

Student satisfaction on the implementation of the online undergraduate thesis examination: a PLS-SEM analysis

PLS-SEM
analysis

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Abstract

Purpose – The covid-19 pandemic that hit the world has caused several changes in the higher education service sector, including the implementation of the undergraduate thesis examination, where direct interaction between students and examiners is avoided and replacing it with an online bachelor thesis exam. This study aims to develop a conceptual model regarding the variables that can affect student satisfaction with the quality of the implementation of online undergraduate thesis examinations in higher education.

Design/methodology/approach – The research instrument consisted of 22 survey questions distributed to 583 students taking the thesis trial examination in the even semester of 2019/2020 who came from 12 different study programs. Factor analysis and structural equation modeling (SEM) were conducted to analyze the validity of the instrument and test the hypothesis. The results of the analysis show that the 22 instrument items used have been determined by sufficient variables to check the structure of each.

Findings – SEM analysis results show that the three hypothesized variables (study program service, examiner performance and quality of video conference applications) positively and significantly affect the level of student satisfaction with the online undergraduate thesis examination 0.187, 0.177 and 0.177, respectively. The total effect of these three factors is 0.737.

Research limitations/implications – This finding is a reference for those who want to improve the quality of the online undergraduate thesis examination in higher education.

Originality/value – As the online thesis examination was implemented in higher education in Indonesia as a result of the implementation of the study and work at home policy by the Indonesian Ministry of Education, it is important to conduct research on the implementation of online thesis exams in Indonesia, especially to study the conceptual model of variables affect student satisfaction with the implementation of the online thesis exam. Because even though the implementation of online thesis exams on a large scale is new to some higher education in Indonesia.

Keywords Online undergraduate thesis examination, Student satisfaction, Service quality, Examiner performance, Video-conferencing

Paper type Research paper

1. Introduction

In higher education, the thesis has been a central element as well as a formal requirement of undergraduate programs for more than a century (Rennie and Brewer, 1987; Wong, 2010). In most universities around the world, a bachelor thesis is a compulsory final step toward graduation in higher education and, thus, is the main key for further study as well as jobs



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requiring a higher education degree (Nouri *et al.*, 2019). As with many higher education institutions in the world, almost all tertiary education institutions in Indonesia also make thesis preparation a requirement for graduation from the undergraduate level.

The writing of the undergraduate thesis begins with determining the research theme, then enters the process of conducting research and compiling a report. A student is usually guided by one or two supervisors who serve as supervisors of the student's written thesis. After going through a process of review and guidance by a supervisor, a thesis will go through a testing process. In this thesis examination, students must present and defend their thesis in front of a team of examiners consisting of advisors and external examiners. The presence of external examiners is intended to minimize the possibility of biased test results (Tinkler and Jackson, 2000). The results of the Christian thesis exam will determine whether a student has passed or not and will be an important factor in determining the grade point average (GPA) achieved by students.

The thesis examination is generally carried out orally and face to face in front of the examiner team. This is so that students can show that they have the knowledge, skills and abilities needed by providing complete answers to each question (Buchwald and Schwarzer, 2010). Oral exams allow two-way interaction between examiners and students which allows examiners to explore the competencies of the students being tested. However, the Covid-19 pandemic that hit the world has caused several changes in the higher education service sector, including in the implementation of thesis examinations, where direct interaction between students and examiners is avoided and replacing it with an online thesis examination system.

In Indonesia, before the Covid-19 pandemic, online thesis exams were very rare or even never been done in higher education. With the start of the large number of higher education institutions in Indonesia that carry out online thesis exams as one of the consequences arising from the implementation of the study and work at home policy by the Indonesian Ministry of Education during the Covid-19 pandemic, we feel the need to conduct research on the implementation of online thesis exams in Indonesia, especially to examine the conceptual model of the variables that affect student satisfaction with the implementation of online thesis exams which is new to most higher education in Indonesia. The student satisfaction variable was chosen as a benchmark because after all educational institutions are a service system with students as the core customers (Ostrom *et al.*, 2011), who must get the best service in various aspects (Hanover Research, 2015) including the thesis examination system, online which was just introduced to students.

In the implementation of the online thesis exam, there are at least three aspects that have changed from the conventional system to the online system, namely, the quality of higher education services for thesis exam participants, the performance of the examiners in the implementation of the online thesis exam and the reliability of the video conference platform chosen as the virtual thesis examination room. In this study, these three things will be studied theoretically to see how these three things transform from conventional systems to online systems. In the analysis section, hypothesis testing will be carried out whether the three aspects that have changed to the online system can form a conceptual model that affects the level of student satisfaction with the implementation of the online thesis examination they are taking.

2. Literature review

Based on the previous reasons, we then reviewed the relevant literature regarding the concept we proposed, the quality of service in higher education, the performance of the examiners and the quality of the video conference platform used on student satisfaction with

the online undergraduate thesis exam. We also introduce our theoretical framework in Figure 1.

2.1 Student satisfaction

By assuming that high education is a service institution with students as customers (Gremler and McCollough, 2002; Hill, 1995), student satisfaction with the quality of higher education services can be perceived as customer satisfaction. Customer satisfaction can be seen as a general assessment of the services provided based on the experiences gained during the provision of services (Anderson *et al.*, 1994), where services meet several needs, wants goals (Oliver, 1999). It is a cumulative concept, rooted in assessments made based on comparisons of services with standards (Rojas-Méndez *et al.*, 2009).

By referring to the definition of satisfaction above, if we expand it to the description of student satisfaction with higher education, then student satisfaction can be defined as a preference that is subjectively evaluated by students based on results and experiences related to education (Gruber *et al.*, 2010). Current research findings reveal that student satisfaction has a positive impact on fundraising and student motivation (Elliot and Shin, 2002) and can attract other students to take courses at university (Helgesen and Nettet, 2007; Navarro *et al.*, 2005).

In this study, we describe the level of student satisfaction with the implementation of the online thesis exam, which involves the quality of online services before the exam begins and the use of video conferences involving participants and examiners during the exam. Based on the above understanding, it is related to student satisfaction with the implementation of online thesis examinations, we can use the approach of student satisfaction with the quality of higher education services and student satisfaction with the ICT system used. Based on this, there are three aspects that are thought to affect student satisfaction with the implementation of online thesis exams, higher education service quality, examiner performance and the reliability of the selected video conference platform which are described as a conceptual model as shown in Figure 1.

The research model proposed shows the direction of the relationship between the hypothesized variables to be tested. We predict these three variables as aspects that will

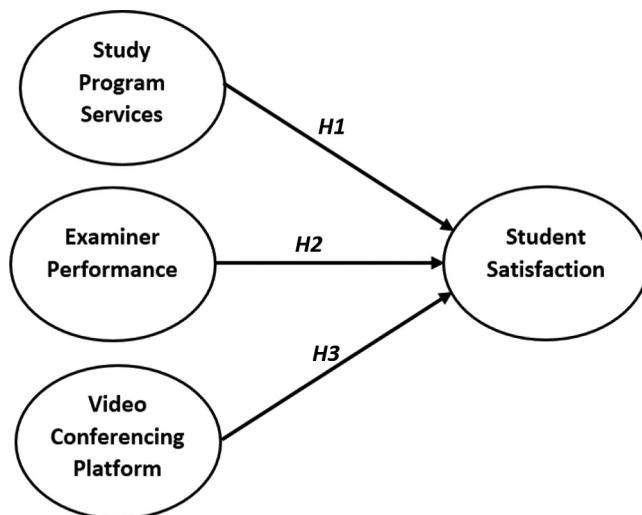


Figure 1.
Conceptual model of
student satisfaction
in the online
undergraduate thesis
examination

affect the level of student satisfaction because these three aspects directly come into contact with students and the effect will be felt by students which will affect their perceptions of organizing online thesis exams.

2.2 Higher education services quality

One approach that can be used by higher education to study students' perceptions of quality is the service quality approach. It stems from service marketing, a sub-discipline within the domain (Clewes, 2003). Based on this point of view, quality can be defined as a measure of how well the level of service provided is in accordance with customer expectations (Grönroos, 1984; Parasuraman *et al.*, 1985). Service quality can also be defined as the result of a comparison of expectations with perceptions of performance (Parasuraman and Zeithaml, 1988). When applied to the context of higher education, service quality can be defined as "the difference between what students expect to receive and their perceptions of actual delivery" (O'Neill and Palmer, 2004) and if defined more specifically in the context of online learning systems, service quality in the context of online learning includes instructor responsiveness and technical support provided by universities (Freeze *et al.*, 2010).

The marketing principle which suggests that the company's strategy must be in accordance with consumer needs has not been seen as a factor affecting higher education at first (Gallifa and Batallé, 2010). However, this view began to change when there was literature stating that quality services had a major impact on higher education (Harvey and Green, 1993) and now the quality of education services has become a major problem in higher education worldwide (Zafropoulos and Vrana, 2008).

The best known and widely used instrument for measuring service quality is the SERVQUAL scale (Parasuraman and Zeithaml, 1988). In this scale there are five indicators that can be measured to describe a quality of service:

- (1) Tangibles. Includes physical facilities, facilities and personnel appearance.
- (2) Reliability. Includes the ability to perform the promised services reliably and accurately.
- (3) Responsiveness. Includes a willingness to help and provide service quickly.
- (4) Assurance. Covers the level of knowledge about employee service and courtesy and the ability to convey trust and confidence.
- (5) Empathy. Covers the care and attention the institution gives to its customers.

In this study, the five indicators of higher education service quality are adopted to the service quality of the study program in providing information services to students taking online thesis examinations:

- H1.* The service quality of study program has a positive and significant effect on student satisfaction with the online undergraduate thesis exam

2.3 Thesis examiner performance

In several sources, there are terms used to describe the "final thesis" such as final tests, theses, papers, dissertations, work projects and graduation projects which all refer to the final project in a higher education program (Meeus *et al.*, 2004). The undergraduate thesis is usually carried out in a research project consisting of several stages where students must conduct a literature review, compile a research plan, collect and analyze their data and, finally, present their findings in a thesis exam (Jiang and Yan, 2019). Through thesis

writing, it is hoped that students will develop competencies for developing critical thinking, empirical research literacy and synthesis of knowledge and assessment of the truth of information (Nouri *et al.*, 2019).

Very little literature regarding the Bachelor's thesis is available. Most of the literature on the thesis is dominated by the master thesis and doctoral thesis. However, one general trend is very clear, the undergraduate thesis is in most cases a derivative of the Master's thesis, so the guide for the master's thesis is suitable for the undergraduate thesis (Meeus *et al.*, 2004). In this literature review, we will use some literature regarding the doctoral thesis and master's thesis as a reference for the implementation of the undergraduate thesis examination, especially in the aspect of the role of the thesis examiner.

The thesis examiner is an important role in the implementation of the thesis exam. Because a thesis is a "work in process," examiners can play a dual role as gatekeepers (summative) and as teachers (formative) to ensure that disciplinary standards are maintained and the institution's quality assurance requirements are met (Kumar and Stracke, 2018). In carrying out the summative role, the examiner will make a decision whether a thesis can be accepted, revised or rejected, while in carrying out the formative role, the examiner must provide feedback that aims to help students revise their thesis. Providing feedback is a central aspect of the role of lecturers in higher education (Irons, 2007), making feedback an integral part of the thesis exam leads to assessments for learning at the higher education level to continuously improve the quality of the thesis (Kumar and Stracke, 2018).

We find it difficult to find literature that specifically provides indicators that show the role that a thesis examiner should play in a research instrument. However, based on a review of some of the literature that we have obtained, there are at least several aspects that must be possessed by thesis examiners that can affect the thesis examination process experienced by students, including the skills of asking questions and communicating with students (Carter, 2008), examiners' expertise in the subject area. thesis (Bourke and Holbrook, 2013), the examiner's experience in guiding the thesis (Powell and Mccauley, 2003), sufficient wisdom and humanity in developing student experiences (Joyner, 2003), being fair in their assessment (Kiley, 2009) and providing useful recommendations for improving the quality of the thesis (Bourke *et al.*, 2004). However, the performance shown by the examiner both in terms of expertise and in terms of personality at the time of the thesis examination will bring comfort to students and improve the quality of the thesis to achieve the quality assurance of the institution:

- H2. Thesis examiner performance has a positive and significant effect on student satisfaction with online undergraduate thesis examinations.

2.4 Web video-conferencing for synchronous online oral exams

Even though the development of online distance learning systems in higher education leaves one problem related to the quality assurance that is produced (Gaytan, 2005; Robles and Braathen, 2002), the implementation of online learning is developing in every higher education. This is caused the application of online learning has helped education providers improve the efficiency and effectiveness of services (Park and Lim, 2015; Puzifferro and Shelton, 2008).

In an online learning system, online assessment is always a challenge (Liu and Chen, 2018). Educators have studied a variety of methods for conducting online assessments. Over the years, instructors have devoted a great deal of work to online assessments (Barber *et al.*, 2015), exploring ways such as online quizzes (Lowe, 2015), online discussions (Kent *et al.*, 2016)

learning analysis to assess online learning (Nyland *et al.*, 2017) or online video conferencing (Dyment and Downing, 2018) Most of the methods and activities presented in the literature are in the scope of asynchronous assessment; there are little research and practice in the field of online synchronous assessment (Chao *et al.*, 2012), one of which is by using web videoconferencing (Liu and Chen, 2018).

In the field of assessment, the use of video conferencing platform applications is usually used for oral examinations as can be done in job interviews (Kroeck and Magnusen, 1997) and college entrance interviews (Tiller *et al.*, 2013). The advantages of using a video conferencing platform for oral exams apart from overcoming distance and time barriers by offering the opportunity to connect a group of participants who occupy different locations through the use of modern telecommunications networks (Mujacic *et al.*, 2014) also simplify the assessment process due to the presence of a recording feature so that the examiner can replay the test results (Kim and Craig, 2012).

Several video conferencing platforms are now developing better with the presence of several features that support the educational process such as presentation features, file sharing and other interactive features. These features can be used to carry out assessments such as oral exams, presentation performance assessments or video product assessments. Evaluation findings reveal that through web conferencing, even students at long distances feel involved and connected in evaluation activities better (Reushle and Loch, 2008).

In addition to assessment purposes related to learning, in higher education, the use of videoconferencing platforms can also be used to carry out thesis exams considering the process is a combination of presentation performance appraisals, interviews, oral examinations and even assessments in the form of video or modeling products. Research on the effectiveness of using the videoconferencing platform for thesis exams is still rarely done, but considering the characteristics of the trial examination implementation previously mentioned, it is possible to use it. In this study, it will be revealed how the level of student satisfaction with the implementation of the online thesis exam where one of the variables to be measured is the quality of the video conferencing web used. In connection with the quality of an online system, there are seven main indicators that show the quality of an online system:

- (1) provides high availability,
- (2) easy to use,
- (3) user-friendly,
- (4) provides interactive features between users and system,
- (5) provides a personalized information presentation,
- (6) attractive features to appeal to the users and
- (7) provides high-speed information access (Wang *et al.*, 2007).

In the context of this research, the video conference application that is used as a virtual space for organizing online thesis exams is a zoom meeting application:

- H3.* The quality of the video conference has a positive and significant effect on student satisfaction on the implementation of the online undergraduate thesis exam

3. Method

3.1 Research design and participants

Data collection was carried out by quantitative methods through field surveys of students who took online thesis trial exams in the even semester of 2019/2020. The data collection

period is September 2020 to October 2020. In general, the sampling method used is non-probability with a purposive sampling technique, where the purpose of sampling begins when the researcher identifies the research problem so that the source of information to be used can be found (Sekaran and Bougie, 2019). Besides the nature of the problem, the reasons for choosing purposive sampling compared to probability sampling techniques are due to its simplicity, rules and costs (Bagozzi and Yi, 2012). In addition, it is easier to collect data because of the rules set by the university where every student who has completed an online thesis exam is required to complete a survey. Overall, 768 students filled out the questionnaire and after processing the information only 583 valid survey data were used in the final data analysis. The sample demographics are shown in Table 1.

Most of the data in our study are dominated by a female because our higher education is teacher education and the tendency for women to choose a career as a teacher is greater than that of men. Then based on the study program, the percentage shown is in accordance with the composition of the ratio of the number of students in our higher education where the primary school education program is the favorite program in our higher education so that it has the largest number of students compared to other programs.

3.2 Measures

A six-point Likert-type scale was used to measure all constructs in the proposed conceptual model. The questionnaire was used to explore quantitative data on student perceptions of online exam implementation satisfaction (SS), study program service quality (SPS), examiner performance (EP), video conference application quality (VCP). SS perceptions were evaluated using the student satisfaction approach to higher education (Teeroovengadum *et al.*, 2019) which consists of five indicators, namely, wise choice, according to expectations, correct choice, enjoy the process and happy experience. We adapt the five indicators to the context of student satisfaction with the implementation of the online thesis exam.

We measure SPS by adapting the SERVQUAL scale (Parasuraman *et al.*, 1985; Parasuraman and Zeithaml, 1988) which consists of five indicators, namely, tangibles, assurance, responsiveness, empathy, reliability. We adapt the five indicators of service quality to the context of online services provided by study programs to online thesis exam

Category	Frequency	(%)
<i>Gender</i>		
Male	91	15.6
Female	492	84.4
<i>Programs</i>		
Counseling guidance	54	9.3
Indonesian language education	64	11.0
English education	41	7.0
Japanese education	18	3.1
Biology education	49	8.4
Economic education	55	9.4
Physics education	17	2.9
Geography education	7	1.2
Mathematics education	58	9.9
History education	29	5.0
Early childhood education	26	4.5
Primary school education	165	28.3

Table 1.
Demographics

participants before the exam process is carried out starting from the registration process, providing information, determining schedules to complain services against problems faced by students.

To measure EP, we did not find a scale set that suited the needs of this study, so we built a scale based on indicators compiled from several articles examining the role of trial examiners so that we succeeded in building an EP scale consisting of six indicators, namely, questioning and communication skills (Carter, 2008), expertise in the field of the thesis subject (Bourke and Holbrook, 2013), examiner's experience in guiding the thesis (Powell and Mccauley, 2003), sufficient wisdom and humanity (Joyner, 2003), being fair in their assessment (Kiley, 2009) and provide useful recommendations (Bourke *et al.*, 2004).

Finally, we measure PVC using a quality scale of an online system (Wang *et al.*, 2007) which consists of seven indicators, namely, high availability, easy to use, user-friendly, interactive features, personalized information and high-speed access. The seven indicators are used to assess the extent of students' perceptions of the quality of the zoom meeting application which is used as an online thesis examination application. Before the scale built was empirically tested and used to collect data, all items were reviewed by experts in the field of educational supervision and assessment. An overview of all constructs and items is presented in the [Appendix](#)

3.3 Data analysis

Partial least squares (PLS) structural equation modeling-variance based (SEM-VB) was used to test the research model using SmartPLS 3.0 software (Ringle *et al.*, 2015). PLS SEM-VB is a variance-based approach that uses total variance to estimate parameters (Hair *et al.*, 2017). The authors prefer PLS-SEM in this study for the following reasons and its use is consistent with the following recent studies in leading journals (Carranza *et al.*, 2020; Chin *et al.*, 2020; Raza *et al.*, 2020; Wan *et al.*, 2020).

- PLS-SEM has a high level of statistical power compared to CB-SEM. This means that PLS-SEM is more likely to identify such significant relationships that exist in the population.
- PLS is higher statistical power makes it easier to investigate theory development for exploratory research (Hair *et al.*, 2019), which is the case for this study.
- This research model is prediction-oriented, which aims to provide a causal explanation between the online thesis examination system (quality of study program service, examiner performance and quality of videoconferencing applications) on student satisfaction.
- PLS-SEM is suitable for identifying models consisting of many constructs and items. In this study, there were three constructs and 22 items, so that PLS-SEM was preferred.

The data analysis process consists of two stages, namely, the assessment of the measurement model and the assessment of the structure of the model. Assessment of the measurement model aims to analyze the validity and reliability of the measurement instruments used, while the assessment of the structure model is used to test the hypothesized structural model.

4. Result

4.1 Measurement model

Assessment of the measurement model aims to analyze the validity and reliability of the instruments used. To test the construct validity, confirmatory factor analysis (CFA) was

used, which consists of convergent validity and discriminant validity. Convergent validity is a measure of the extent to which several specific construct variables gather together and share the same proportion to form high variance (Hair *et al.*, 2014) or in other words, convergent validity is a measure that shows that a set of indicators represents one latent variable. The measure of convergent validity can be seen from the loading factor, average variance extracted (AVE) and composite reliability (CR) (Hair *et al.*, 2014).

Based on Table 2, the results show that there are all constructs that have outer loading values ranging from 0.714 to 0.888, which exceed the proposed value of 0.7 (Kannan and Tan, 2005). Then the AVE value shows a variation in the value between 0.649 and 0.715, which also exceeds the proposed value of 0.50 (Bagozzi and Yi, 1988; Fornell and Larcker, 1981; Hair *et al.*, 2017). Then the CR value ranges from 0.902 to 0.938, which also exceeds the proposed value of 0.7 (Gefen *et al.*, 2000; Kline, 2011; Werts *et al.*, 1974). Based on these results, it can be seen that all the indicators of convergent validity have been fulfilled because the loading value, AVE, CR and Cronbach alpha exceed all the parameters, so it can be concluded that all construct items are valid instruments in constructing each latent variable.

Apart from convergent validity, another measure that shows construct validity is discriminant validity. Discriminant validity is the extent to which a construct is completely different from other constructs (Hair *et al.*, 2010). Technically, discriminant validity requires that a construct is not highly correlated with other constructs (Campbell, 1960). If discriminant validity is not seen as a construct measure condition, when there is a high correlation between the two variables, the researcher cannot be sure that the hypothesized structural pathway actually occurs or is simply the result of statistical differences (Farrell, 2010). Discriminant validity includes the Heterotrait-Monotrait ratio and Fornell and Larcker Criterion.

Construct	Item code	Item	Outer loading	AVE	CR
Study program services (SPS)	SPS1	Tangibles	0.801	0.649	0.902
	SPS2	Assurance	0.714		
	SPS3	Responsiveness	0.863		
	SPS4	Empathy	0.850		
	SPS5	Reliability	0.793		
Examiner performance (EP)	EP1	How to ask questions	0.784	0.705	0.935
	EP2	Wisdom and sufficient humanity	0.853		
	EP3	Subject Expertise	0.861		
	EP4	Experience as supervisors	0.860		
	EP5	Fair in judgment	0.860		
	EP6	Provide recommendations	0.818		
Video conference platform (VCP)	VCP1	High availability	0.792	0.715	0.938
	VCP2	Easy to use	0.885		
	VCP3	User-friendly	0.888		
	VCP4	Interactive features	0.869		
	VCP5	Personalized information	0.825		
	VCP6	High-speed access	0.809		
Student satisfaction (SS)	SS1	Wise choice	0.857	0.713	0.925
	SS2	According to expectations	0.856		
	SS3	Correct choice	0.883		
	SS4	Enjoy the process	0.787		
	SS5	Happy experience	0.837		

Table 2.
Convergent validity

Table 3 shows the value of the heterotrait-monotrait ratio, which is the average heterotrait-heteromethod correlation relative to the average monotrait-heteromethod correlation (Hair *et al.*, 2017; Henseler *et al.*, 2014). Based on Table 3 it appears that the Heterotrait-Monotrait (HTMT) ratio value is in the range 0.302 to 0.556, which is in accordance with the required criteria that the HTMT ratio value must be <0.85 because the HTMT value is more than 0.85 indicating a lack of discriminant validity (Kline, 2011).

Table 4 shows the Fornell and Larcker criterion values where the values listed on the thick diagonal are the root of the AVE value, while the remainder is the correlation coefficient (*r*). Based on the Fornell and Larcker criterion value, the condition for discriminant validity is when the AVE square root value of the latent variable must be higher than the correlation between the latent variable and all other variables (Chin, 1998; Fornell and Larcker, 1981). Based on the values listed in Table 4, it appears that the root value of AVE (skewed data) shows a higher value than the other values so that it can be concluded that the discriminant validity is met.

Based on the results of testing on all instruments used with CFA, it is found that all the required criteria for both convergent validity and discriminant validity have been fulfilled so that it can be concluded that the instrument used in the study can be used to test the proposed model hypothesis.

4.2 Testing the hypothesized models

To test the hypothesized structural model, the standard values of beta (β), R^2 and *t*-values can be used through the bootstrap procedure with a 5,000 repeat sample (Hair *et al.*, 2017).

Figure 2 and Table 5 illustrate the results of the structural model testing showing the results of hypothesis testing. The SEM analysis results show that the three hypothesized variables (study program services, examiner performance and video conferencing platform) positively and significantly affect the level of student satisfaction in participating in the online thesis trial. Based on the results, *H1*, *H2* and *H3* were accepted with ($\beta = 0.334, t = 9.438$), ($\beta = 0.304, t = 6.641$) and ($\beta = 0.329, t = 6.513$).

On the R^2 value, it can be concluded that the combination of Study program services, Examiner performance and Video conferencing platforms affects the level of student satisfaction in taking the online thesis exam by seven (33%, this effect is in a Large category (Cohen, 1988).

Table 3.
Discriminant
validity: HTMT ratio

Construct	SPS	EP	VCP	SS
SPS				
EP	0.704			
VCP	0.775	0.719		
SS	0.848	0.811	0.836	

Table 4.
Discriminant
validity: Fornell and
Larcker criterion

Construct	SPS	EP	VCP	SS
SPS	0.806			
EP	0.633	0.840		
VCP	0.700	0.661	0.845	
SS	0.757	0.733	0.763	0.845

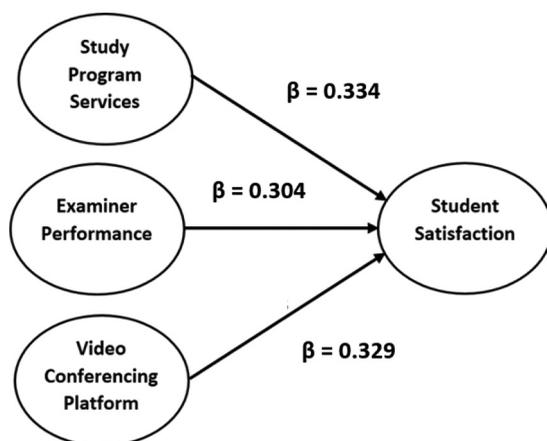


Figure 2.
Structural model
assessment

Hypothesis	Path	STd. beta	STd. error	t-value	Bias	Convidence interval		Decision	R ²
						5.00%	95.00%		
H1	SPS → SS	0.334	0.035	9.438	-0.001	0.278	0.394	Supported	0.727
H2	EP → SS	0.304	0.046	6.641	0.004	0.229	0.379	Supported	
H3	VCP → SS	0.329	0.05	6.513	-0.003	0.248	0.413	Supported	

Table 5.
Structural model
assessment

Note: $p < 0.05$

5. Discussion

Although the use of video conferencing is not a new thing to be used as a distance learning platform in higher education in Indonesia, the use of video conferencing is still very rarely used for thesis exams. Most higher education institutions in Indonesia carry out thesis exams by directly bringing together the students being tested and the examiners in a prepared room. This was done with the aim of maintaining the sacredness of the thesis exam and creating a more intensive two-way discussion between the examiner and the students being tested. Because even though the implementation of the thesis exam has a difference with the oral exam in general, wherein the thesis examines the role of the examiner is not limited to being a tester who is in charge of giving a number of questions to check student mastery of the thesis he wrote but also acts as a supervisor who will provide suggestions and instructions for improving the thesis must be done by students.

Basically, the implementation of online thesis exams using video conferencing is one form of service provided by higher education so that students can still take the thesis exam amidst various limitations to hold thesis exams by holding face-to-face meetings directly. As a form of service, it is important for organizers to know the level of user satisfaction with the quality of the service system being organized. Empirical studies confirm that general service quality in the context of higher education has an effect on student satisfaction (Brown and Mazzarol, 2009; Dericks *et al.*, 2019). Likewise, specifically, the quality of online system services in learning in higher education has a positive and significant relationship to user satisfaction (Althunibat, 2015; Aparicio *et al.*, 2017).

In its implementation, the online thesis examination system that is held involves various things so that the implementation is successful and gives satisfaction to students who take the thesis examination like the main users in the system. The three hypothesized variables (study program services, examiner performance and video conferencing platform) proved positively and significantly played an important role in student satisfaction with the implementation of the online thesis examination. Even though the three variables have only fulfilled the student satisfaction level of 77%, this value is calculated enough for the organizer to pay attention to the three variables.

Apart from organizing online thesis examinations, the study program is the leading organizing unit as a representative of the university in providing services to students both academically and academically. The quality of services provided by study programs must be a concern for every study program that organizes online thesis examinations to maintain the quality of service that can provide satisfaction to students participating in thesis examinations.

Examiners have a vital role in carrying out thesis exams. In the hands of the examiner, the validity of the thesis has been prepared by the student. In carrying out their duties, examiners have the obligation to study the thesis to be tested, listen to the presentation given, ask a number of questions, submit suggestions and recommendations and provide an assessment to students who take the thesis exam. For most experienced testers, these six things are probably the norm in every face-to-face script exam. However, in doing the online thesis exam, it could be that some examiners who are not familiar with the virtual environment feel something different that affects their performance in taking the exam. Examiners who are comfortable and accustomed to face-to-face thesis exams may experience a decrease in their sacred scores when the thesis exams are conducted online in a virtual room. This is where the challenge for a thesis examiner is to continue to show good performance as an examiner by maintaining formal elements in the implementation of online thesis exams so that students still have satisfaction with the implementation of the thesis exam even though it is implemented online.

Because the key to the successful implementation of a quality thesis exam is from the interactions that occur between examiners and students, so when the thesis exam is held using a video conferencing platform, it must be ensured that the platform used meets all the needs of the thesis examination as when the thesis exam is carried out face-to-face direct face. With the variety of videoconferencing platforms that are available, it is important for organizers to choose a platform that suits their needs and is suitable for use with the available networks so that the quality of online thesis examinations will still give students satisfaction in terms of the virtual space provided by the study program.

6. Conclusions, implications and limitation

The main objective of this study is to examine the conceptual model of variables that affect student satisfaction with the implementation of the online thesis examination. The results show that the variables study service quality program, examiner performance and video conferencing platform quality positively and significantly affect student satisfaction in taking the online thesis exam by 73%. This result is of course a guide for higher education who will hold an online thesis examination to pay attention to these three variables.

However, although this study offers a positive conceptual model for practice and theory, this study also has limitations in not involving the role of the supervisor in building the model. Even though in practice, the supervisor also takes a role in the implementation of the thesis examination as a student companion who might provide some helpful answers to the questions submitted by the examiner. In the future, further research needs to be carried

out by adding a variable of the role of supervisors as one of the factors that might affect the level of student satisfaction with the online thesis examination. Moreover, the results of this study indicate that the three variables studied only affect 73% of the student satisfaction level, which means that there is a factor of 27% which will affect the level of student satisfaction and it could be that the role of the supervisor is one of them.

Apart from the various limitations of the study, this finding is quite encouraging because it has succeeded in explaining the variables that affect the level of student satisfaction with the implementation of the online thesis examination. The findings of this study can provide important insights for policymakers on how to better design an online thesis examination system.

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Table A1.
Research variable
indicators

Variable	Item code	Item	Sources
SPS	SPS1	Tangibles	<i>Adapted from (Parasuraman et al., 1985; Parasuraman and Zeithaml, 1988)</i>
	SPS2	Assurance	
	SPS3	Responsiveness	
	SPS4	Empathy	
	SPS5	Reliability	
EP	EP1	Questioning skills	<i>(Bourke et al., 2004; Bourke and Holbrook, 2013; Carter, 2008; Joyner, 2003; Kiley, 2009; Powell and Mccauley, 2003)</i>
	EP2	Wisdom and sufficient humanity	
	EP3	Subject expertise	
	EP4	Experience as supervisors	
	EP5	Fair in judgment	
	EP6	Provide recommendations	
VCP	VCP1	High availability	<i>Adapted from (Wang et al., 2007)</i>
	VCP2	Easy to use	
	VCP3	User-friendly	
	VCP4	Interactive features	
	VCP5	Personalized information	
	VCP6	High-speed access	
SS	SS1	Wise choice	<i>Adapted from (Teeroovengadum et al., 2019)</i>
	SS2	According to expectations	
	SS3	Correct choice	
	SS4	Enjoy the process	
	SS5	Happy experience	

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