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Usability Evaluation for User Interface Redesign of Financial Technology Application

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Abstract. KoinWorks is one of financial technology in Indonesia that running its businesses with online peer to peer lending model based on mobile application. The number of KoinWorks mobile application users is increasing however there are still some obstacles along the way. Canceled order rates of KoinWorks are still quite high. In 2017, there are only 7,5% of the total users who actually did the transaction. In addition, the result of a preliminary study conducted on 114 respondents shows that nearly 75% of the users find it difficult to use the application. This study aims to evaluate the usability of KoinWorks mobile application, to analyze the existing usability problem, and to achieve a better usability interface design. Usability is measured using both quantitative and qualitative measurements. The quantitative measurement comprises user performance metrics such as task success, time on task and error that measure effectiveness and efficiency of the mobile application as well as saccade on eye tracking. The qualitative measurements include the System Usability Scale questionnaire (SUS), Questionnaire for User Interface Satisfaction (QUIS) and Retrospective Think Aloud (RTA). This study shows that KoinWorks mobile application has a poor performance and usability. Interface redesign was proposed and resulted in a better performance and usability.

1. Introduction

Fintech is one of the promising industry because it has the potential to benefit various parties in the financial industry [1]. The development of financial technology cannot be separated from industrial and technological revolution wherein industrial era 4.0 the influence of mobile devices, virtual cloud software, personalized online services, and communication technology [2] [3]. KoinWorks, The Most Innovative Fintech of The Year, according to Bisnis Indonesia Fintech Award 2017, is one of the pioneers of the investment platform online peer to peer lending mobile application. In this case, KoinWorks can be classified as electronic commerce because of the feature which brings together buyers, namely investors and sellers or namely borrowers of funds with online systems. Electronic commerce user acceptance model states that one of the factors influencing a desire to conduct transactions is the perception of ease of use [4]. Based on information from KoinWorks, KoinWorks mobile application had experienced changes both small and large in terms of visual and functional which proved to reduce cancel order by 10%. This shows the mobile application display affects users behavior in purchasing KoinWorks loan products. From the historical data of KoinWorks, it appears that there is a decrease in the number of visitors from the start page, namely the investment summary to the payment page. Out of 100% of KoinWorks mobile application visitors, only 7.5% of them were successfully converted from visitors to investors. Therefore, there is a big chance of improvement for KoinWorks mobile application so that in the future the business process runs more effectively and KoinWorks can increase its revenue through increasing loan sales. Previous studies [5] [6] [7] show that mobile application improvements can be done through usability and eye tracking evaluations.



Usability is a quality attribute to measure how easily an interface is used [8]. Usability is defined through five components of quality, namely learnability, efficiency, effectiveness, errors, and satisfaction which can ultimately show the ease of using an electronic commerce. Likewise, eye tracking can determine the behavior of users when they are on the user interface of a platform [7].

2. Methodology

2.1. Research Object

Based on the issues discussed earlier, this study aim to evaluate usability and the user interface of the KoinWorks application to understand the extent to which mobile applications are easy to use by users and provide recommendations for improving KoinWorks application interface design. By integrating the usability and eye tracking approaches, evaluation can consider the ease of use of user-oriented applications. The results of this study will show recommendation of user interface redesign of KoinWorks application which consider ergonomics aspects to increase the ease of use of the application.

2.2. Participants

According to KoinWorks company records, there are almost 15.000 user account until 2014 but only 1,7% of them are active users. In this research, there are 60 usability testing respondents and 22 eye tracking respondents in initial evaluation with different ages, backgrounds, gender, and occupations [9]. This study divides the group of participants based on the frequency of use. The first is a group of inexperienced participants, people who have never had prior experience in making transactions in the KoinWorks mobile application. Second is a group of experienced participants, people who have had experience in making transactions on KoinWorks mobile applications. Control of respondents is also done by ensuring that each respondent has a similar understanding of the tests performed. For the verification of prototype, there are 10 new respondents that also consist of 2 groups which are experienced and inexperienced [9].

2.3. Research Design

In conducting research, several controls need to be applied. This control is used to avoid potential bias due to certain conditions and factors [10]. Each respondent in the study was asked to work on the same scenario. The scenario includes the loan purchased, loan type, investment grade, amount of interest given and loan duration was made the same for every respondent. The personal data input in the process of logging in and transactions, including email address, password and amount of funds invested was also was determined by the researcher to avoid differences in task completion time due to differences in input data and loan choices. Each respondent has the same starting point in the execution of the task to avoid differences in the completion of the task time caused by differences in the steps to provide loans due to differences in starting points. In addition, testing of the mobile application was carried out using an Android-based mobile phone with the Xiaomi brand with the *Redmi Note 3* type. This control was needed to achieve input data consistency, especially in performance measurement. The steps for implementing the most effective and correct tasks according to UX Researcher of KoinWorks is available in figure 1. These 12 steps then determined as the tasks respondents should follow in this research.

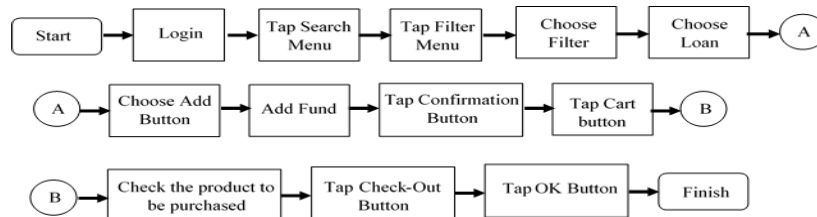


Figure 1. Task by Respondents

Usability is measured in 3 dimensions, including effectiveness, efficiency and user satisfaction. Measurement of effectiveness and efficiency is show respondents performance while user satisfaction

and perceived ease of use are measured using QUIS and SUS questionnaire. Retrospective Think Aloud and eye tracker analysis is also conducted to strengthen research analysis. The description and criteria of each measurement dimension are available in table 1. The data obtained is used as the basis for making improvement applications. Using two iteration, the new designs is then verified again by the participant to compare its usability with the previous design using the same methodology as in the initial evaluation.

Table 1. Application Performance Measurements

Dimension	Metrics	Description	Criteria
Effectiveness	Task Success (Binary)	Measurement of how effective participants can complete the task	A succeeded task is when participants have ordered the product according to the task scenario and have entered the complete self-shipment data.
	Time on Task (Seconds)	Measurement of the time needed to complete the task	The less time needed by participants to complete a task indicates higher efficiency.
Efficiency	Errors (Binary)	Measurement of the number of errors made by participants during the work assignment	The fewer mistakes made by the participant during a task indicates higher efficiency.

3. Result and Discussion

The results of this research will be presented and discussed in this chapter.

3.1 Effectiveness, Efficiency, and Satisfaction

If less than 70% of participants cannot complete the task perfectly, it can be said that the task is difficult and problematic so it requires analysis and improvement [10]. As shown in table 2, the percentage of success for the inexperienced group is less 43% while the experienced group has a success rate of 73% showing that the KoinWorks mobile application is effective to be used for the experienced group. It is seen that the percentage of success in the group of experienced participants is always higher when compared to the group of inexperienced participants. This shows that the experience of interacting with the KoinWorks mobile application affects the success in using it.

Table 2. Usability Evaluation Result

Group of Respondents	Effectiveness	Efficiency		Satisfaction	
	Success Rate	Time on Task (\bar{x})	Errors (Σ)	QUIS (\bar{x})	SUS (\bar{x})
Non-Beginner	73%	244.7 seconds	116	6.53	54.58
Beginner	43%	253.3 seconds	198	5.82	39.42

At initial of this research, pilot testing was conducted to determine the standard time of loan funding task. The testing concludes that it takes 3.7 minutes or 222 seconds to complete the task. From table 2, it can be seen that

both of the group's time on task is longer than the standard time. The average of time on task from the experienced group is 244.7 seconds while the average value of time on task from the inexperienced group is 253.3 seconds. It shows that there is a difference between the time of completion of the actual task obtained during the study and the standard time value. Still, time on task from both groups of respondent and the standard time is not much different from one another. The difference obtained is not significant. One of the factors includes the number of participant's familiar interactions with mobile applications both in financial technology and electronic commerce apps so even though they have never used the KoinWorks application participants can easily operate it. In addition, it can indicate that the KoinWorks application has good learnability so that it is easily understood by beginners. Therefore this analysis needs to be equipped with error frequency analysis because if it is found that the error frequency is high then it can be said that the KoinWorks application is difficult to operate. The summary of error frequency from each group of respondents is available in table 3.

Table 3. Summary of Error Frequency

Code	Error Type	Experienced	Inexperienced
K1	Pressing a button other than the plus button on a loan	3 (10%)	18 (56.67%)
K2	Not using the filter menu on the loan selection page	9 (30%)	27 (90%)
K3	Mistakenly selecting the filter option	0 (0%)	9 (30%)
K4	Not pressing the search menu or search icon on the home page	23 (77%)	11 (37%)
K5	Not using the "+" button when inputting funds	8 (27%)	11 (37%)
K6	Ordering a loan is not according to specifications	5 (17%)	18 (60%)
K7	Can't find a shopping cart (on the first product order)	6 (20%)	13 (43%)
K8	Can't find grade information	10 (33%)	17 (57%)
K9	Not immediately proceed the funding process after adding loans	18 (60%)	24 (80%)
K10	Looking for specifications on loans that have been fully funded	13 (43%)	19 (63%)
K11	Can't find loan type information	16 (53%)	23 (77%)
K12	Returning to the previous menu to repeat the process	5 (17%)	8 (27%)

As shown in table 2, the inexperienced group have 198 errors in total while the experienced group has the total of 116 errors. There is more than one type of error that occurred in carrying out a loan funding task as seen in table 3. One important finding is that error type K2 has the highest frequency among others type of errors from inexperienced groups. When visiting the KoinWorks application, not all users know exactly what product they want thus loan product filter is needed that helps users find loans that they want to fund. Many numbers of filters variation to be chosen and the placement of filters that are relatively close together makes it difficult for respondents to correctly use the filters. They ended up not filtering the loan completely that makes them couldn't find the requested loan.

As shown in table 2, QUIS and SUS result of the experienced group always have a higher value than the inexperienced group which indicates that satisfaction is perceived better among the former group. From the results of SUS questionnaire data processing, it is found that the average SUS score given by the experienced participant group was at the marginal low level, where subjective perception or rating by this group was in the "okay" category, but if in the company's perspective, immediate improvement was needed [11]. Marginal low assessment position which means even though the user is perceived as "okay" but is included in the lower limit. Likewise in the group of inexperienced participants who gave an average score of SUS at the level of not acceptable or unacceptable where the subjective perception or rating by this group was in the "poor" category so it was necessary to immediately improve the application. This is shown by various other aspects which show that the KoinWorks application is less user-friendly to the inexperienced category respondents.

3.2 Retrospective Think Aloud

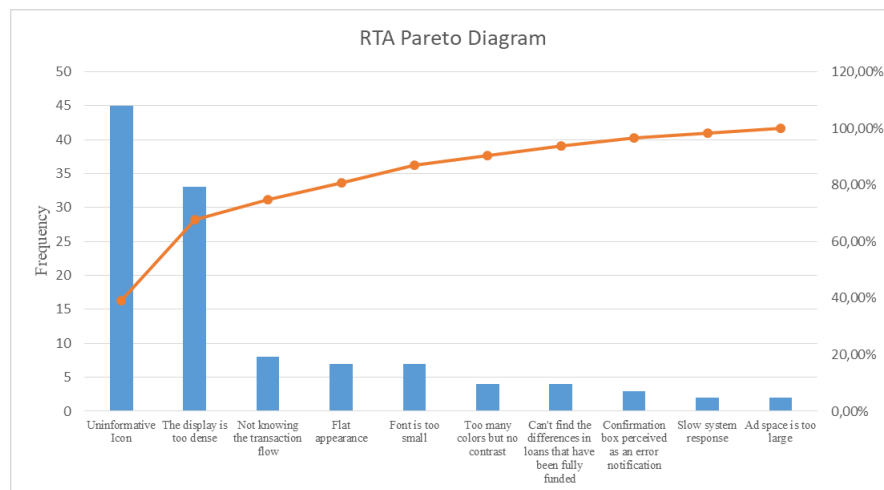


Figure 2. RTA Pareto Diagram

As seen in figure 2, 4 out of 10 problems are included in the 80% cause of the problem. These are non-informative icons, overly dense in appearance, not knowing the transaction flow, and flat appearance. These four causes will be the basis for proposed improvement.

3.3 Eye Tracking

The heatmap data on the interface of the customer journey assigned task is available in figure 3. The data displays the eye's focus behavior on the parts in the KoinWorks application design interface. Figure X shows the heatmap of the homepage interface from both groups of respondents.



Figure 3. Heatmap of Login Interface from Experienced Groups

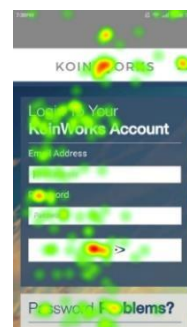


Figure 4. Heatmap of Login Interface from Inexperienced Groups

In the first task, the two groups of respondents log in by entering their e-mail and password and pressing the enter button. Respondents from both groups complained that the entry button did not look like a pressable button. additionally, that the human icon image was perceived as a profile icon when in fact the icon was to change the language of the application. Heatmap from both groups of respondents does not have a far different. The same pattern is also found in the other tasks.

3.4 Verification of Proposed Design

After analyzing the data obtained during the study, namely performance measurement data and eye tracking questionnaire, the proposed improvement design was carried out. The design of the proposed improvements also uses literature studies as the basis for its design. Basically, the improvement proposal does not change the brand design principle of KoinWorks so that researchers have collaborated in terms of brand knowledge in KoinWorks application design by conducting Focus Group Discussion (FGD) with UX Researcher and KoinWorks Graphic Designer application.

Table 4. Proposed Improvement For KoinWorks Application

Interface	Based on	Proposed Improvement
Login	Language switching icon is not informative and the display is too flat (RTA analysis)	Changing the icon into a flag icon that visualizes language switching
	Heatmap Eyetracking Result	Making a shape and color contrast to make the difference between buttons and e-forms look
Homepage/Summary	Confusing “browse” terminology (QUIS)	Changing the terminology into "loans" and putting list icon as the list of loans representative
Browse/Loan List	Filter buttons and icons are hard to find (analysis of efficiency)	Repositioning and reshaping of the filter icon to make it noticeable
	Dense interface and flat appearance (RTA)	Repositioning of information structure to make it less dense
	Confusing “grade information” terminology (Eye tracking and QUIS)	-Repositioning and reshaping of filter icon -adding “?” icon as a grade information representative
Filters	incorrectly using filter feature (error analysis)	Making a color contrast and highlighting the chosen loans
Funding	“+” icon is unnoticeable (RTA and error analysis)	Making a color contrast and reshaping the icon
Cart	Unnoticeable notification (RTA and eye tracking)	Adding pop up <i>notification</i>

The proposed improvement then made into wireframe and prototype to be retested. The prototype design is done using Adobe XD software. The user interface redesign of KoinWorks application can be seen in figure 5.

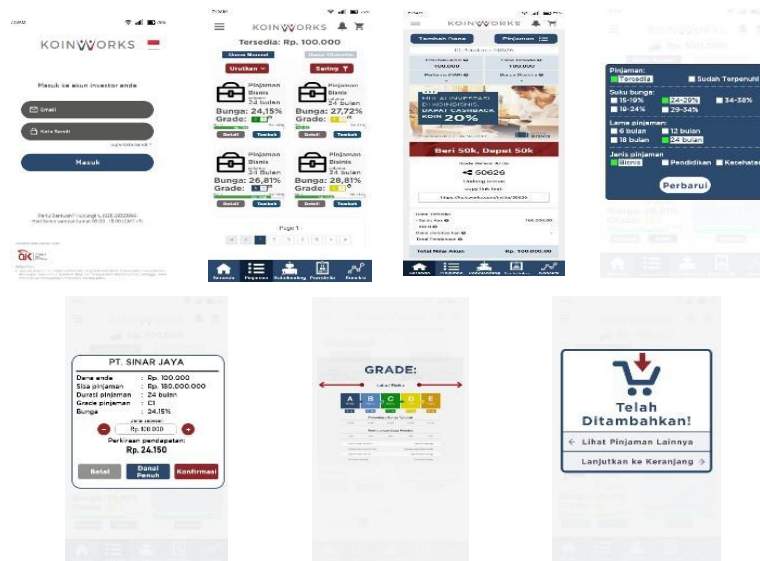


Figure 5. User Interface Redesign of KoinWorks

A comparison of user performance from the use of wireframes, prototypes, and previous KoinWorks applications is available in table 5. Wireframe is the unfunctional improvement version of the apps in the form of interface whereas prototype is the functional applications that has been redesigned.

Table 5. New Design Verification

No.	Measurements	KoinWorks Application	Wireframe	Prototype
1	<i>Task Success (%)</i>	60%	60%	100%
2	<i>Time on Task (s)</i>	250	286.4	60.4
3	SUS questionnaire(score)	54	38	76
4	<i>Saccade (unit)</i>	333	245	162

As seen in table 5, the prototype has better usability results compared to wireframe and the KoinWorks application. It has a higher value of task success, shorter time on task and lesser saccades. The smaller the number of saccades, the better the appearance because it does not cause mental burden [7]. This shows that the resulting prototype able to provide better ease of use to users than the current design.

4. Conclusion

This research aims to evaluate the usability of KoinWorks mobile application, to analyze the existing usability problem, and to achieve a better usability interface design. The results showed that KoinWorks have low usability evaluation among users, especially inexperienced users. The proposed improvements design is based on an analysis of the problems faced by users from both groups of participants. The four aspects of the analysis that are used as the basis for improvement are non-informative icons, overly dense in appearance, not knowing the transaction flow and flat appearance. The design of the proposal is done with two iterations where the first iteration is a wireframe and the second iteration uses a prototype. After doing usability testing back to the three designs namely the current KoinWorks application, wireframe, and prototype, it was concluded that the repair design in prototype form have the best usability compared to the other two as it is more effective and efficient so that it was easier to use even among new users.

References

- [1] Chishti S & Barberis J 2016 *The Fintech Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries* Hoboken: Wiley **p 207-208**
- [2] Dapp T F 2015 *Fintech Reloaded-Traditional Banks as Digital Ecosystems*. Frankfurt: Research Deutsche Bank **p 1-26**
- [3] Pegden C D 2017 *Simio LLC* Retrieved from Simio: <https://www.simio.com/applications/industry-40/index.php>
- [4] Pavlou P 2003 Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with The Technology Acceptance Model. *International Journal of Electronic Commerce*, **p 69-103**
- [5] Bhandari U Neben T Chang K and Chua W Y 2017 *Effects of Interface Design Factors on Affective Responses and Quality Evaluation in Mobile Application* Computers in Human Behaviour **vol. 72 p 525-534**.
- [6] Hussain A B Abbas S A Abdulwahed M S Mohammed R G and Abdulhusssein A A 2015 *Usability Evaluation of Mobile Game Application: A Systematic Review* International Journal of Computer and Information Technology, **vol.04 no.03 p 547-551**.
- [7] Liu M and Zhu Z 2012 *A Case Study of Using Eye Tracking Techniques to Evaluate The Usability of E-Learning Courses* International Journal of Learning Technology **vol.43 no.13 p 154-171**.
- [8] Nielsen, J 1993 *Usability Engineering* San Francisco: Morgan Kauffman.
- [9] Hwang W and Salvendy G 2010 *Number of People Required for Usability Evaluation: The 10 +/- 2 Rule* Communication of The ACM **vol.53 no.3 p 130-133**.
- [10] Rubin J and Chisnell D 2008 *Handbook of Usability Testing Second Edition*. Indianapolis: Wiley Publishing, Inc. **p 53-54**
- [11] Bangor A Kortum P and Miller J 2009 *Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale* Journal of Usability Studies (JUS) **vol. 4 no. 3 p 114-123**

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