



A Confirmatory Factor Analysis of Digital Empowerment Dimensions in Senior High School Students

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Abstract—This study aims to analyze the dimensions of digital empowerment in high school students. This study identifies eight dimensions of digital empowerment, namely awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity. To test and to analyze the eight dimensions, this study uses a descriptive quantitative approach with a survey method. The survey is conducted online to 30 respondents, who are students from SMAN 59 Jakarta, Indonesia. The data analysis of this study uses the Statistical Package for the Social Sciences (SPSS) software version 25.0 with an analysis focus on confirmatory factor analysis (CFA). The result of this study indicates that eight dimensions that have been identified in previous study have a fit and correlation with digital empowerment, but the order has changed. Gratifications dimension is the most dominant dimension of digital empowerment compared to other dimensions.

Keywords—digital empowerment, confirmatory factor analysis, digital empowerment dimensions, senior high school, students.

I. INTRODUCTION

Digital empowerment is very important to pay attention at this time because it is related to the digital revolution, that is an era that brings rapid changes to individuals, society, and the environment [1]. With the digital revolution, various new technologies have emerged that create new opportunities, along with the increasing use of the internet and mobile technology [2].

Empowerment was defined [3] as the process of developing individual abilities to have greater participation. With digital technology, individual participation in the digital world can be more empowered [4]. Digital empowerment refers to the ability of individuals to use digital technology effectively in order to develop their life skills while strengthening their abilities in the community in the information age or also known as the information society [5]. In the current era, individuals who are unable to use digital technology or refuse access to digital technology will be powerless. Therefore, individuals and the information society need to be encouraged in digital empowerment so they can participate in using digital technology [6]. One form of digital empowerment is an effort made on students, namely the position of students is central to the teaching method and students need to be involved in digital empowerment [4].

In preparing students to have skills and information in the digital world, school has a very important role [1]. As an educational institution, school has a role to provide information and teaching skills to students so they can understand the digital world [7]. School has functions to train students as individuals to be able to enter the community and according to the needs and expectations of the information society [1]. Meanwhile, students are the young generation who play a very important role in the formation of the information society and digital society, because they have good access technically and are highly motivated to be able to use digital technology [6]. The young generation who dominates digital technology will be more productive, have more social belonging, and are able to solve various important problems in development [1].

Digital empowerment has become a study or object of study by several previous researchers [1], [5], [8], who stated that there are four elements that enable the formation of digital empowerment in individuals, namely awareness, motivation, technical access, and empowerment. Awareness is related to individual feelings, hopes, dreams, and attitudes [1]. Motivation is related to individual attitudes and efforts to achieve the goals that have been set [1], [9]. Technical access is related to hardware or software in digital technology. Empowerment is the ability, skills, knowledge of individuals to use digital technology, including digital literacy or the ability of individuals to understand messages conveyed through digital technology [1].

Then, there is also previous research which states that digital empowerment is related to gratifications in digital technology, namely the use of mobile apps. Gratifications is related to Uses and Gratifications Theory, that develops not only in traditional media, such as television, but also the internet and cell phones. The audiences, which in this case is internet and cell phone users, choose the media based on their purpose, and they have their own control over the chosen media. Factors that affect gratifications of mobile apps users are engagement, pass time, knowledge, education, and social [10].

Meanwhile, there is also another study which mentions the existence of social contractual utility, social contractual egalitarianism, and real equality of opportunity in society. A social contractual utility is a social contract that deals with goals and ideals, for example building a good society with good people. A social contractual egalitarianism is a social contract related to the principles of equality, equal, and non-discriminatory policies. A real equality of opportunity relates to the opportunity for all individuals in society to access various relevant programs [11].

The study of social contract utility has also been carried out by Irwansyah [12] related to the values of society in adapting to new technology. The study used in-depth interviews, reviews of online news coverage, and observations in data collection. The results of the study indicate that four aspects of the use of social contracts, namely need, agreement, togetherness, and interests, play an important role and must be integrated so that people can plan, adopt new technology, so that digital empowerment can be implemented. That study recommends the need to do another study that includes social contract utility with a quantitative approach.

While turning to this study, this study aims to analyze the dimensions of digital empowerment in students, especially high school students. The dimensions of digital empowerment in this study are a combination of three previous studies from Akkoyunlu and Yilmaz [1], Ellis [11], and Gerlich [10]. Studies on digital empowerment have been carried out [1], [6] on teachers and college students, but not yet on students. Thus, conducting digital empowerment studies on students is the novelty of this research. Students are also the nation's next generation who will increasingly use digital technology in the future so they must be adaptive to the digital revolution. Furthermore, individuals who have strong critical thinking, adaptability, and continuous learning are needed in the future [13].

This study proposes digital empowerment scheme as shown in Figure 1, and the hypothesis developed in this study is:

Awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity are dimensions of digital empowerment.

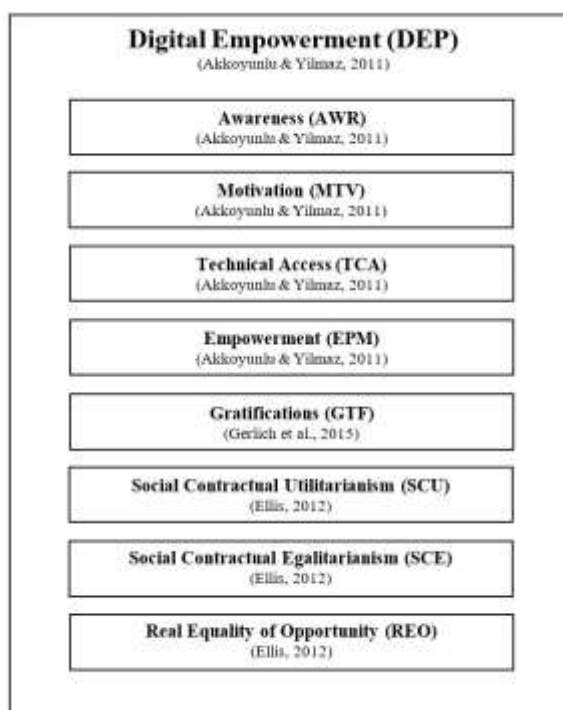


Figure 1. Eight Dimensions of Digital Empowerment Scheme

II. METHOD

This study uses a quantitative approach with descriptive type using a survey method [1], [10]. There are several stages carried out in this study, which consists of identifying problems, conducting literature studies, determining problem formulations, collecting research data, processing research data, presenting and discussing research results, and making conclusions [14], [15].

The stages of identifying problems, conducting literature studies, and determining problem formulations are carried out in parallel, which focuses on the dimensions of digital empowerment [1], [10], [11]. The study data collection stage, it is carried out by collecting samples from 30 respondents. The sample size of 30 is sufficient because this study is a pilot study that does not require too many samples. It is stated that a sample size of 10 to 30 respondents is allowed in both exploratory and pilot studies [16]–[18]. The study's data collection is carried out by survey [1], [10] to 30 students of SMAN 59 Jakarta, Indonesia. The selection of students of SMAN 59 Jakarta as respondents because they can represent the school as a whole, which in the context of this study the school is the population [19]. As an A-accredited school, has a number of academic and non-academic achievements, and has heterogeneous student characteristics, SMAN 59 Jakarta can be accessed by researchers so that it is possible to obtain data. A study with the ease of obtaining data by survey techniques can be carried out anywhere [20], so it is relevant in the context of this study.

The survey conducted in this study for data collection is an online survey [10] which is assisted by google forms. The use of this online form classifies this study as a web-based survey study. This means that the questionnaire is posted on the website and accessed by respondents who are connected to the website, either via a link or by using the website's Uniform Resource Locator (URL) [21]. In this study, the questionnaire used a 10-response Likert scale with a range of 1 to 10 (starting from 1 = very, very totally disagree until 10 = very, very totally agree) [10]. The distribution of online questionnaires to respondents using the WhatsApp instant message application. The data collection was carried out on September 7th to 10th, 2020. After the data has been collected completely, the next stage is the data processed with SPSS version 25.0. The next step, the processed data is presented, analyzed, discussed, and concluded as a study results [14], [15], [22].

III. RESULT AND DISCUSSION

A. Validity Test

The validity test in this study is carried out by using the Pearson correlation test assisted by SPSS version 25.0 [23]. The level of significance is measured with regard to two (**) or one (*) asterisk. Two asterisks indicate a significance level of 0.01, which means that the test result level has a chance of being correct by about 99 percent and for being false by 1 (one) percent. In other words, a significance level of 0.01 means that the confidence level is 99 percent. Meanwhile, the one asterisk shows a significance level at the 0.05 level, which means that the confidence level is 95 percent, or in other words the test results have a 95 percent chance of being correct and about 5 (five) percent of errors [23].

On the other hand, the significance level of the validity of the instrument can also be observed from the interpretation of the Pearson correlation coefficient (r). Correlation values ranging from 0.00 to 0.09 mean that the correlation is neglected. A correlation value between 0.10 to 0.39 means a weak correlation. The correlation value between 0.40 to 0.69 means that the correlation value is moderate. A correlation value between 0.70 to 0.89 means a strong correlation. Then, a correlation value between 0.90 and 1.00 means that the correlation is very strong [24].

This study was conducted by testing the validity of digital empowerment with its eight dimensions, namely awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity. The validity test in this study examines 78 question items. The result of the validity test finds 9 (nine) invalid question items, including awr1, tca2, tca5, epm5, scu7, scu11, reo2, reo3, and reo4, and also 69 valid question items. Among the 69 valid question items, there are 4 (four) question items with a significance level of 0.05 (95 percent confidence level with an asterisk *) and 65 question items which have a significance level of 0.01 (99 percent confidence level with a sign **). Meanwhile, the validity index (r) of valid items is in the range between 0.402 - 0.904.

B. Reliability Test

The reliability test in this study is carried out by seeing the alpha value (Alpha Cronbach) [23], [25], [26]. A research instrument (questions in the questionnaire) is said to have high reliability if it has an alpha value (reliability coefficient) indicating a number equal to or more than 0.70. Meanwhile, if it is less than that

number, it is considered unreliable [25], [26]. The meaning of the alpha value, it can be explained that the value between 0.00 - 0.19 means very low/very unreliable, the value between 0.20 - 0.39 means low/unreliable, the value between 0.40 - 0.69 means moderate, the value between 0.70 - 0.89 means high/reliable, and the value between 0.90 - 1.00 means very high/very reliable [25]–[27].

The reliability test in this study is conducted on valid question items from the results of the validity test which was carried out previously. The results of the reliability test of the digital empowerment variable are as follows:

TABLE I. THE RELIABILITY TEST RESULT FOR DIGITAL EMPOWERMENT VARIABLE TABLE TYPE STYLES

Variable	Reliability Test Results	
	Cronbach's Alpha	Interpretation
DEP	0,982	Very Reliable

Table I shows the reliability test results of the digital empowerment variable showing that the alpha value is 0.98 (rounded off from 0.982). When compared with the minimum standard for reliability of 0.70 [22], [23], the alpha value of 0,98 is much greater than that standard. Thus, the variable of digital empowerment with all of those question items is reliable.

C. Hypothesis Test

The confirmatory factor analysis (CFA) test is used to test the hypothesis of the study, that is stated:

Awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity are dimensions of digital empowerment.

After the CFA test is carried out, the results of this test are summarized in Table 2 as follows.

TABLE II. CONFIRMATORY FACTOR ANALYSIS OF THE STUDY HYPOTHESIS TEST RESULTS

Item	Value
Kaiser-Meyer-Olkin (KMO) Measure of Sampling	0,895
Significance (Sig.)	0,000
Correlation:	
(AWR) Awareness	0,892
(MTV) Motivation	0,926
(TCA) Technical Access	0,879
(EPM) Empowerment	0,935
(GTF) Gratifications	0,959
(SCU) Social Contractual Utilitarianism	0,951
(SCE) Social Contractual Egalitarianism	0,893
(REO) Real Equality of Opportunity	0,888

The CFA test results show that the value of the Kaiser-Meyer-Olkin (KMO) Measure of Sampling is 0.895. It means that the value is in a large category and is feasible for factor analysis. Interpretation of the KMO value is based on its meaning as follows: (a) the KMO value of less than or equal to 0.500 is unacceptable, (b) the KMO value between more than 0.500 to 0.700 is mediocre, (c) the KMO value between more than 0.700 to 0.800 is good, (d) the KMO value between more than 0.800 to 0.900 is great, and (e) the KMO value more than 0.900 is superb [28].

While it is, the significance value of Bartlett's Test of Sphericity is 0.00 (rounded from 0.000). That value is smaller than the standard correlation value, which the standard value must be less than 0.05. A less than 0.05 means that the level of correlation is significant [23], [28]. It means that the value of 0.00 which is smaller than 0.05 shows that the correlation of hypothesis testing through CFA is accepted. Thus, the meaning is awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity are dimensions of digital empowerment. The significance value of 0.00 can also be seen that the values of these dimensions are already fit with only one component, namely digital empowerment.

D. Digital Empowerment Scheme

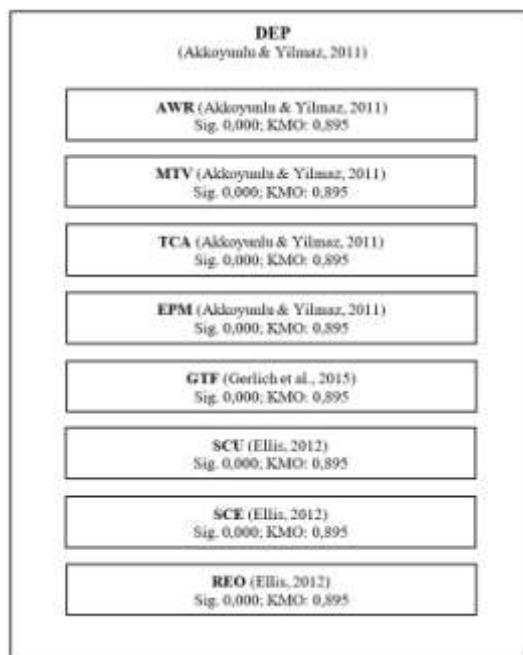


Figure 2. The Schematic of Digital Empowerment Dimensions from Hypothesis Test Results

After seeing the results of hypothesis testing in this study, the digital empowerment scheme can be described as follows (See Figure 2).

E. Discussion and Implication

The result of the CFA test on the research hypothesis shows that there are eight dimensions that have a fit correlation value with digital empowerment. The eight dimensions are sorted from the largest to the smallest correlation, are gratifications (0.959), social contractual utilitarianism (0.951), empowerment (0.935), motivation (0.926), social contractual egalitarianism (0.893), awareness (0.892), real equality of opportunity (0.888), and technical access (0.879).

From the correlation value of the eight ordered digital empowerment dimensions, it can be observed that gratifications dimension is the most dominant dimension because it has the highest correlation value. Gratifications be the dominant dimension in this study, which means high school students have certain goals in choosing digital technology as the most priority. Students have certain goals in selecting applications according to previous studies, which state that applications can be used to obtain education, gain knowledge, spend time, as well as for socialization and interaction [10], [29], [30]. Thus, senior high school students focus on selecting digital technologies that can be used by them to get all the benefits mentioned earlier.

Meanwhile, from describing the demographics of the respondents in this study, 30 senior high school students who become respondents are consists of 11 male and 19 female. The age range of 30 respondents are 16 to 17 years old. In terms of using communication devices, students use cellphones at least 4 (four) hours and at most for 20 hours per day. The most used messaging applications for them are WhatsApp and Line. The most used social media is Instagram, and they use YouTube, Spotify, TikTok, Netflix, and WattPad applications for entertainment. More student own laptops than have desktop computers.

This study has several implications. First, the result of this study is limited to testing only eight dimensions, so it is possible that there are other dimensions of digital empowerment that have not been explored. This study can develop further by adding other dimensions, or can add samples, and enrich the variation of the sample. The second implication, this study prefers a heterogeneous school population, so that further research can also focus on digital empowerment in homogeneous schools. The third implication is that this study is an extension of previous studies on the utility of social contracts that use a different approach. The previous research used a qualitative approach, while in this study it was quantitative. The fourth implication is that this study can be a reference for academics and school management in examining the motivation of students to carry out digital empowerment. By knowing the dimensions of digital empowerment, academics and school management can develop a learning and teaching process based on digital empowerment.

IV. CONCLUSION

This study examines and analyzes eight dimensions of digital empowerment in high school students. The eight dimensions proposed to be tested are a modification of previous studies [1], [10], [11], that are awareness, motivation, technical access, empowerment, gratifications, social contractual utilitarianism, social contractual egalitarianism, and real equality of opportunity. From the CFA test, it was found that the eight dimensions have a correlation value that is fit for digital empowerment. The order of the dimensions based on the highest to lowest correlation value of the CFA test results is gratifications, social contractual utilitarianism, empowerment, motivation, social contractual egalitarianism, awareness, real equality of opportunity, and technical access. From the results of this study, gratifications be the most dominant dimension because students emphasize the choice of digital technology with certain goals being the most priority. Thus, in order for high school students to be more digitally empowered, the opportunity for students to choose and access digital programs and student ownership of digital technology devices should be given more attention. Schools as educational institutions can cooperate with the government and the private sector in providing access and digital technology tools, so that their students can be digitally empowered, able to adapt better, and always responsive to the digital revolution.

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