User Experience Evaluation on University's Learning Management System (LMS)

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Abstract: Learning Management System have become a crucial system in learning environment nowadays. The User Experience of LMS has always become a discussion topic to be reviewed. This research goals is to see how hedonic quality and also pragmatic quality affect the attractiveness of LMS. The LMS that we used is BINUSMAYA and we collect valid data from 248 undergraduate college student in BINUS University. The result shows that, hedonic and pragmatic have impacts to attractiveness and some practical result for BINUSMAYA evaluation.

1 INTRODUCTION

Rapid technological developments have penetrated the world of education in the past decade. The transfer of learning has begun to change from traditional learning methods to learning ways with an internet-connected environment. Causing new challenges to create an active and interactive environment. E-Learning is one of the topics that emerged in this decade, e-learning involves digital tools for teaching and learning activities, e-learning uses all existing technologies to enable learning activities wherever and whenever.(Abaidoo and Arkorful, 2015).

The Learning Management System is increasingly developing and has become the main tool for delivering e-learning material. Increasing existing materials, and existing needs increase the complexity of LMS platforms that require more knowledge, time, and effort.

BINUS University is one of the tertiary institutions with 30,000 active students. BINUS University has five campuses in Jakarta and one campus in the Alam Sutra, Tangerang and one campus in the Bekasi area. Since 2001, BINUS University has implemented LMS in helping deliver learning content and information services to students and lecturers. Even BINUS University has implemented a mobile version of LMS for students and lecturers. In its development, the LMS that has been implemented has undergone four changes (BINUSMAYA 1.0, BINUSMAYA 2.0, BINUSMAYA 3.0 and BINUSMAYA 5.0). Seeing the development of BINUSMAYA and the increasing features provided, it is necessary to see the usefulness of these features especially for S1 student users.

This research was conducted to find out whether users (in this case students) have sufficient User Experience at BINUSMAYA from existing factors. The final results of this study can be used as suggestions for evaluating BINUSMAYA, what are the aspects that must be improved.

2 LITERATURE REVIEW

2.1 Learning Management System

A Learning Management System is a web or cloud-based software program that helps in the teaching and learning process and assists in delivering effective teaching, training and program development. The Learning Management System facilitates instructors, students and administrators to use and access services and are outside the time limit and place in the teaching and learning process (Takahashi *et al.*, 2014). The technical term for LMS is application software for administration,

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documentation, tracking, reporting, and delivery by educational courses or e-learning training programs (Ellis, 2009).

The Learning Management System has two specifications that affect users: 1) The usefulness of LMS lies in the needs determined by individuals or organizations. This means that LMS can be useful and very effective for academic purposes, but that does not mean that LMS will be suitable for industry too 2) LMS assistants who are well-treated technically for ongoing support (Abaidoo and Arkorful, 2015).

In higher education, LMS has a range of tasks than usual. A consistent finding is that LMS is used most often for the distribution of learning materials, more rarely for communication between instructors and students, and even more rarely for online assessment or collaborative learning (Woods, Baker and Hopper, 2004; Blin and Munro, 2008; Mahdizadeh, Biemans and Mulder, 2008; Larsen, Sørebø and Sørebø, 2009; Brown, 2014; Garrote and Pettersson, 2016).

Based on the research conducted by Broadbent (Broadbent and Poon, 2015), it was found 10 self-regulated learning strategies in online learning systems. Of the 130 papers that passed the filter for review and then filtered again into 12 papers, 10 online self-learning strategies were found, namely; Self-regulated learning strategies combined, Metacognition, Time management, Effort regulation, Peer Learning, Elaboration, Rehearsal, organization, critical thinking, help seeking.

2.2 User Experience

According to the definition given by ISO in 2008, User Experience (UX) is defined as a person's perception and response that results from anticipated use and use of a product, system or service. According to research conducted by Law in 2009, the definition of UX is focused on the consequences of use which directly impacts user experience.

Hassenzahl, assesses that there are two dimensions when a user interacts with a product. Pragmatic Quality refers to the product's ability to support the achievement of "do-goals" (goals that must be done)(Hassenzahl, 2010). Pragmatic quality focus on the product, the benefits and uses of the product with its relation to tasks. Hedonic Quality refers to the ability of the product to support the achievement of "be-goals". Hedonic tends to focus on oneself, such as why a person owns and uses a particular product.

Experience is a subjective matter, it arises from a situation, object, person, the interrelationship between all things, and relations with the experience / user, but all these things are made and remain in the mind of the user. So that a product cannot only be assessed objectively (for example Usability Testing), that quality must also be experienced to have an impact

Experience is also a comprehensive thing, not an intermediary in an HCI (Human Computer Interaction), an action always has a goal mediated by interactive products (technology). But often do not see the goal as a whole, there is a hierarchy of three levels regarding goals (goals) which are divided into be-goals, do-goals, motor-goals. In paying attention to the experience of a user the three things must also be noticed.

Experience is also situated that is located in certain circumstances, where this happens uniquely and may not be repeated exactly. But that does not mean experience cannot be categorized. Experience is also dynamic, it is continuous, starting from seeing, taking action, thinking, and feeling. Likewise also in interacting with a product, in every interaction there are experiences that occur and vary.

Lastly, Experience is positive, positive here does not mean endless pleasure, or a superficial entertainment. A more appropriate word to describe is "useful" or "valuable". Pleasant experiences fall into the beneficial category because they meet the psychological needs of users. Bad or unpleasant experiences can also be in a useful category, when you can direct to a higher or more valuable end.

2.3 Be Goals & Hedonic Quality

In the hierarchy of goals that are the highest level are be-goals. Be-goals have a nature where this comes out from within the user, very close to users, which when compared to motor goals is very different, because motor goals are closer to the world, namely things like interaction with products. Be-goals are those that motivate an action, and give action is a meaning. Examples of be-goals are "being competent", "admired", "being close to others", "being autonomous", "being stimulated".

The ability of a product to support the achievement of "be-goals" is important, because these be-goals are the drivers of experience. Lack of usability (usability) causes a barrier to achieving be-goals such as being autonomous, competent, connected with others, stimulated, and popular through the use of technology.

Hedonic quality that looks will be a potential indicator of achieving be-goals through interaction with the product. The experience that is felt by the

user occurs / is made through the fulfilment of the be-goals.

Hedonic quality can be said to be a "motivator" that captures the visible ability of the product to make a positive experience through meeting the needs of users.

2.4 Do goals, Motor Goals, & Pragmatic Quality

In the middle level we know the do-goals. Do-goals are concrete results that users want to achieve, such as "making phone calls" or "watching a film". The existence of a do-goals is outside of a technology, but not entirely independent. For example "making phone calls" can be achieved through various types of telephone, communication software, and many others. This activity will not be born without a technology, so the do-goals themselves are born of technology.

At the lowest level in the goals hierarchy are motor goals. Motor goals are ways to achieve a do-goals. For example "making a phone call" has several sub-goals before reaching that goal, such as pressing a button, reading the words in the screen. Traditionally, the design of an interaction is understood as designing a structure under the do-goals, which is to regulate everything that includes the sub-goals in achieving the do-goals.

The ability of a product to achieve "do-goals" supports the fulfilment of the goals requirements. Pragmatic quality focuses on how a product successfully performs tasks according to their needs, when compared to hedonic quality with hedonic quality which directly influences the achievement of be-goals, pragmatic quality affects indirectly by influencing do-goals. So that it can be concluded that pragmatic quality helps to achieve be-goals easier.

Pragmatic quality can be said as a "hygiene factor" that enables the fulfilment of user needs through boundaries but is not a positive source of experience itself.

2.5 Relations between Hedonic and Pragmatic Quality

The model made by Hassenzahl argues that needs (be-goals, motives) are the source of experience and the driver of product use. It takes fulfilment, where a "meaning" is created when interacting with the product. However, to achieve fulfilment of needs, the product must also be able to be a helper, who is able to make or shape the desired experience. In Hassenzahl's model, all levels of the hierarchy must be aligned and shaped by and return to the superordinate level.

Fun, usability, and functionality are entities. Usability and functionality are conditions that must be achieved before achieving pleasure, but usability and functionality without pleasure are meaningless.

Fun, usability, and functionality are three different things, but they must be aligned in order to create a positive experience. So that it can be concluded that a product cannot provide functions without a meaning, and also cannot give meaning without a function.

2.6 Attractiveness

Attractiveness is the overall impression by the user, whether they like the product, annoying / can be enjoyed, good / bad, pleasant / unpleasant, interesting / not attractive, friendly / unfriendly.

2.7 User Experience Questionnaire (UEQ)

User Experience Questionnaire (UEQ) is a collection of questions to test hedonic and pragmatic quality of a product, and see the relevance to attractiveness of the product.

UEQ was created in 2005 with an analytical data approach to ensure the practical relevance of the scale that has been built which relates to differentiating aspects of quality. The item in this questionnaire is a reduction of 80 raw questions and then after the validity and reliability tests are broken into 6 scales with 26 questions.

The questionnaire divides the research component into 6, namely:

- *Attractiveness* (rate of attractiveness)
- *Perspicuity* (Level of clarity)
- *Efficiency* (level of efficiency)
- *Dependability* (Ability to be relied upon)
- *Stimulation* (level of stimulation)
- *Novelty* (Level of Novelty / Innovation)

Attractiveness is a pure valence dimension. Perspicuity, efficiency, and dependability enter into the aspect of pragmatic quality while stimulation and novelty enter into the hedonic quality aspect. Figure 1 will show the structure of this questionnaire.

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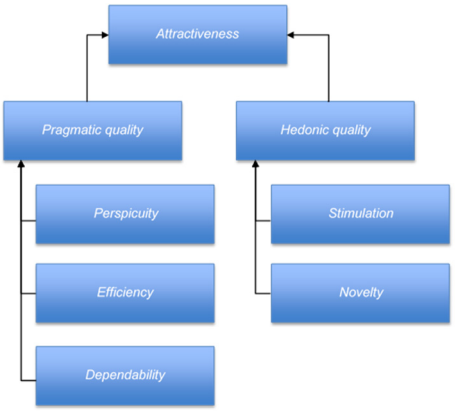

Figure 1 **Questionnaire Structure**

2.8 Previous Research on User Experience in LMS

In 2014 Zaharias et al conducted research on the quality of LMS viewed from a User Experience perspective. In this paper it was found that 50% of the respondents to the previous survey changed their LMS platform due to user experience issues (Zaharias and Pappas, 2016). While most of the existing literature focuses on the capabilities of LMS in terms of administration and management of the learning and teaching process. From this study a conceptual framework and LMS evaluation model were created from the user experience perspective. They conducted an online survey of 466 professional teachers and from the results of their survey made a user-oriented evaluation with four dimensions. That is; pragmatic quality, authentic learning, motivation and engagement. But this model has not been tested enough for its validity and reliability, so when compared with the model that User Experience Questionnare provides, it is still rarely used. Because the UEQ model has proven its validity and reliability.

In a research publication in 2014 which was still in operation,(Santoso *et al.*, 2014) conducted a study of the Student Centered E-Learning Environment (SCELE) which was implemented to complement the traditional teaching method in 2005 at Fasilkom UI. An evaluation of the effectiveness of the e-learning system used by the instructor has been carried out. However, user experience evaluations for students have not been implemented. 113 students enrolled in the Informatics Engineering program were asked to evaluate SCELE. Data collection is done quantitatively and qualitatively, where quantitative data collection is carried out with UEQ. Whereas qualitative data is carried out by conducting interviews. From the research results, it was found that the Pragmatic Quality of SCELE was good (more than 0.800) and the hedonic quality of SCELE was in a neutral position.

3 RESEARCH METHODOLOGY

3.1 BINUSMAYA

BINUSMAYA is an LMS applied by BINUS University to support the study process at BINUS. Where students can access existing learning resources, and can also be a portal to receive and send assignments, and are used to verify attendance when classes take place.

Since 2001, BINUS University has implemented LMS in helping to deliver learning content and information services to students and lecturers. In its development, the LMS that has been implemented has undergone 4 times changes (BINUSMAYA 1.0, BINUSMAYA 2.0, BINUSMAYA 3.0 and BINUSMAYA 5.0). Seeing the development of BINUSMAYA and the increasing features provided, it is necessary to see the usefulness of these features especially for S1 student users.

The modules in BINUSMAYA 5.0 are as follows:

Table 1 **BINUSMAYA 5.0 Module**

Modul	**Sub-Modul**		
News Stream	-		
Mail	-		
Message	-		
OneDrive	-		
Course	*Educati on Level*	*Semester*	*Course Name*
Learning	*Thesis*	*Thesis Defence Schedule*	
		Download Center	
		Graduation Book Photo Upload	
		Upload Thesis File	
		Graduation Confirmation Form	
	Curriculum	*Prerequisites for Internship and Thesis*	
		Course Distribution	
	Internship/Seminar Exam Schedule		
	Exa	*Exam Schedule*	

	m	*Print KMK*	
	Class Schedule		
	Grades	*View Score*	
		View Grade	
		Score Protest	
		View Score Lab	
	Academic Calendar		
	English Score Test		
	Registration Calendar		
	Attendance Information		
	KRS Manager		
	Course Registration		
Student Service	*Services Queue*		
	Services Queue History		
Forum	-		
Development Program	*Advisory*	*Advisory Activity*	
		Schedule Meeting	
e-Certificate	*Certificate*		
Enrichment Program	*Registration*	*Registration Form*	
		View Registration Form Result	
Academic Advisory	-		
Student Activity Transcript	*Total Point*		
Graduation	*Questionnaire*		
	View Graduation Status and Schedule		
Feedback	*Send Feedback*		
	View Feedback		
	FAQ		
Financial	*Financial Summary*		
	Payment Receipt		
Event	*My Event History*	*Event List*	
FEP	*Courses*	*General Orientation*	
		Academic Orientation	
		Campus Life Orientation	
		English Foundation	
	Exam	*Exam Schedule*	
		Print KMK	
	BC	*Download*	
	Coordinator	*and Upload Interview*	
	Class Schedule		
	Attendance Information		
Registration	*Telegram Registration*		
	Vital Source Registration		
	Blog Registration		
	Bee Presenter		
	Leave, Reactive & Resign		
	Self Service Campus Solution		
	Binus Access		
	Cashless Vaganza		
	MSDNAA		
	BC Registration		
Support	*Download Center*		
	Letter Request		
	Requesting History		
Binus TV	-		
Binus Square	-		
Library	-		

3.2 Research Stage

First, the identification of problems that need to be discussed in the research is carried out, as well as formulating research problems according to the topics taken. Then, learning that is related to the topic of research is carried out by reading a journal about related research that has been done before. After that the research model and the variables needed in this study will be determined. The research model is seen from the studies that have been done before, and variables taken from the research model. then the questionnaire to test the hypothesis of the research model was made, the questionnaire was seen from previous studies. Then the questionnaire is distributed to BINUS University Active S1 students, according to their sample needs. After collecting answers from respondents, and the number of respondents fulfilling the required sample, it will be tested for validity and reliability of each research variable. Data analysis was carried out with the help of Microsoft Excel provided by UEQ. Of all the information obtained after processing the data a conclusion will be drawn that is related to the initial hypothesis of the study.

3.3 Data Collection

Data collection was carried out by distributing questionnaires through an online survey distributed to

BINUS University S1 active students. The scale used is a seven-point Likert scale, the reason for using this scale is because the questionnaire used is User Experience Questionnaire (UEQ) where the assessment is determined from a value of minus three to three which is helped by a seven-point Likert scale. The questionnaire was used to assess the three components of User Experience, namely hedonic quality, pragmatic quality, and attractiveness. Hedonic quality and pragmatic quality are represented by several more detailed dimensions.

In determining the research sample, the Binus population was taken with the assumption of 30,000 students, of which in the latest data in the 2017/2018 school year, BINUS University active students were in the number 23,000 students rounded up.

This study uses stratified sampling because of the plurality of respondents and has heterogeneous demographics.

The formula to be used in calculating samples from the population will be calculated by the sampling formula Isaac and Michael:

$$S = \frac{\lambda^2 . N . P . Q}{d^2 (N-1) + \lambda^2 . P . Q}$$

S = Sample Size
λ2 = Chi Squared, with dk = 1, the problem level is between 1%, 5%, or 10%
N = Total Population
P-Q = 0.5
d = 0.05

With the table determining the number of samples from Isaac and Michael provides convenience in determining the sample, where the level of error to be used is 10% and population N is 30,000, a sample of 268 people is needed.

3.4 Data Analysis

Analysis of the data in this study was carried out with the help of a statistical software tool namely Microsoft Excel which has been modified to be a tool to measure the results of UEQ answers. Validity and Reliability Tests do not need to be done anymore considering UEQ has been used several times as a tool to evaluate an LMS.

4 RESULT

4.1 Demographics

In this study the number of answers to the questionnaires to be analyzed and processed were 288 respondents.

The demographics of the respondents in this study included binusian/class, department, and frequency using BINUSMAYA. The following data collected from respondents samples formed in the graph in Figure 2.

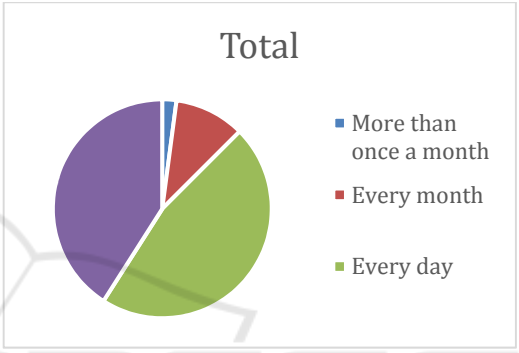

Figure 2 Frequency of Use

Of the 288 respondents who filled out the questionnaire, 6 people or 2% of respondents access BINUSMAYA above once a month, 30 people or 10% of respondents access BINUSMAYA every month, 118 people or 41% of respondents access BINUSMAYA every week, 134 people or 47% of respondents access BINUSMAYA every day. From this data it can be concluded that the majority of respondents are BINUSMAYA users who are quite routine.

4.2 Result of Analysis

In this study, the measurement tool used was a questionnaire developed from UEQ. UEQ was created in 2005 with an analytical data approach to ensure the practical relevance of the scale that has been built which relates to differentiating aspects of quality. The item in this questionnaire is a reduction

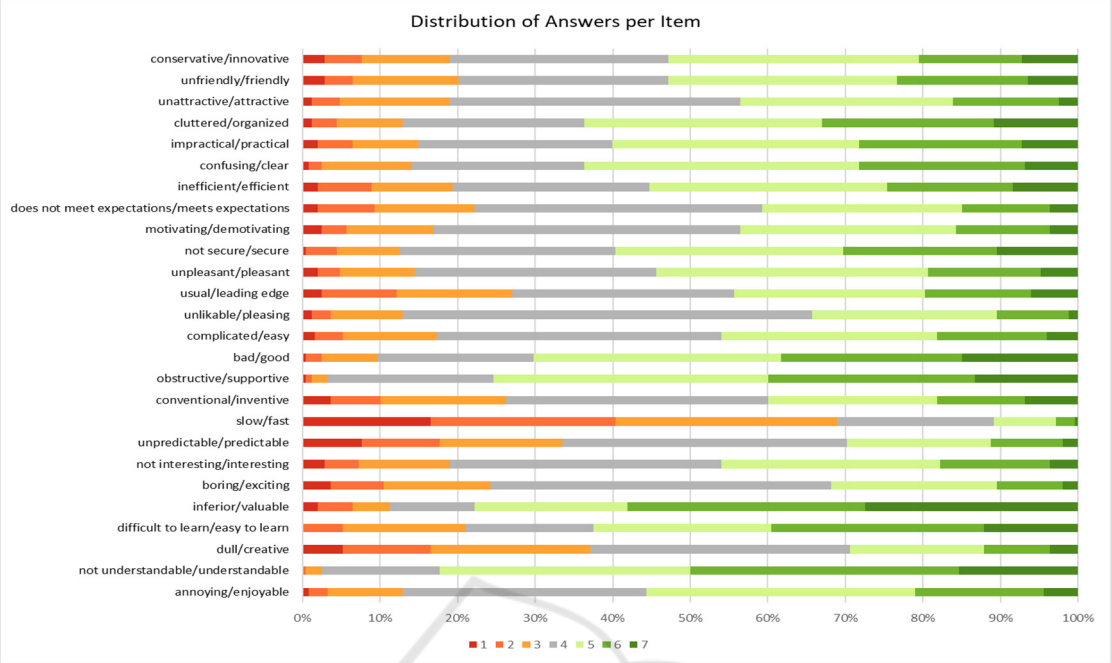

Figure 3 **Response from the Participant**

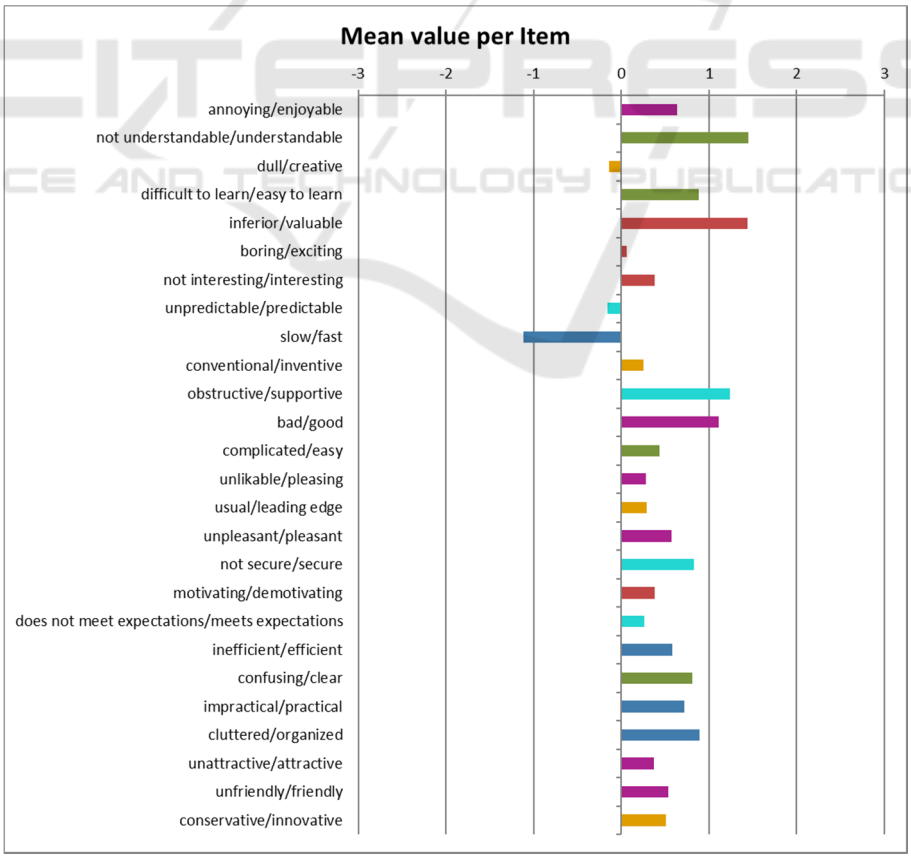

Figure 4 **Mean Per Item**

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of 80 raw questions and then after the validity and reliability tests are broken into 6 scales with 26 questions. The scale of the research is carried out with a 7-point Likert scale which later will be interpreted to -3 to +3 and the data will be processed with an excel template provided by UEQ. The following table 4. research variables given to respondents, fill data randomized, not always positive variables on the right, preventing charging seriously. So as to facilitate the detection of inconsistent data collection.

A summary of the response results from 291 respondents is provided in Figure 3 Of the 288 respondents, it was found that respondents who were detected had misinterpretations of the meaning, or did not take seriously as many as 40 respondents, so that the data considered valid only became 248 respondents because of a mistake in filling. Following is the distribution of responses from questionnaires provided.

After converting the questionnaire answers to the values needed to evaluate UX from BINUSMAYA, namely -3 to +3, the average value of each component of the questionnaire is obtained. Tie the average value below -0.8 so this represents a negative evaluation, if the average value is between -0.8 to 0.8 then this represents a neutral evaluation of the scale, which needs to be increased but not too severe. Figure 4 will provide the average response of each component of the questionnaire.

UEQ is divided into six components, namely attraction, efficiency, accuracy, stimulation, and novelty. Each questionnaire question represents one part of the component. Table 4.3. describe the evaluation of UX BINUSMAYA from each component

Table 2 UEQ mean and variance

UEQ Scales	Mean	Variance
Attractiveness	0.585	0.84
Perspicuity	0.895	0.92
Efficiency	0.269	1.06
Dependability	0.542	0.78
Stimulation	0.565	0.89
Novelty	0.228	1.10

From the results of the questionnaire it can be seen that BINUSMAYA has a neutral level of evaluation in various aspects. The aspect that can be said to be good is only from the aspect of clarity, where the average value is above 0.8. The most needed value for improvement is the novelty value, namely the level of innovativeness from BINUSMAYA. However, for the size of BINUSMAYA LMS, it has a fairly good UEQ value compared to previous studies. The small distance between confidence intervals indicates that this research is quite accurate. Cronbach-alpha coefficient averages above 0.7 except the accuracy that only has 0.67. Table 4.4, 4.5, 4.6. and 4.7 Will describe coefficient data and confidence intervals.

4.3 Result of Analysis

UEQ benchmarks have been developed in recent years. Benchmarks are built from evaluating 401 products and 18483 responses from various products (Business software, web pages, web shops, social networks).

Because benchmark datasets have a limited number of evaluations, reciprocal responses are divided into 5 categories for each scale:

- Excellent: enter in the best 10% results
- Good: 10% of datasets are better than products, and 75% worse
- Above Average: 25% of datasets are better than products, and 50% worse
- Below Average: 50% of datasets are better than products, and 25% worse
- Bad: included in the category of 25% of bad products

Table 3 will provide the average value of the UX component provided by BINUSMAYA when compared to the benchmark value.

Table 3 Benchmark Value Comparison

Scale	Mean	Compari-sson to bench-mark	Interpretation
Attractive-ness	0.58	**Bad**	In the range of the 25% worst results
Perspicuity	0.90	**Below Average**	50% of results better, 25% of results worse
Efficiency	0.27	**Bad**	25% of results better, 50% of results worse
Dependability	0.54	**Bad**	In the range of the 25% worst results
Stimulation	0.56	**Below Average**	50% of results better, 25% of results worse
Novelty	0.23	**Bad**	In the range of the 25% worst results

The benchmarking results show many aspects that must be improved by BINUSMAYA, but considering

BINUSMAYA is an LMS, it is not fair to compare it with other products. But from this data we can conclude that from the attractiveness, efficiency, accuracy, and novelty of BINUSMAYA, quality needs to be improved.

5 CONCLUSIONS

Based on the results of the research conducted by conducting a survey of 26 attributes representing 6 dimensions in UEQ, namely Attractiveness, Efficiency, Accuracy, Clarity, Stimulation, and Novelty. Conclusions can be drawn according to the research objectives, namely evaluation of UX as follows:

- From the overall evaluation, many neutral evaluations must be carried out. Of the 6 dimensions that exist only the dimensions of clarity that meet the needs and standards of experience needed.
- From the results of the distributed questionnaire, if viewed from 26 items that have been studied. Speed is a major problem where this attribute is the only attribute that is in a negative evaluation. Which signifies the need for improvement in terms of the speed of BINUSMAYA
- Interval distances that are not so large, and also high alpha values indicate UEQ is an accurate and consistent research suggestion.
- The average results of Hedonic quality, pragmatic quality, and Attractiveness are not that significant, but being at the midpoint shows the relevance of these three components in a User Experience
- The two things that must be improved first and foremost in BINUSMAYA are matters relating to efficiency in pragmatic quality and matters relating to renewability in hedonic quality.

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