The Relationship of Product Design Quality and User Satisfaction for Academic Potential Tests Simulation Mobile Application Development with User-Centered Design

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Abstract: In developing a user-centered software, there are various things that need to be considered, such as expectations for better development, as well as quite different stages of work. One method that can be used to develop software that is in accordance with the user's expectation is User-Centered Design (UCD), this method is proven to have produced a software that is believed to have a good quality value. The Academic Potential Test Mobile Application is a mobile-based application that can be used as a simulation to assess and measure the value of a person's academic potential. This mobile application was developed specifically to be used as a supporter in the New Student Admission process at Politeknik Caltex Riau. This mobile application is developed using the user-centred design method, by using this method the application product is also expected to have a good value. User satisfaction is an absolute opinion given by application users shortly after they use the application, although it is of good value in terms of product quality, sometimes user satisfaction is neglected. It is necessary to keep measuring user satisfaction even though the product quality value has been declared good. Another study shows that there is a relationship between the value of product quality and the value of user satisfaction for desktop application. So, in this research we would like to prove the relationship between those two variables, in the development of mobile applications then it will become a reference for other developers in developing a mobile application with User-Centered Design method.

Keywords: Mobile Application, User-Centered Design, Academic Potential Test, Simulation, Correlation

1. Introduction

Software development is often a difficult thing for a developer, this is not only a challenge in manufacturing and the features and technology to be used, but how to build a software that can provide whatever the user wants. In developing a user-centered software, there are various things that need to be considered, such as expectations for better development, as well as quite different stages of work [1]. One method that can be used to develop software that is in accordance with the wishes of the user is User-centered design (UCD), this method is proven to have produced a software that is believed to have a good quality value [2].

User-centered design is done from the user's perspective [3], whether to ensure that in the end, the result will have a good quality value according to the user's opinion. Korpershoek et all [3] states that the UCD method is proven to be good at developing mobile applications that meet user expectations. In addition, Wardana et al [4] also show that the UCD method is also good in facilitating the process of developing mobile applications, resulting in excellent products.

The Academic Potential Test Mobile Application is a mobile-based application that can be used as a simulation to assess and measure the value of a person's academic potential. This mobile application was developed specifically to be used as a supporter in the New Student Admission process at Politeknik Caltex Riau with the New Student Admissions Committee and Prospective Students are users of the application. Based on statements from various previous studies, the development of this mobile application is carried out using the user-centred design method. By using this method, the application product is also expected to have a good value.

Behind the good reputation given by UCD, it turns out that there are several weaknesses that are also often caused [6, 7]. Although it is of good value in terms of product quality, sometimes user satisfaction is neglected, especially if the application provided is used by a wide and unlimited number of users. User satisfaction is an absolute opinion given by application users shortly after they use the application [8], of course this will also be an important matter in the development process. Some users of course do not always say they like and are satisfied with the experience they have gone through when using the application, it is necessary to keep

measuring user satisfaction even though the product quality value has been declared good [9, 10]. This aims to ensure that the resulting application products already have good value and user satisfaction.

Saupindo et al [11] and Handoko [12], states that in a desktop and web-based application development, there is a relationship between the value of product quality and the value of user satisfaction. This is certainly a reference that can support that the same thing can happen in the development of mobile-based applications [13, 14]. With the quality measurement results that have been obtained, as well as data collection for user satisfaction that has been carried out, it is necessary to test the academic potential test mobile application that is being built, in order to show more optimal evidence.

Therefore, in this research, we would like to prove the correlation between the two variables, the value of product quality and user satisfaction in the development of mobile applications. With this evidence, it is hoped that it can become a reference for other developers in developing a mobile application with a good and correct method.

2. Related Works

2.1 Mobile Application Development with User-Centered Design

Mobile applications are software that runs on mobile platforms such as PDAs, Cellphones, Tablet PCs, and Smartphones. Mobile applications have characteristics that are not the same as other types of applications. Some things make this type of mobile more special [15]. Usually, what distinguishes it is the limitations of the mobile device itself, such as screen size, access methods, resource strength, and others. These things show that the characteristics of mobile applications can be studied further to be used for specific needs [16].

Software quality requirements are a collection of software characteristics that have been analyzed according to the needs of the software arrangement [17]. Quality requirements for mobile applications are a collection of quality requirements that have been proposed by Trisnadoli et al. in previous research [18].

These quality requirements are built by finding important references in each mobile application requirement so that a new formulation is formed that can show intersecting and interrelated needs to become a good quality requirement as a reference in designing software.

The User-Centered Design method refers to the user experience of prospective users and has a concept where a user is the center of development. The term User-Centered Design first appeared in the University of California San Diego (UCSD) laboratory by Donald Norman in 1980 [19]. UCD is a design philosophy that places the user at the center of a system development process [3]. The working principle of UCD [20] is Focus on User, Integrated Design, From the Beginning Continues on User Testing, and Interactive Design.

2.2 Potential Academic Test

A potential test is a form of measurement of general potential cognitive ability (a measure of maximum performance), specifically designed to predict the chances of successful learning in higher education. That's why tests like this are usually called Academic Potential Tests. The basic idea in constructing the Academic Potential Test follows the concept of the development of the Graduate Record Examinations (GRE), which consists of a Verbal Reasoning (V) section. Quantitative Reasoning (Q), and Analytical Writing (AW) [21], with some changes. In general. The Academic Potential Test in Indonesia consists of three subtests: Verbal subtest, Quantitative subtest, and Reasoning subtest [22].

The Academic Potential Test is not structured based on the subject syllabus. Therefore, the success of answering questions in this test is minimally related to mastery of certain subject content. This is because the content of the questions in the potential test is developed so that the chance of success in answering depends more on the use of both logical and analytical reasoning [23].

Multi-Platform-based simulation applications have been built before using multi-platform, but some shortcomings can still be developed in the future. So, it can be concluded that similar applications are suitable for use in practice questions related to the Academic Potential Test. [24].

3. Methods

The phase of this research methodology can be explained as follows:

- Phase 1: User needs analysis aims to get essential points from users in developing indicators that can later become a benchmark in completing the research targets.
- Phase 2: Collecting User Requirements, carried out using surveys/data collection by observation and interviews that aim to specifically address the expectations and desires of users by utilizing the appropriate UCD concept to be specific to the user's point of view.
- Phase 3: Drafting based on data obtained from the previous phase to build software according to the expectations developed.
- Phase 4: Mobile Apps development using the User-Centered Design method as a sample product of the quality model evaluation media that will be built based on the results of the applied design.
- Phase 5: Empirical evaluation analysis is carried out to prove whether the development carried out is by the common research goals.

The methodology of the objectives of this research can be seen in Figure 1.
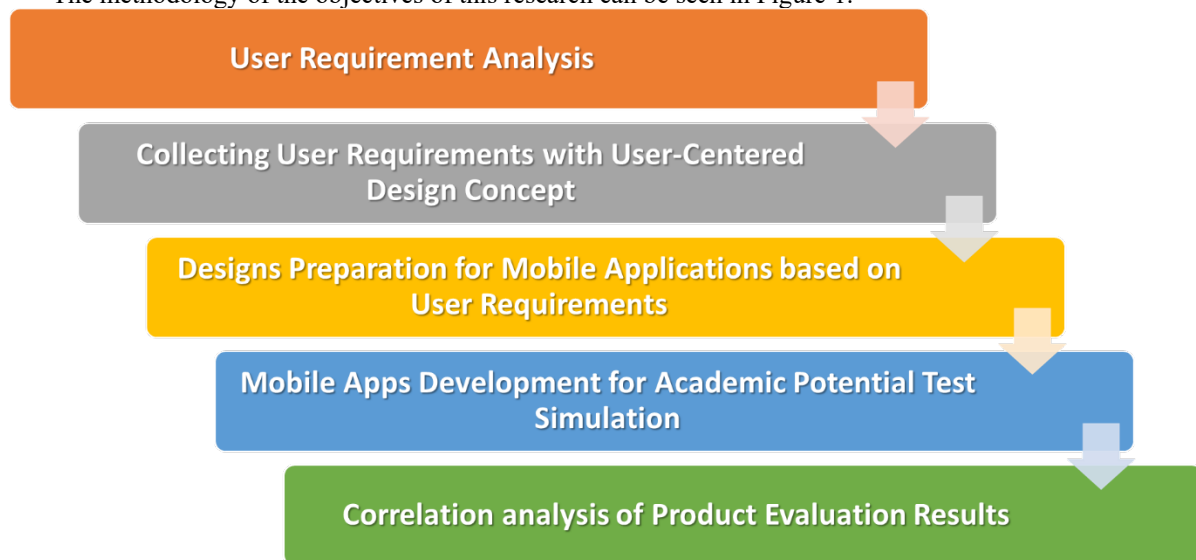
Figure 1. Research Methodology

Mobile application development is planned based on the phases that have been carried out previously, the phase of collecting data on by the user expectation, so it will be adequately achieved from the user's point of view. The data collection was carried out by interviewing various categories of respondents, from managers, decision-makers to prospective students interested in using the Application as one of the media created to improve their understanding and knowledge regarding the Academic Potential Test.

After conducting interviews, then the results obtained are analyzed to produce a list of needs that have been detailed as user requirements for further development. In general, the description of the expected needs has been collected well. Still, in the end, it is necessary to re-evaluate whether what is expected by the user is correct and follow what was designed by the developer. In this case, the developer builds a design in the form of a wireframe to visualize what is expected by the user in the previous requirements gathering phase. The result of the wireframe is something shown in the figure 2.
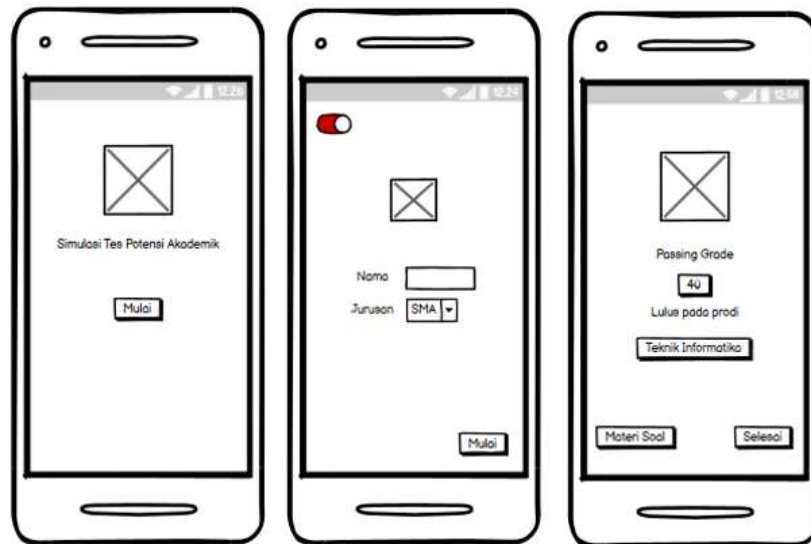
Figure 2. Wireframe Design

The design description is then evaluated and re-tested on the same users to confirm that things was expected by the user. Design evaluation is done by showing the application design, and then the user will give some comments and input that are considered by the initial user expectation. The data collection conducted by using questionnaires and observation sheets.

Based on the evaluation, it is found that the user has agreed to all the features, and the resulting design description is following the expected needs. Then further development can be continued in the implementation phase in the form of a mobile application product.

4. Result and Discussion

4.1 Mobile Application Development

This mobile application was developed to see how the implementation of the design that has been developed can be adjusted to the user's expectations when the product is used.

The product is built using tools that can accommodate all the features that have been designed to be implemented properly as the original product form. UI/UX is also a concern here. The use of layout, user comfort, and other needs have been implemented with achievements according to the target from the initial design.

After the mobile application product is produced, testing is carried out on several users, which aims to see the feasibility of the product being built. Besides that, this test aims to get feedback and the level of satisfaction from users. These values will later be evaluated based on the initial design values that have been obtained in the previous phase.
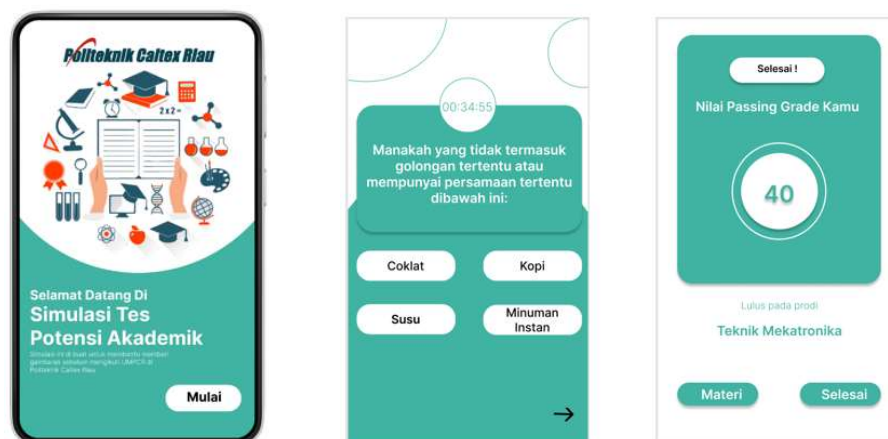

Figure 3. Mobile Application Product

Data collection for testing the product was carried out on several respondents' samples obtained in the following way:

$$n = \left\{ Z^2_{\left(1-\frac{\propto}{2}\right)} \times p(1-p) \right\}/d^2 \quad (1)$$

With:

   d (Precision) = 10% = 0.1,

   Z (confidence degree) 90% = 1.64

   p = 0,5

then:

$$n = \frac{\left\{ Z^2_{\left(1-\frac{\propto}{2}\right)} \times p(1-p) \right\}}{d^2}$$
$$= \frac{\{ 1,64^2 \times 0,5(1-0,5)\}}{0,1^2}$$
$$= \frac{\{ 2,689 \times 0,25\}}{0,01}$$
$$= 67,24$$

So, it can be concluded that by 68 respondents who tested, to prove whether there is a relationship between good design and good product results based on the concept of the relationship or correlation between the two factors.

Testing was conducted using a software satisfaction questionnaire measuring instrument for users. Questionnaires were given to respondents after they used the mobile application product for several time, so it was hoped that the experience they had while using the Application could be a measurable input for this research.

The following is an illustration of the acquisition of data obtained from the tests carried out.
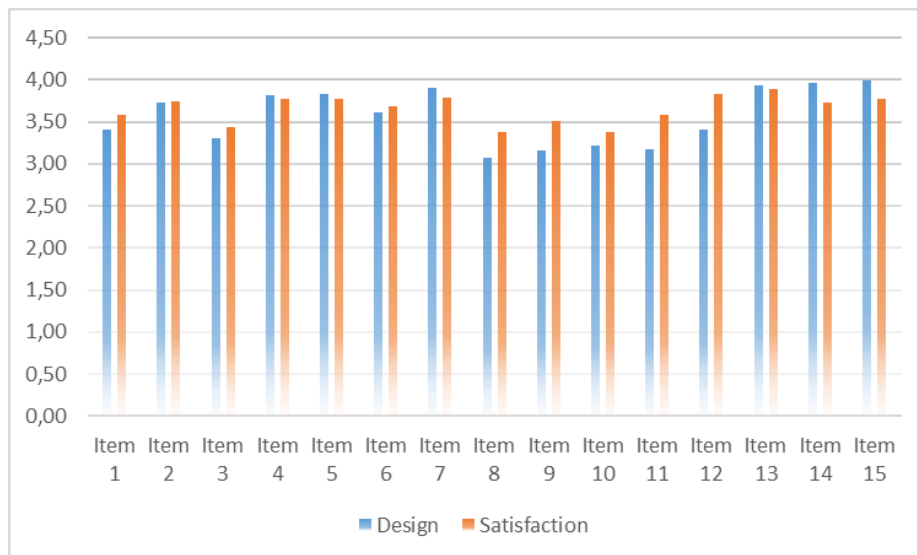
Figure 4. Comparison of design value results and user satisfaction

Based on the data shown in figure 4, the value of the results obtained from the design and mobile application product that have been run have values that are close together. Thus, there is no inequality in the satisfaction brought by users both in terms of design and product.

4.2 Evaluation Result Of Academic Potential Test Mobile Application

The evaluation carried out aims to obtain and prove that a good design produced with the UCD concept will provide good satisfaction results based on the point of view of users who have used the products that have been developed. In this case, the evaluation is done by testing the correlation between the two variables.

The data from the two variables that have been obtained are then measured and analyzed with the concept of correlation test with the partial correlation method because the data obtained from the research conducted are of the interval and ratio type, and the number of data samples is not much.

Based on the correlation test results, showing the significant value is 0,00, proving that there is a positive relationship between the two variables produced. Also, by the Pearson Correlation value is 0.538, the relationship between the two variables is moderate. This shows that the better the design carried out by the UCD method, the higher the results of user satisfaction when using application products. With the occurrence of a unidirectional correlation displayed, the opposite can also occur when the results of a design that is not good may result in a low satisfaction value.

5. Conclusions

Based on the research that has been done, it can be proven that there is a significant relationship between the value of product quality and user satisfaction in the development of the academic potential test mobile application that has been carried out by applying the User-Centered Design method which is shown based on the positive correlation test results. This also provides new evidence that the development of mobile applications using this method, not only provides a good product quality value, but at the same time also has a high impact on user satisfaction. With the evidence in this research, it can be a reference for developers in choosing the right way to carry out the mobile-based application development process in the future.

Acknowledgement

Reference

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