E-Learning Success Model During Pandemic of Covid-19 in Indonesian High School: Gender Perspectives

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Abstract

Background: *Online learning in educational institutions is a necessity during the Covid-19 pandemic. The application of online education in high schools during the Covid-19 pandemic requires the support of information system technology and the readiness of teachers and students, as well as the role of schools in conducting it. The success of the information system support can be evaluated using the IS Success Model.*

Materials and Methods: *This study analyzes the effect of information quality, system quality, and service quality on e-learning on the performance impact using the Structural Equation Model (SEM). A survey was conducted on 719 high school students in Indonesia, 478 female students, and 241 male students. Gender differences were only proven on a few items using the independent sample t-test. The effect of gender as a moderator was tested in this study using a two-group analysis on SEM.*

Results: *The results of the research using structural equation analysis showed that gender moderate the relationship between service quality and performance impact. The overall models which are analyzed show that only system quality and service quality have an effect on performance impact. The results of the hypothesis test on the female sample are the same as the overall model, while the male sample is only significant in the relationship between system quality and performance impact.*

Conclusion: *Differences in research seen from a gender perspective may be caused by differences in the research context, both time, place, respondent characteristics and the context of information technology.*

Key Word: *IS Success Model; elearning; Covid-19; gender differences.*

I. Introduction

The Covid-19 pandemic, which began at the end of December 2019, has spread to more than 200 countries[1] and caused massive disruption to the academic setting[2]. Educational institutions struggle to continue to carry out their functions, but many of these efforts have not provided the expected results. Referring to the report issued by UNESCO, as of the end of 2020, the number of students affected by the Covid-19 pandemic reached more than 127 million[3]. The traditional learning process in schools or campuses cannot be carried out like before. Strict isolation measures in response to the pandemic have kept students and educators at home thus, disrupting their social life and learning at home can be stressful for students and educators[4].

Learning which was previously carried out face-to-face is now done online[5] and working or studying in the digital space is new to society[6]. All final educational institutions are transforming into the digital world in the implementation of learning, but their digital transformation capabilities are also different. A country's response to educational disruption varies from country to country, including a country's response to the spread of COVID-19[7]. Most education systems did not have much time to prepare for learning from home[8]. The transition to distance learning cannot be managed simply by encouraging the use of technological tools, especially the most advanced ones, to students and teachers[9]. The use of technology in the educational setting requires an adoption stage, starting from socialization or public education on the use of various educational technologies. Educational technologies do not only focus on the use of technological tools, but also relate to the systematic application of resources that scientifically incorporate appropriate pedagogy to transform knowledge and skills effectively[10]. Educational technologies offer many options so teachers must be critical of their application and impact on pedagogy and learning[11].

The educational setting during a pandemic is a research opportunity that can be studied to understand the various behaviors of individuals and institutions. The use of digital devices or the existence of financial pressure in the higher education sector itself is not a new thing, but the fact that the entire university experience has transformed into a digital experience deserves attention[12]. The e-learning system had shown a more phenomenal role than before the COVID-19 crisis[13].

The current pandemic creates a need and opportunity for us as educators to consider best practices to support student learning to keep them thriving in times of crisis and what role student support networks play as part of this[12]. Various lessons learnt or best practices in online learning are expected to increase the effectiveness and efficiency of online learning post-pandemic, because the online learning model will remain a trend in the future. Integrated learning can become an ongoing feature in many classrooms as schools reopen[14]. The educational setting is also required to change, and it is necessary to transform the education ecosystem in the online era. Post-pandemic educational reforms must be transformational and not attempt to return to normal[15].

Schools rarely have policies on gender issues[16]. This study looks at the successful implementation of e-learning at high school in Indonesia during the 'study from home' policy which is massively implemented during the Covid-19 pandemic. The evaluation of the e-learning success uses the IS Success Model which is connected to learning performance with the structural equation model. This analysis is more focused on the differences between male and female students which are presumed can strengthen or weaken the relationship between the three variables in the IS Success Model and learning performance. Understanding the factors influencing student learning during the COVID-19 pandemic, including gender differences, can help educators better adapt their remote classroom teaching in emergencies[17].

Online Education

The COVID-19 pandemic has settled online learning as the "new normal" in Higher Education[18]. Educators worldwide are suddenly turning to remote teaching on an emergency basis in response to the emerging pandemic[19]. The sudden transformation to online learning can inflict serious consequences on the quality assurance of higher education[20]. Online teaching consists of complex tasks that require investment in effective and efficient information technology solutions[21]. Technological support, availability of infrastructure, and perceptions of lecturers and students have a significant relationship with the effectiveness of the online learning process[10]. The effective use of technology for online teaching is not only limited to understanding the functionality of the technology itself[19]. Curriculum materials need to be changed or at least modified to be suitable for teaching using technology[22].

Online learning has been used interchangeably with several similar terms, including "e-learning", distance learning, and "blended learning"[23]. "The electronic learning or e-learning refers to the action of knowledge acquisition through computer network based on the environment"[24]. The definition of online education or learning based on how big the proportion of learning content is delivered online. Online learning shows a minimum proportion of 80% where most or all of the course material is sent online[25]. The distance learning approach has become the only way for institutions worldwide to continue their studies during the Covid-19 pandemic[2]. The massive forced shift to distance learning resulting from school closures during the pandemic has exposed deep inequities regarding families' access to technology[14]. Online education in the context of information and communication technology is related to the concept of e-learning. The application of online education in educational institutions requires adaptation at the institutional and individual levels. This adaptation is needed so that the continuity of the educational process is assured.
The ability to adapt or to change behavior at different individual levels is an interesting topic for research. Distance education in various methods of electronic delivery shows different effectiveness and efficiency. The effectiveness of online classes, particularly in a pandemic, depends on the relationship of triad factors, which are specific infrastructure, student specificity, and educator specificity[10]. The significant expansion of online learning will build on the skills developed by educators and students in times of unsettled pandemics and respond to emerging challenges and structural transformations[11]. Students may encounter or engage with ethical issues that may arise in online learning and examinations. This will form a complex perception of their attitude towards academic integrity and rationalization of inappropriate behavior[26].

The massive forced shift to distance learning resulting from school closures during the pandemic has exposed inequities in families' access to technology[14]. The shift also highlights the limitations of distance learning for many families who have access to technology yet struggle to balance between working inside and outside the home during the pandemic while also supervising their children's education. Being stuck at home with little support is sometimes, especially in less advantaged families, working too hard with little available space, making the students get engaged can be very difficult[15]. Inadequate bandwidth and poor network connectivity are the main obstacles during online learning. Other challenges are the home environment that is not suitable for attending online classes, feelings of isolation and loss of motivation due to lack of face-to-face interaction, and excessive exposure to computer screens which causes fatigue[27].

IS Success Model & Gender Perspectives

The IS Success Model which was first proposed by DeLone and McLean has been updated, after ten years of introduction of the original model which was first published in 1992[28]. The model adds a "service quality" dimension. The DeLone and McLean model consist of 6 dimensions, which are information quality,

system quality, service quality, use, user satisfaction, and net benefits. System quality and information quality have a significant positive effect on user satisfaction and the use of e-learning systems in the United States[29]. Ching & Maarof (2021) used the IS Success Model to see the impact of e-learning on learning outcomes in universities in Malaysia. The results showed that there is a significant relationship between system quality and service quality with student satisfaction and learning outcomes[30]. Gender differences are found both outside and inside schools. This means that both teachers and parents should be made aware of this as a starting point for appropriate action[31]. A study from Thaalan, Shanthi, & Paridi (2012) found that male and female students were generally motivated to engage in e-learning activities. In addition, there is a statistically significant difference in social attendance between male and female students in e-learning activities[32].

II. Material And Methods

A survey was conducted on 719 high school students in Indonesia using online questionnaires distributed from March to June 2021. The school locations were divided into two groups, Java and outside of Java. Differences in perceptions between male and female students for each item on the research variables were tested by an independent sample t-test. The effect of three dimensions of the IS Success Model (information quality, system quality, service quality) on the performance impact was tested using the Structural Equation Model (SEM). SEM is a multivariate technique that combines multiple regression analysis with confirmatory factor analysis to simultaneously estimate a series of interrelated dependence relationships[33]. One of the advantages of SEM is that it can determine the direct and indirect effects of one variable to several other variables using simultaneous equations or structural equations. The research model can be seen in Figure 1.
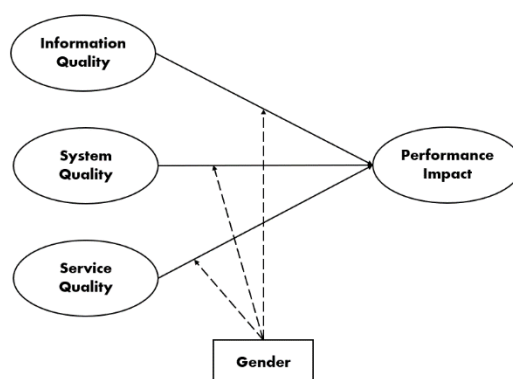

Figure 1. Research Model

The moderating effect of gender is tested with subgroup analysis, namely by analyzing the structural model in each group which are male student group and the female student group. The three exogenous variables refer to the three determinants of the IS Success Model. Information Quality consists of 6 items, Service Quality consists of five items, Service Quality, and Performance Impact consist of ten items. The validity and reliability of the instrument is analyzed with the Confirmatory Factor Analysis, while the hypothesis is tested with the structural equation analysis.

III. Result

Respondents Profile and Description of Research Variables

Research respondents were 719 high school students consisting of 241 male students (33.5%) and 478 female students (66.5%). The number of students whose schools are located in Java Island was 394 people (54.8%) and outside Java was 325 people (45.2%). The number of students who had internet access at home was only 278 people (38.8%), students accessing the internet via cellphones were 558 people (77.6%), and students having a computer at home amounting to 441 people (61.3%). Students who always used search engines every day totaling to 282 people (39.2%), always looking for learning materials on the internet totaling to 280 people (38.9%), always accessing online libraries totaling to 56 people (7.8%), always accessing the school websites totaling to 185 people (25.7%), and always looking for learning materials through social media totaling to 205 people (28.5%). This study focuses on the difference in perception between male and female students in assessing the success of e-learning using the IS Success Model and its impact on learning performance. The differences in perception for each research variable can be seen in the following figures.

Information Quality

The differences in perception between male students and female students for the Information Quality variable are shown in Figure 2.
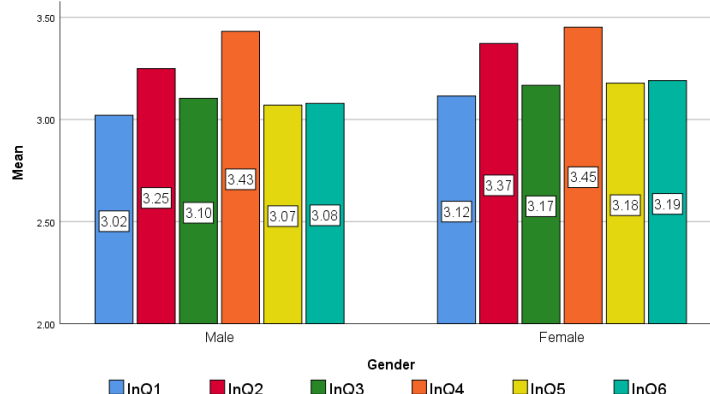

Figure 2. Information Quality

The two indicators with the highest scores are items InQ4 (easy to access) and InQ2 (easy to use), while those with the lowest scores are InQ1 (easy to understand) and InQ5 (information completeness). This shows that the learning materials available in the learning management system still need to be improved so that they are easy to understand and complete in accordance with the expected learning outcomes for each subject. Significant differences in perception between male students and female students were only evident on items InQ2 (ease of use) and InQ6 (relevance). Male students showed lower perceptions for both items.

System Quality

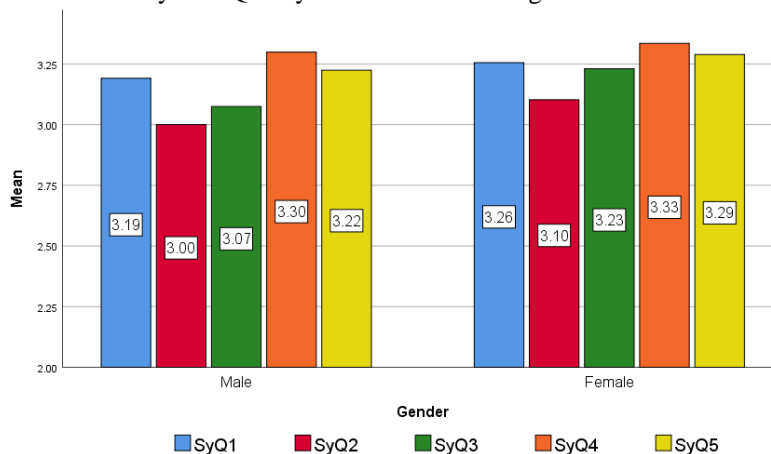The average of five items for the System Quality variable in terms of gender can be seen in Figure 3.

Figure 3. System Quality

SyQ4 (System Adaptation) and SyQ5 (Integration and Consistency) items scored higher than the other three System Quality items. The item with the lowest score is SyQ2 (difficulty in learning through the e-learning system). These findings indicate that technically, the e-learning system is very satisfactory, but students find it difficult to understand subjects by relying on an online system. The difficulty in understanding learning materials by relying solely on learning from home through e-learning becomes the biggest challenge. This requires the creativity of teachers in designing digital content that may be accessed through e-learning. Only SyQ3 items (required features for learning) showed significant differences between male and female students. Female students tended to score higher on the completeness of features which suit their learning needs.

Service Quality

Service Quality is measured by five items with its averages of difference in terms of gender presented in Figure 4.
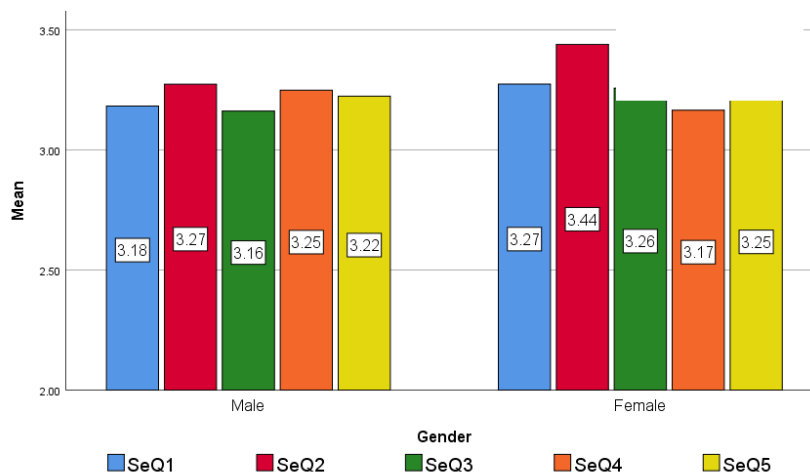
Figure 4. Service Quality

The SeQ2 item (attractive design) is the Service Quality item which has the highest score, while the other four items are relatively equal, viewed both from the perceptions of male students and female students. Female students showed considerably higher scores than male students with a significant difference test. The item with the lowest score for male students is SeQ3 (reliability), while the lowest item for female students is SeQ4 (learning difficulty).

Performance Impact

The endogenous variable in the Structural Equation Model is Performance Impact which is measured by ten items. The differences in the average scores by gender are presented in Figure 5.
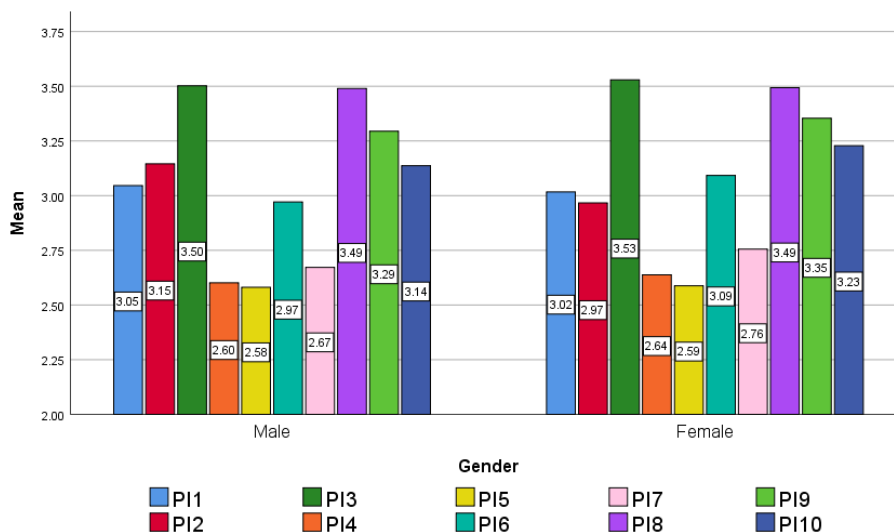

Figure 5. Performance Impact of E-Learning

Performance Impact shows a relatively fluctuating score for each item. The two items with the highest scores are PI3 (cost savings) and PI8 (new knowledge). The three items which have the lowest scores are PI4 (improving achievement), PI5 (learning effectiveness), and PI7 (learning target). This finding is in accordance with the notion that learning from home has yet to succeed in achieving the learning outcomes which have been established. The simultaneous and sudden implementation of learning from home policies causes the various parties to start without preparation, either the teachers, students, or schools as e-learning managers. E-learning is considered ineffective, does not support improved achievement, and unable to meet learning targets. These student perceptions shall be considered in planning e-learning in the future, including how the system is designed and its pedagogical aspects. Significant difference in average scores between male and female students is only evident in item PI2 (saving energy and mind). Female students tended to judge that the use of e-learning is more energy and thought-consuming than male students.

Confirmatory Factor Analysis and Goodness of Fit

The first stage in the analysis of the structural equation model is the measurement of reliability and validity of the measurement items or the analysis of the measurement model. The measurement of reliability and validity uses Confirmatory Factor Analysis for the four research variables. The results of these measurements are presented in Table 1.

Table 1. Confirmatory Factor Analysis

No.	Variable	Item	Mean	S.D.	Loading	Cronbach α	AVE	CR
1. .	Information Quality	InQ1	3.0834	.8168	.771	0.858	0.8953	0.5890
		InQ2	3.3310	.7475	.820			
		InQ3	3.1460	.7136	.834			
		InQ4	3.4451	.7807	.787			
		InQ5	3.1419	.8000	.718			
		InQ6	3.1530	.6792	.661			
2.	System Quality	SyQ1	3.2337	.8384	.829	0.875	0.9098	0.6688
		SyQ2	3.0682	.9169	.836			
		SyQ3	3.1780	.7980	.826			
		SyQ4	3.3227	.7622	.814			
		SyQ5	3.2670	.6989	.783			
3.	Service Quality	SeQ1	3.2434	.7393	.789	0.834	0.8831	0.6545
		SeQ2	3.3839	.7557	.846			
		SeQ3	3.2253	.7644	.854			
		SeQ4	3.1933	.9051	-.427			
		SeQ5	3.2420	.7388	.742			
4.	Performance Impact	PI1	3.0264	.8788	.659	0.881	0.9051	0.5154
		PI2	3.0264	.9635	.671			
		PI3	3.5202	.9422	.495			
		PI4	2.6259	.8787	.718			
		PI5	2.5855	1.0045	.781			
		PI6	3.0515	.9165	.719			
		PI7	2.7274	.8645	.778			
		PI8	3.4924	.8798	.682			
		PI9	3.3338	.8893	.716			
		PI10	3.1975	.8559	.727			

SeQ4 items on the Service Quality variable and PI3 items on the Performance Impact variables were not included in the main research model because their reliability and/or validity were low. After dropping the unreliable and invalid items, the CFA results showed high reliability and validity of the measuring instruments as seen from Cronbach's alpha, AVE, and CR which are higher than the reference mentioned by Hair et al. namely loading factor, Cronbach's alpha, and CR which are greater than 0.7[34]. Disruption of validity occurred in the Information Quality and Performance Index variables with CR values below 0.6. Provided that the CR value is still above 0.5, the CFA results are used for further analysis, namely structural model analysis for hypothesis testing. This study analyzed three empirical models, which are the structural model for the entire sample, as well as two structural models in terms of gender to examine the moderating effect of gender. All goodness of fit parameters from this empirical model are close to the saturated model which indicates the structural model to be relatively good.

Structural Model

The first model is a research model for the entire research sample regardless of gender, as shown in Figure 6.
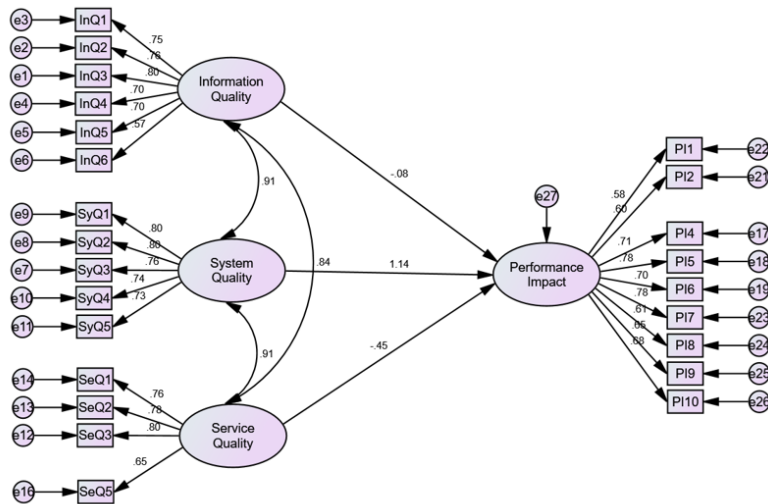
Figure 6. Structural model for the total sample

The next structural model analysis is conducted by looking at the influence of gender, namely by analyzing the structural model in the male or female group only. The two structural models are shown in Figure 7 for men and Figure 8 for women.
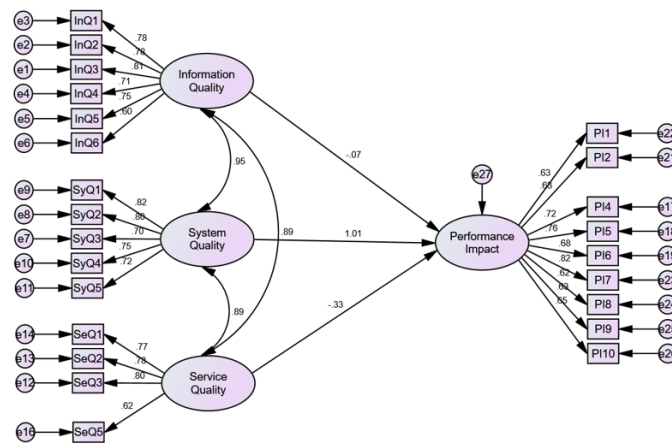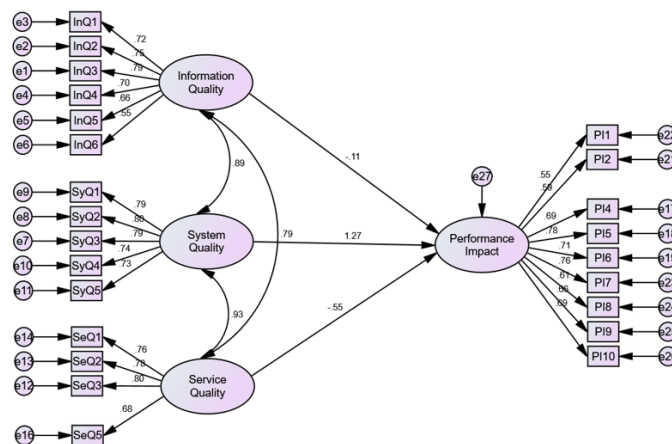

Figure 7. Structural Model for male students

Figure 8. Structural Model for female students

Moderating effect of gender may be seen by comparing the hypothesis test results of structural model for men with the structural model for women. The summary of such comparison is shown in Table 2.

Table 2. Results of gender influence as moderator

No.	Hyphotesis			Male		Female		Remark
				Estimate	P	Estimate	P	
1.	InQ	→	PI	-0.075	0.849	-0.114	0.521	No moderated
2.	SyQ	→	PI	1.178	0.011	1.219	***	No moderated
3.	SeQ	→	PI	-0.304	0.122	-0.594	0.022	Moderated

IV. Discussion

The technological context observed in this study is information and communication technology applied in education, or specifically in online learning or e-learning. There are various models or platforms for online learning, including social media which may be used to support online learning. Various online learning platforms are also at the present increasingly to be user-friendly and adaptive to the learning style of the learners. Access to online learning systems via mobile is also a consideration for developers of learning technology. Mobile-based learning or mobile technology in fact has only become common and ubiquitous in the last twenty years through increased connectivity, functionality and portability of mobile devices[5]. This research is more focused to e-learning, namely online learning that is able to be accessed by students through gadgets or computers in their respective homes

The results of the hypothesis test for overall model indicate that only two variables from the IS Success Model determinant which affect the performance impact, namely System Quality and Service Quality. The influence of system quality is greater than service quality. The anomaly shown in the results is that the higher the service quality, the lower the performance impact. This condition may be due to the condition of service quality which on average was still quite low compared to the other two variables. Users who were fairly proficient felt that the service quality must still be improved, despite the fact that students who gave lower rate to service quality also had a higher performance impact. This condition shows that school students who catch a higher impact of e-learning still in fact perceive that the service quality of e-learning in general has to be improved. Service quality is fundamental when learning services require complete services or support during the pandemic because student interaction with the e-learning system is entirely conducted 100% via in the internet through online services. The results of the analysis when related to the context of the pandemic may refer to the research by Ho et al. (2020) which stated that interaction is crucial in the system in order for learners and educators to be able to continue communicating in an effective manner through the online system. Furthermore, social support plays an important role in student's attitudes during their participation in online learning to be able to achieve learning goals or achievements[35].

Based on the comparison of the structural model for men and the structural model for women above, it is evident that there is a moderating effect of gender on the relationship between service quality and performance impact. The summary can be seen from the results of the hypothesis testing of the two sample groups which show differences in decisions where the male sample is not significant while the female sample is significant. Females know less about information technology, enjoy using the computer less than male students, and perceive more problems with software[31]. Possible causes of this are differences in parental support, access to computers, amount of female role models and activities carried out with computers in school.

The difference between this study and other studies is viewed from the latent variables, or without looking at the value of each item. If regarded per item of each variable, differences in perception between men and women still occured, as in the previous descriptive analysis. There are differences between men and women who focused more on social presence in online learning activities[32]. Female students who were more involved with their learning communities achieved better results. These results are in line with the research from Morante et al. (2017) which showed that female students who were more involved with their learning communities achieved better results[36]. The difference between the last two studies and this research lies in the method of analysis. This study places gender as a moderator that affects the relationship between the two other variables, while previous studies use a difference test and regression analysis that places gender as an independent variable. Another study that used an independent sample test during a pandemic was conducted by Liu et al. (2021). The study showed that there are gender differences in SROL (Self-Regulated Online Learning) in high school students during the COVID-19 lockdown[37]. A research of gender using structural equation analysis was carried out by Correa et al. (2015) for the acceptance model of e-learning which referred to the Technology Acceptance Model, while this research refers to the IS Success Model[38]. The results of the previous research showed that there are statistically significant differences between men and women when adopting an e-learning platform.

V. Conclusion

The Covid-19 pandemic has indeed changed the world of education, which is forced to implement learning from home system using various technology platforms. This emergency or forced situation allows everyone to have the ability to adapt or accelerate in the use of different information technology, including when

regarded from a gender perspective. The results of the research using structural equation analysis showed that gender moderate the relationship between service quality and performance impact. The overall models which are analyzed show that only system quality and service quality have an effect on performance impact. Different results were shown when the samples were disaggregated by gender. The results of the hypothesis test on the female sample are the same as the overall model, while the male sample is only significant in the relationship between system quality and performance impact.

Differences in research seen from a gender perspective may be caused by differences in the research context, both time, place, respondent characteristics and the context of information technology. Research from Yu (2021) did not show significant differences between men and women in terms of the impact of online learning as well[39]. Gender differences in online learning outcomes tend to be inconsistent and even paradoxical. Such matter requires further research, in particular on what aspects of technology still indicate differences between genders. Gender difference in the use of technology may also be viewed from differences in generations of the research sample and differences in countries that have different characteristics at the individual level, as well as differences in social and cultural backgrounds[40].
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