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The DeLone and McLean Model on User Satisfication of Academic Service Systems

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Abstract

The purpose of this study was to see the perception of the use the educational service system at the Faculty of Economics, Universitas Negeri Jakarta, using the DeLone and McLean model. The samples of this study were final year students and graduate student with a purposive sampling technique and the data obtained through a questionnaire. The data used in this study is cross section panel data, which variables used are system quality, service quality and user satisfaction contained in the DeLone and McLean model. The mixed method made is obtained from the modification of the two models. Finding of result are there is a significant positive effect, between system quality and service quality on user satisfaction. And it was found the analysis there was a need for the development of the current system that can be analyzed using FAST (Framework for the Application of System Thinking), which is carried out in four phases are scope definition, problem analysis, demand analysis, and logical design.

Abstrak

Tujuan dari penelitian ini adalah melihat persepsi penggunaan sistem layanan akademik Fakultas Ekonomi Universitas Negeri Jakarta dengan menggunakan Model DeLone and McLean. Sampel dari penelitian ini adalah mahasiswa tingkat akhir dan alumni dengan menggunakan teknik purposive sampling dan data dikumpulkan melalui kuesioner. Data yang digunakan dalam penelitian ini merupakan data panel cross section, dengan variabel kualitas sistem, kualitas layanan dan kepuasan pengguna yang terdapat pada model DeLone and McLean. Kombinasi model yang dilakukan didapat dari modifikasi kedua model. Hasil yang diperoleh adalah terdapat pengaruh positif yang signifikan antara kualitas sistem dan kualitas layanan terhadap kepuasan pengguna. Dan didapatkan analisis adanya kebutuhan untuk pengembangan sistem saat ini yang dapat dianalisis menggunakan FAST (Framework for the Application of System Thinking), yang dilakukan dalam empat tahap yaitu scope definition, problem analysis, demand analysis, dan desain logis.

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INTRODUCTION

Ease of accessing information is important. Moreover, entities and organizations are currently competing in speed and accuracy to support the efficiency and effectiveness of internal performance and public services. This makes a good, organized, easy-to-access, integrated and friendly-looking system an obligation in the running of an organization. Especially with government policies due to the COVID-19 pandemic which requires all people to carry out their activities online (in the network) which results in all types of activities being disrupted and hampered.

The information system that becomes a series in supporting an activity will continue to be improved and refined. The development of information systems is currently very much needed, even development needs to be carried out very deeply in order to facilitate performance. Universities, which are educational services, are one that has an impact and must immediately develop information systems. In addition to the performance of education personnel, information systems have an important role in providing services to students.

From the studies carried out such as by vaezi et al. (2019) and Kalankesh et al. (2020), the riset and unit of analysis is an information system in the industry, both in the service sector and in the marketing sector. This study will be analyzed the information system on the service system in non-profit organizations, namely education. This research is expected to be the basis for building a system that can meet the needs of teaching students in accordance with academic regulations in each educational institution.

In this study, the author will examine the academic service information system, especially at the Faculty of Economics, Universitas Negeri Jakarta. Currently, there are many information systems used, both for lecturer performance, learning processes as well as data and student assessments. One system that is of particular concern is Sistem Informasi Akademik (SIAKAD). SIAKAD is an information system that is in direct contact with students and is a major factor in the running of all lecture activities. In addition, there is also a system that is not spared in supporting lectures, in particular, such as a system that supports final year students in submitting thesis or even for Surat Keterangan Pendamping Ijazah (SKPI) which is currently required by the Ministry of Education and Culture at the University. However, currently there is no support for the system that covers the convenience of students in submitting theses to thesis trials or databases related to SKPI. The author will analyze the satisfaction of final year students and graduate student as a consideration of whether the existing system is good or the need for an additional integrated system to support academic services, especially for final year students.

This study uses several models of success in the use of information systems. The successful model of using information systems will use the DeLone and McLean model to see whether the indicators of each model have met the success and provide net benefit for students. The DeLone & McLean model has several indicator variables, namely system quality, service quality, user satisfaction, usage, user satisfaction and added value. In this study, we use three initial indicators to assess and analyze the system, namely system quality, service quality and user satisfaction. Then the author will propose the development or creation of a new integrated system that is better and optimal.

This research was driven by several previous studies, namely user satisfaction greatly affects the success rate of success in implementing the academic service system (Arribe, 2019; Jeyaraj, 2020). By looking at the models and theories used, in this study there are differences with previous research, namely the object of data observation, namely in final year students and graduate student of FE UNJ. Furthermore, the model used is the DeLone McLean model with three independent variables, namely system quality, service quality and user satisfaction. The objectives to be achieved in this study are to analyze user satisfaction and the quality of information systems correcpondeng to student needs, especially final year students of the Faculty of Economics, Universitas Negeri Jakarta. The system is a series consisting of two or more components that are interconnected and interact with each other to achieve a goal where the system is usually divided into smaller sub-systems that support a larger system (Romney & Steinbart, 2017; Shim & Jo, 2020). Meanwhile, according to Mulyadi, the system is a network of procedures made according to an integrated pattern to carry out the company's main activities (Mulyadi, 2016). It is described in (Romney & Steinbart,

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2006) that there are five components to the accounting information system, namely; (a) People, namely a person or individual who operates a system with various functions (b) Procedure, which is a process that is carried out either manually or automatically by collecting data, processing, and storing data (c) Data, activities in a business process of an entity (d) Software, tools used to carry out the process of processing data into information (e) Information Technology Infrastructure, tools in physical form to support a data and information processing process.

Academic services in administrative technical work, according to (Kotler & Lee, 2008) every activity offered and carried out both physically and logically and services offered by academics or admissions to students and other academics, basically does not result in ownership. From the description above, it can be concluded that academic services are a series of activities that are invisible (intangible) and visible from the university to the academic community, especially students who carry out the registration process, exams, report scores, and final exam sessions.

There are several models that can be used to measure the level of success of an information system and have been developed by several researchers. In this study, the model used is (Petter, DeLone, & McLean, 2008) which explains that information quality, system quality and service quality will have a positive influence on use and user satisfaction which in turn will affect the final result, namely net benefits.

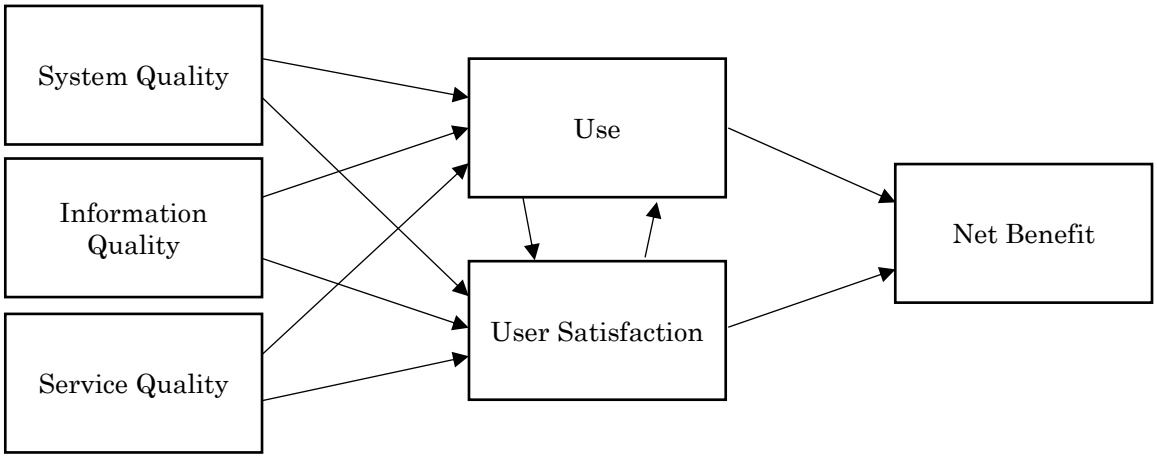

Figure 1. DeLone and McLean (Modification)

Information quality is a measurement of the output of information systems in a subjective way by users. Then the output of the information system can be referred to as perceived information quality. Post and Anderson (2013) stated that the quality of information systems is measured based on the ability of the system to provide useful information for users. According to Stair and Reynolds (2011), a quality information system is a system that can provide satisfaction for its users by producing valuable information. There are three components affect the quality of system services, namely quality assurance provided by the system, system empathy in the form of system concern for users and system response which is the quality of system response to actions taken by users. Usage can be divided into two, user output (information use) and users of the system (system use). Both of these explain how to use the information and use the information system itself. Further explained in the study (Livari, 2005), the use carried out includes 2 items, n the use of daily time and frequency of use. Frequency of use can be interpreted as the frequency of using the system during work. Satisfaction is a feeling of pleasure or disappointment felt by a person after he compares his impression of the quality or performance of a product with his expected expectations (Kotler, 2003). So it can be said that dissatisfaction is a form of a person's response after he compares expectations and reality.

User satisfaction can be defined as the impression that arises after comparing user perceptions of the performance of a product with their expectations (Kotler & Keller, 2016). Meanwhile, system user satisfaction is assessed based on the response and feedback obtained through the user after taking action on the information system. User assessment of the system can

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be subjective, depending on satisfaction. Net benefit is the benefit or benefit felt by individuals and organizations after implementing a system. Perception of usability can be measured through five items are speed of accomplishing tasks, job performance, effectiveness, ease of work, and usefulness at work.

In this research we will analyze and identify the kind of system it can be satisfy the user. So, the result in this research will be source of the subsequent research about system development that will use all of the variables in De Lone and McLean model above. And also to build the new system that can be more useful and satisfy the main user.

According to DeLone and McLean (2003, 2008), in the system development its success can be measured by two variables, there are the intensity of system use and user satisfaction of the information system concerned. Meanwhile the quality of information (as system output) and the quality of the information system concerned are variables that affect the success of the information system. These two variables each affect the quality of information, and the quality of information systems (DeLone & Mc Lean, 2008; Sabeh et al., 2021; Lee et al., 2021). The variable intensity of system use also affects the satisfaction of the user of the information system concerned. Markus and Keil (1994) state that a system"s success will have an impact on the individual and organizational users, and in the individual impact will affect organizational performance.

METHOD

This research is to seek for empirical evidence about the level of user satisfication on academic service system and the appropriation the system to student needs. There are 3 variables that will be used in this research are system quality, service quality, user satisfaction and net benefit. To find out more about these variables, indicators are needed that will be formulated into question items or statements in which each item has a score range between (1 - 5) so that each answer will have a different weighted score. From this score range, 5 alternative answers will be obtaine: very good, good, neutral, not good and very bad, with consecutive scores from 5 to 1. The net results obtained or net benefits are the benefits or benefits felt by individuals and organizations after implementing a system. Perception of usability can be measured by five indicators, namely: speed of accomplishing tasks, job performance, effectiveness, ease of work, and usefulness at work.

The sample is taken by purposive sampling technique, there are final year students which using the academic system for tesis process and graduate student which they had use the system before, so the data obtained are relevant to the research objectives.

Table 1. Question Indicator

Variable	Indicator	Question Items
System Quality	Convenience	1
	Completeness	2,3,4
	Speed	5,6
	Security	8,9
	Consistency	7,10
	Simplicity	11,12,13,14,15,16
Service Quality	Ability	1,2
	Update	3
	Speed	4
User Satisfaction	Satisfaction	1,2,3
	Results	4

The method of analysis carried out uses the mixed method with quantitative and qualitative data, which will later become information supporting the analysis of the problem formulation in this study. Meanwhile, quantitative data was obtained by distributing questionnaires to 70 randomly selected respondents. Analysis will be conducted on the satisfaction respondents. From the formulation of the existing problems, analysis can be carried out so as to produce the right solution

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for the improvement and development of the existing system.

Analysis and development of the new system will be carried out using the FAST (Framework for the Application of System Technique) method. By using the FAST method in this study, it will be limited to covering the 4 initial stages with the following details: First, Determination of the scope of system development. At this stage, research will be carried out by looking at the process in the academic service system of the Faculty of Economics, Universitas Negeri Jakarta. The research carried out is to conduct direct interviews with the parties involved. The purpose of this phase is to find the core of the problem in a system, the opportunities that can be achieved, and the needs of the end users. Second, Analysis of existing problems within the scope of the system to be developed. At this stage, it can be identified several problems that exist in the current system in the academic service process of the Faculty of Economics, Universitas Negeri Jakarta. Next, the project will agree on the scope and problem statement. The goal is to define the business criteria against which the new system will be evaluated.

Third, Analysis of user requirements and needs for the system to be developed. After analyzing the problem and understanding it in more detail, it is possible to analyze user needs for the current system to be developed. Thus, the accounting information system that needs to be developed is considered to be able to improve the performance of related departments, especially in determining prices in the e-component system. Finally, Design of accounting information system development logic. After analyzing the available information and analyzing user needs, the next step is to develop a system using logic modeling with a logic modeling stage and a process modeling stage using data flow diagrams (DFD), and data modeling by identifying entity and design entity-relationship diagram (ERD) and interface design.

Research analysis will explain how the results of data is obtained by distributing questionnaires and be processed using the SmartPLS application. This application is used to support research conducted with the Structural Equation Model (SEM) method.

1. Validity and Reliability Test

The collected data were analyzed using method of structural equation modelling partial least square (SEM-PLS) to estimate constellation of variables. The procedure data analysis according to Chin (1998), Hair et al. (2020), and Saptono et al. (2021). There are two exogenous construct: system quality and service quality and exogenous construct whith 4 criterions. It can be seen in the figure and table below, that the existing indicators have a loading factor > 0.60 which means that each of these indicators is a valid indicator to measure the construct. There are several criteria used to assess the outer model, including composite reliability, Cronbach's alpha and AVE. Tha AVE at more than 0.5 that such convergent validity can be confirmed, Ramayah et al. (2017).

It can be seen in the figure and table 2, that the existing indicators have a loading factor > 0.60 which means that each of these indicators is a valid indicator to measure the construct. There are several criteria used to assess the outer model, including composite reliability, Cronbach's alpha and AVE.

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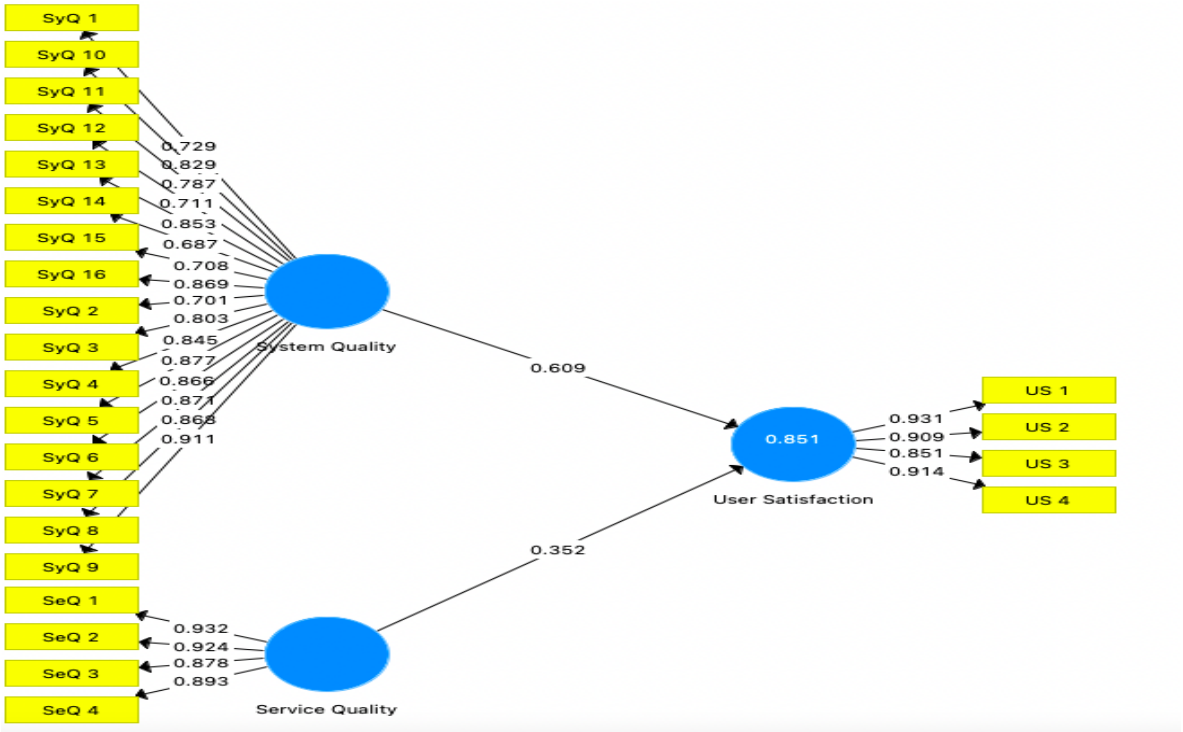

Figure 2. Validity and Reliability Analysis

Table 2. Outlier Indicator

	Service Quality	System Quality	User Satisfaction
SeQ 1	0.932		
SeQ 2	0.924		
SeQ 3	0.878		
SeQ 4	0.893		
SyQ 1		0.729	
SyQ 10		0.829	
SyQ 11		0.787	
SyQ 12		0.711	
SyQ 13		0.853	
SyQ 14		0.687	
SyQ 15		0.708	
SyQ 16		0.869	
SyQ 2		0.701	
SyQ 3		0.803	
SyQ 4		0.845	
SyQ 5		0.877	
SyQ 6		0.866	
SyQ 7		0.871	
SyQ 8		0.868	
SyQ 9		0.911	
US 1			0.931
US 2			0.909
US 3			0.851
US 4			0.914

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Table 3. Reliability Test (Construct Reliability and Validity)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Service Quality	0.928	0.928	0.949	0.823
System Quality	0.964	0.968	0.968	0.657
User Satisfaction	0.923	0.929	0.946	0.814

Based on the table above, the Cronbach's alpha of each construct is > 0.70, the composite reliability of each construct is > 0.70, and the average variance extracted (AVE) of each construct is > 0.50, which means that all constructs are reliable.

2. Relationship Analysis

Table 4. T-stat Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Service Quality -> User Satisfaction	0.352	0.345	0.074	4.727	0.000
System Quality -> User Satisfaction	0.609	0.617	0.071	8.596	0.000

Next is the t-test stage. This test is carried out to see whether the independent variable partially has a significant effect on the dependent variable. Thus, the following hypothesis is obtained:
H0: The Service Quality variable has no significant effect on User Satisfaction variable.
H1: The Service Quality variable has a significant effect on the User Satisfaction variable.
H0: The System Quality variable has no significant effect on the User Satisfaction variable.
H1: The System Quality variable has a significant effect on the User Satisfaction variable.

And the basis for decision making is as follows:
If the probability (probability value) > 0.05 or – t table < t count < t table then H0 is not rejected.
If the probability (probability value) <0.05 or – t table < t count < t table then H0 is rejected.

So it can be concluded based on the table above, the value of t stat + 1.655 < 1.96 so that H0 is rejected, all variables have a positive and significant effect. Thus the structural equation is:

User Satisfaction = 0.60*System Quality + 0.35*Service Quality + e

Table 5. R Square

	R Square	*R* Square Adjusted
User Satisfaction	0.851	0.848

The coefficient of determination (R square Adjusted) is used to show how much influence the influencing variable has on the affected variable.

Based on the table above, the Adjusted R square value is 0.848, indicating that 85.3% of the User Satisfaction variance can be explained by changes in the System Quality and Service Quality variables. In comparison, the other 14.7% is caused by other factors outside the model.

Based on the table above, the value of R square Adjusted by the User Satisfaction equation = 0.60*System Quality + 0.35*Service Quality + e from the table above is 0.851, indicating that 84.8% of the variance of User Satisfaction can be explained by changes in the System Quality and Service Quality variables. In comparison, the other 15.2% were caused by other factors outside the

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model.

System Analysis is conducted to analysis description of an ongoing government organizational process will be carried out. Furthermore, the problems that occur in the organizational process will be explained. Problems are formulated based on indicators that have a significant effect on each other between variables. From the formulation of the existing problems, analysis can be carried out so as to produce the right solution for the improvement and development of the existing system.

Based on the data above, it is obtained an analysis of the relationship between variables which explains the significance and how much influence between variables. In accordance with the provisions of p-values <0.05, it can be concluded that H0 is rejected or in another sense that the relevant variable has a significant influence. The following are significant variables are Service Quality to User Satisfaction and System Quality to User Satisfaction.

Furthermore, the determination of the magnitude of the influence between variables will be carried out by looking at the Original Sample. Then it is found that all significant variables will have a positive effect and the System Quality variable on User Satisfaction is the most influential variable. Thus the System Quality variable can be used as a reference for further research purposes which will be supported by observational data and interview data to determine problems and discussions.

In analyzing the problems that occur based on interviews, the scope is determined using the framework described by James Wetherbe (Whitten & Bentley, 2007) is PIECES (Performance, Information, Economics, Control, Efficiency, Service). The framework will be explained in tabular form by showing the problems that occur and the opportunities if the system development is carried out. The following is a table of problems and opportunities that occur, especially in BPAD DKI Jakarta.

Table 6. PIECES

No	Existing Problem	Opportunity Happened
Performance		
1.	There are often delays in the process of completing the requirements for thesis, trial and graduation courses	Timeliness in document reporting
2.	Less effective and efficient in submitting thesis courses	Admin staff can easily select students who are allowed to take thesis courses
Information		
3.	Document requirements in managing thesis course requirements are still done manually	Document management for thesis course requirements is easy to do and computerized
4.	Document data for thesis course requirements are often reported late	Ease of getting the required thesis course documents for students who apply for thesis courses
5.	The process validation process and guidance documents are still manual	Ease for admin staff and study programs to check and validate related processes and supporting documents during guidance
Economics		
6.	Excessive use of physical documents in paper form.	Reduce paper usage and physical storage
Control		
7.	The guidance process is still manual.	Convenience for students and supervisors in carrying out the guidance process, filling out log books, and digital signatures
Efficiency		
8.	The existing system does not meet user needs, so greater effort is needed to provide information for system requirements.	Good integration in the system makes it easier for users to input data and access data in real time
Service		
9.	Information about students, grades (transcripts), submission of thesis courses,	Make it easier for admin staff and study programs to access and validate the

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No	Existing Problem	Opportunity Happened
	and guidance process to trial graduation scores is not real-time.	requirements for submitting thesis courses until the thesis trial. Make it easier for students and supervisors in carrying out the guidance process.

Problem analysis of the current system will be carried out. The following are the obstacles and consequences of existing problems as well as some proposed solutions in overcoming common problems. Problems were identified based on the results of the suggestions of students who filled out the questionnaire.

Table 7. Problem Analysis

No	Problem	Inhibitor	Consequence	Proposed solution
1.	Submission of thesis courses is not yet available in the existing academic system	The submission of thesis courses, the guidance process, the submission of the required documents, the provision of information related to the trial and the submission of the trial are still manual	1. Students are required to submit cours-es manually	1. A system was created by providing a platform to facilitate students in submitting thesis courses by sending complete requirements, providing a forum for conducting online guidance processes, submitting proposals/ thesis trials so as to reduce the use of time for admin staff and study coordinators in validating requirements. 2. Utilization of the system can provide updates and data on the completeness of supporting documents for thesis to trial
2.	Sending documents for thesis course requiremen ts is still manual		1. Delivery of documents and com-pleteness of thesis course requirements in physical and manual form	
3.	Late submission of thesis courses and required documents		1. Students are late in submitting thesis courses so that many students are late for these courses 2. The admin staff does not know in detail the students who want to take the thesis course as well as the process of validating the required documents which takes quite a long time	
4.	The guidance process is manual		1. Guidance, comments and signatures of the supervising lecturer take a long time with	Students and supervisors can conduct online guidance and there is a log book available for storage from the guidance process activities to notes from the supervisor
5.	Giving comments and signing			

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No	Problem	Inhibitor	Consequence	Proposed solution
	the guidance process is manual		limited time for offline guidance	
6.	There is no app-lication for research concentrati on yet		1. Often the research concentration is not in line with the supervisor's research concentration	Utilization of the system by submitting a supervisor based on the research concentration that students are interested in
7.	Submis-sion of proposal documen-ts / theses is still manual	No systems and databases are available to facilitate document uploads	1. Students are required to submit a proposal / thesis docu-ment in physical and manual form	Availability of database for data storage of proposal/thesis documents

RESULTS AND DISCUSSION

From the analysis above, it can be seen that there are several system weaknesses that cause users to find it difficult to carry out activities effectively and efficiently. Therefore, it is necessary to develop an existing information system by creating a new support system and it is hoped that it can support the activities of submitting thesis courses to the trial.

After analyzing the problems that arise in the current system, an analysis is carried out to determine the user's needs for the system to be used by making context diagrams. A context diagram is a picture that will explain the relationship between the system and the environment outside the system and contains the flow of information and data into and out of the system. The following is a system context diagram.

Logical design is an overview of business needs in a system will be obtained by process models and data processes. The purpose of the logical design is to describe in detail the information needed to develop an e-component information system. The logical design will be described in the form of a Data Flow Diagram (DFD). In contrast, the data modeling will be described in the form of an Entity Relationship Diagram (ERD). Described in (Whitten & Bentley, 2007) that process modeling is a technique used in organizing and documenting the structure and flow of data. Furthermore, in modeling the process, the technique that will be used is the Data Flow Diagram (DFD). DFD is a modeling tool with system analysis to describe a network with functional processes in a system and will be connected to each other through data flows.

The resuts of this research are the available system of academic services have positive influence on user satisfaction, Hypothesis testing conducted using SEM (Structure Equation Model) shows that there is a significant positive effect, between system quality and service quality on user satisfaction. This shows that the user satisfaction variable can be a measure to assess the real use of an information system. Furthermore, the relationship between variables that becomes a benchmark for user satisfaction is a very strong variable and affects how the academic service system runs.

After obtaining the results based on the relationship between variables, the authors conducted a survey. Based on the survey, it was found that there was a need for the development of the current system. In system development, the author proposes using FAST (Framework for the Application of System Thinking), which is carried out in four phases are scope definition, problem analysis, demand analysis, and logical design. The implementation of the academic service information system at the Faculty of Economics has not met the needs of students, especially in the

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database and process of submitting thesis courses as well as the submission of proposals and thesis trials. This can be seen from the suggestions from users (students) for better improvements in the system that supports student academic services.

Kalankesh et,al (2020) examined factors that can influencing user satisfaction with information systems and according to the analysis, that factors can be categorized in seven dimensions there are: system quality, information quality, system use, perceived usefulness, vendor support quality, user characteristics also organizational structure and management style. In the process of developing, designing, implementing, or purchasing an information system, all these factors can be induced higher user satisfaction if these factors are properly considered. But with the system will be possible, it will end up with dissatisfied users which will eventually contribute to system failure.

Vaezi, Mills and Chin (2019) examine a comprehensive model of attribute-level satisfaction to measure user satisfaction with information systems. IS covers multiple subsystems, components, and attributes, with marketing research as unit analysis and combined with attribute satisfaction theory to assess user satisfaction resulting levels of abstraction, there are three levels the most abstract (complex) level, level of satisfaction with each major IS component (i.e., information, system, and service satisfaction) and level of user satisfaction measured with key attributes of each major IS component (e.g., information format, system reliability). The fiding of the research is a parsimonious yet practical model along with associated measures that can assess user satisfaction across various IS aspects (i.e., components and attributes) and different user interactions with IS.

From the results of this study indicate that the quality of the system (system quality) and the quality of information (information quality) is good, can be represented by the usefulness of the system output obtained. This is shown in there that an influence on the level of use of the system concerned (intended to use) as well as user satisfaction (user satisfaction). An information system is a combination of hardware and software (DeLone & McLean, 2008; Mustafa et al., 2020), this strengthens the opinion that the quality of information systems is the quality of the combination of hardware and software in information systems. So that the better the quality of the system and the quality of the output of the given system, for example, the faster time to access; and the usefulness of the system output, will cause users not to feel reluctant to reuse (reuse); thus the intensity of system usage will increase.

CONCLUSIONS AND SUGGESTION

From the analysis conducted, has conclusion that user satisfaction with the available system of academic services had a positive influence. There is a significant positive effect of system quality and service quality on user satisfaction. The relationship between variables that becomes a benchmark for user satisfaction is a very strong variable and affects how the academic service system runs. It was found that there was a need for the development of the current system. In system development, the author proposes using FAST (Framework for the Application of System Thinking). The implementation of the academic service information system at the Faculty of Economics has not met the needs of students, especially in the database and process of submitting thesis courses as well as the submission of proposals and thesis trials. This can be seen from the suggestions from users (students) for better improvements in the system that supports student academic services.

Based on the analysis of information systems in this study, the Faculty of Economics is expected to develop a system that is more suitable and can meet user needs in supporting the timely completion of studies. It is necessary to build an information system that can be applied to the domain of the Faculty and the University so that the system can be well integrated.

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