Remove Pb and Cd in Aqueous Solutions : Isotherm and Thermodynamic
Y F Liem, M W B Kembie and N M Tanusaputra C-57

Current Perspectives and Mini Review on Zeolitic Imidazolate Framework-8 (ZIF-8) Membranes on Organic Substrates
P D Sutrisna, N F Himma, N Prasetya and I G Wenten C-63

Power generation in a Plant-Microbial Fuel Cell Assembly with Graphite and Stainless Steel Electrodes Growing Vigna Radiata
K R Pamintuan and K Sanchez C-69

Drying of Celery Leaves (Apium graveolens L.) using a PV/T Solar Dryer
L Sapei, E Tarigan, D N Sugiarto and D Gianluca C-75

Kinetics Oxidative Degradation of Chitosan in Formic Acid with The Presence of Hydrogen Peroxide
E Purwanto, J Connor and Y Ngothai C-81

The Role of IT in Innovation Enhancement

Smart urban farming using arduino in residential area
D A Prima, W D Savitri, V R Prasetyo, E Suryadjaja D-1

Towards power supply efficiency in IoT for image-based transmission scheme
N Karna, M Safira D-7

E-commerce for Japanese pop-products in Indonesia: the sign of decline stage
Gunawan, Yu Noda D-14

Enhancement of weighted centroid algorithm for indoor mobile non-cooperative localization system
R D Ainul D-20

E-commerce development using object oriented analysis and design (OOAD), a case study in Marenggo Natural Dyes Batik SME in Indonesia
D P Sari, N U Handayani, Y Widharto, M F M Raharjo D-26

Anchored instruction ITS: a novel approach to make learning programming interesting and effective
B Hartanto, J Reye D-32

Requirements analysis for the disaster logistics inventory information system to improve the effectiveness and efficiency of handling emergency response periods
N U Handayani, D P Sari, Y Widharto, G Basyir D-39

Software verification and validation using statistical test: a systematic mapping study
S Arifiani1, F Handani, S Rochimah1, D Herumurti, I Kuswardatyan D-45

Usability of multimedia-based technology in situational judgment test: literature review and survey on millennial generation
F Handani, E Yuliandari, Elisabeth D-52

Employing game technology as positive influence on conveying positive message and train positive behavior: case study racism and tolerance issue
N M Angga, M F Suciadi, S Yuanita, M A Wiradarma D-59

FSM based virtual camera control for earthquake evacuation simulation
D A Prima D-64

Machine learning to predict rainfall at Deli Serdang Stasion in North Sumatra
I Fitriyaningsih, L R Bernando, S N Kwatri D-71

Rethinking third place in the digital era
R F P Hadi, E Ellisa D-78

Image based indonesian fruit recognition using MPEG-7 color structure descriptor and k-nearest neighbor
J Siswantoro, H Arwoko, M Widiasri D-84

The design of android-based application for museum guide information system using beacon technology
D Absari, D H Prasetyo, F Adinata D-90

Virtual reality app on Milky Way solar system, case study: Kebraon II Public Elementary School, Surabaya, East Java, Indonesia
M F Suciadi, Lisana, F Ramadhan D-96

Computer vision system in measurement of the volume and mass of egg using the disc method
M Widiasri, L P Santoso, J Siswantoro D-102

Fraud detection using process mining and analytical hierarchy process with verification rules on erp business process
M F Naufal D-108

Customer intention to use airbnb application: a case study
S Bellina, Laurence, N Hartono D-114

Evaluation of academic website using eye tracker and ueq: a case study in a website of xyz
A H Kusumo, M Hartono D-119

A decision tree algorithm for predicting amount of batik tulis lasem production by decision support system to support financial feasibility
T Khotimah, R Nindyasari, N Ermawati D-125