

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

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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 SJTs 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 SJTs' 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 Millennial 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 Millennial. 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 minimized 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 Millennial 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.

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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.

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