Commodification of Mobile Banking Interface Design for Elderly Users

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The design planning of the Mobile Banking Interface Design for Elderly Users aims to redesign the mobile banking application interface to be more effective and easier for elderly users. This research uses a mixed-method of explanatory sequential, which sequentially uses quantitative and qualitative modes. The quantitative model uses questionnaires and bodystorming simulations to obtain data on the needs and behavior of the elderly. The qualitative model is based on the User-Centered Design (UCD) design process. The research resulted in the following: (1) data on the needs of elderly users when using mobile banking applications (2) data on the behavior of elderly users to better understand the interface of the mobile banking application. Based on these data, a mobile banking interface was developed to suit the needs of elderly users, which includes a more simplified display, enlarged text size, enlarged button size and additional spacing, adjusted icon shape to the understanding of elderly users, and display layout arrangements that are very concerned for making the interaction process more comfortable. Evaluation of the interface design results on mobile banking applications for elderly users shows that the application is more acceptable, more understandable, and easier for elderly use.

Keywords : mobile banking, interface, elderly users, design

INTRODUCTION

The rapid advancement and development of information technology have affected the banking industry with the advent of mobile banking applications. Mobile banking is a service that allows bank customers to perform banking transactions via mobile phone or smartphone (OJK, 2015). Mobile banking provides banking services that serve to facilitate customers in making banking transactions without the need to visit a bank or ATM except to make cash withdrawals. The advantage of mobile banking is that customers can make transactions anywhere and anytime without being time-bound. Services in mobile banking include: financial transactions, non-financial transactions, funds transfers, balance checks, and bill payments which can be performed via mobile phones.

The use of digital transactions has increased during the Covid-19 pandemic because of changes in people's behavior that have switched to using virtual economy transactions and the ease of accessing payments using mobile banking. The Banking Supervisory Chief Executive of OJK, Heru Kristiyana said that online sales or transactions rose by 320% in March 2020. Continued to April which increased by 480% (Faqir, 2020). Hary Purnomo, the Secretary of Bank BRI said that in 2019 internet banking and mobile banking users had increased by 15.46 million and mobile banking by 24.21 million (Hutauruk, 2019). Meanwhile, visits to bank offices and ATMs decreased during the Covid-19 pandemic due to avoiding crowds. In addition, people have also begun to turn to digital money in making payments to reduce direct contact with sellers. Hary Purnomo, the Secretary of Bank BRI said that mobile transactions and internet banking are increasingly needed by customers in today's digital era.

It is undeniable that mobile banking will be useful for all ages. However, smartphone applications are usually made for all ages, hence sometimes causing some problems for the elderly (Ellis & Marshall, 2019). There are no existing mobile banking applications that are fully compatible for elderly users. Elderly individuals tend to associate a visual design with a comfortable, relaxed atmosphere, and are associated with the availability of a lot of free time (Indrawati, 2009). For example, the mobile banking application owned by Bank BRI named BRIMO BRI. This BRI mobile application has a modern design but does not suitable for the elderly. On its homepage, there are too many selectable buttons that can confuse and unease elderly users. Also, the text and icon sizes are not large enough for the elderly. A person is determined to be elderly if he is 60 years old or older, because of certain factors that cannot meet his basic needs physically, spiritually, and socially (Nugroho, 2012). In addition, with increasing human age, there is a degenerative aging process that has an impact on physical, cognitive, feeling, social, and sexual changes (Azizah, 2011).

As part of modern society, digital technology users are a group that is very closely related to meeting the needs of creative and innovative visual design (Murwonugroho et al., 2011). However, for the elderly generation of digital technology users, there are additional requirements that are very important, namely trustworthiness and self-efficacy concern (Jin & Fan, 2022) and recreational criteria as well as functional or easy to operate (Li & Luximon, 2016). The results of the pre-research survey show that most elderly people have complaints about the texts or images that are too small. From the pre-research survey, it was also found that most elderly people have problems with both eyes so it is difficult to see small texts or pictures. In addition to the findings, the elderly also experience making mistakes in operating, an doing transactions, also no help available, so they have to be guided by the closest people/ people around. Based on those issues, this research aims to redesign mobile banking to be more effectively and easily used by elderly users.

RESEARCH METHOD

This research uses a quantitative method approach. A research method that is based on positivism philosophy is used to study certain populations or samples, data collection using research instruments, and quantitative data analysis/statistics with the purpose to test the hypothesis that has been determined (Creswell, 2014). The data obtained will be used to identify problems that occur in elderly interaction with mobile banking applications. This study uses three stages of research in the design of mobile banking applications for elderly users (Fig. 1). In the first stage, the purpose is to identify the problems experienced by elderly users when using mobile banking applications. To identify the problem, researchers used two methods, a questionnaire and bodystorming simulation. Questionnaires are needed to find out the needs of elderly users when using the mobile banking application. Bodystorming simulation is a physical situational simulation technique to find out the behavior of elderly users when interacting on a mobile banking application on the smartphone screen.
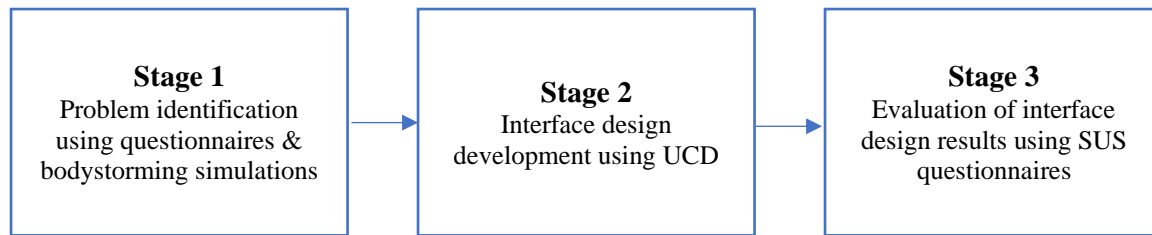
Figure 1. Research stage

The second stage of development of the mobile banking application interface design will use the User-Centered Design (UCD) method. The User-Centered Design (UCD) method has four stages namely, Understand Context of Use, Specify of Requirement, Design Resolution, and Evaluate Against Requirements. The third stage is an evaluation of the design results using the System Usability Scale (SUS) questionnaires (Brooke, 2013), a questionnaire on user view towards the result design usability.

The SUS score is determined by three assessments, namely Acceptability, Grade Scale, and Adjective Rating (Fig. 2). Acceptability is used to see the level of user acceptance of applications consisting of Not Acceptable, Marginal (low and high), and Acceptable (Brooke, 2013). The range of "not acceptable" values is 0-50, "marginal" is 50-70, and "acceptable" is 70-100. The grading scale is used to see the level (grade) of a software/ website by the user. The grading scale consists of levels A(80.3-100), B(68-80.3), C(68), D(51-68), and F(0-51) (Sauro, 2011). Adjective ratings, to see the application ratings consist of "worst imaginable" (0-25), "poor" (25-39), "ok"(39-53), "good"(53-74), "excellent" (74-85), and "best imaginable" (85-100) (Bangor et al., 2009).
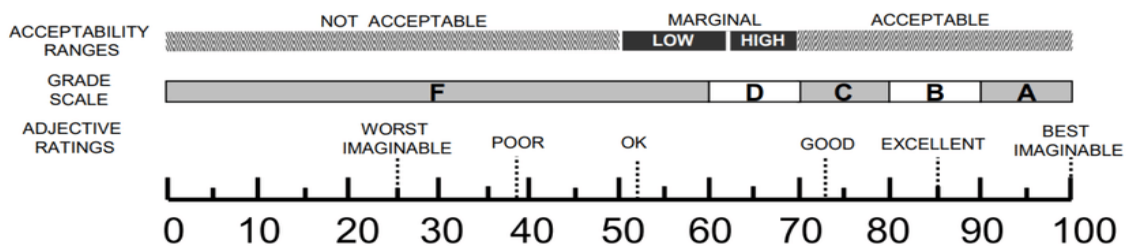

Figure 2. System usability scale (sus) score rating

RESULT AND DISCUSSION

Problem identification stage
Researchers identified the problem using questionnaires participated by 120 elderly users of mobile banking applications which include 69 (57.5%) female respondents and 51 (42.5%) male respondents. The questionnaire consists of three main sections with a total of 19 questions/ statements to be answered by respondents. The three main parts are Habits in Using mobile Banking Applications (Front Page / Login), Habits in using banking applications, and Habits of Using Banking applications, and Habits in Using Banking Applications.

The results obtained from the questionnaire are as follows: (a) having difficulty in performing login into the application. The difficulties often experienced are typing and remembering usernames and passwords, (b) elderly users prefer a simpler display of content/menu to understand more easily, (c) three services that elderly users often use on mobile banking applications are money transfer, transaction history, and balance information. (d) elderly users experienced difficulties in reading texts that are too small on the display of transfer services. (e) elderly users require an automatic transfer receipt storage feature after making a money transfer, as well as a button for automatic receipt storage feature and receipt delivery to the pre-order application. The findings at this stage comfirm the findings of Jin & Fan (2022) and Trabelsi-zoghlami et al. (2018), which show that the use of mobile banking applications in the elderly is influenced by factors other than age and familiarity with technology. Seniors' UX frequently addresses security, practicality, and privacy concerns.

Next is to conduct a bodystorming simulation participated by seven respondents who have to do

two different simulations (Fig 3). In the first simulation, respondents used plastic lens glasses and then perform to use the mobile banking application. While in the second simulation, respondents used plastic lens glasses coupled with an electric massager to simulate tremor movements. A respondent who finishes the bodystorming simulation will continue to fill out questionnaires that have been provided. The questionnaires aim to get information on what respondents feel when doing bodystorming simulations.

Figure 3. Respondents performing bodystorming simulation

The results from the bodystorming simulation are not only obtained from the questionnaire but also from the duration of task completion of the respondents in each simulation. So the conclusions are: (a) the usage duration of respondents when operating mobile banking is longer especially if they experience more than one disruption; (b) respondents can still recognize the color and appearance of the mobile banking application. (c) respondents have difficulty filling the form on the transfer service page, and are mistaken when pressing the button. (d) respondents feel that the keypad key and feature keys are too small so respondents experience errors in pressing the keypad key and feature keys.

The usability interface, according to Ho & Tzeng (2021), comprises of technical factors such as font style and size, navigation, page-turning, and page-to-speech. The simple interface includes useful elements such as infographics, categories, and item information. The outcomes from this study's bodystorming process were then classified based on the dichotomy defined by Ho & Tzeng (2021) in order to achieve a match between the mobile banking design and the needs and characteristics of older customers. According to Yang & Lin (2018), the older generation's participation in mobile devices occurs due to the pressure of trends and top-down public administration mechanisms, so developers must change the grade of mobile applications that are developed and also want to bind users from the older generation. Thus, it can be

followed up in this study based on the bodystorming phase and the outcomes of Almao's (2018) evaluation of usability and accessibility.

Design development stage
In the second stage, this study uses the UCD method consisting of several stages before conducting the design development of the mobile banking application interface. The first stage of the UCD method is Understand Context of Use which aims to find out the usage of mobile banking applications in elderly users. The results from the questionnaires show that most elderly users often use mobile banking applications in everyday life, exactly what Garcia-Penalvo et al. (2014) and Kurniawan et al. (2021) said. Banking services used by elderly users are money transfers, viewing transaction history, balance information, payments, and balance Top Ups. Because of the ease of these services, elderly users prefer to use mobile banking applications instead of going to the nearest ATM or branch bank office as they used to be.

After finding out the utility of mobile banking applications for elderly users, the next stage is to know their needs when operating the application. The needs of elderly users obtained from the results of questionnaires and body-storming analysis can be concluded in

Table 1.

Table 1**.** Specifying user needs

Needs	Things to be considered
1. When elderly users are going to log in to the mobile banking application they need to remember the username & password.	It is necessary to design a login display that only has one password fill to make it easier for elderly users. But this display exists when elderly users have already entered the mobile banking application.
2. Elderly users need to understand the display of content/ menu more easily	The content/ menu display is the initial display that will be seen by elderly users, therefore it should be easy to understand. In addition, there is a help feature, and a teller will appear to explain some of the buttons/ features that are on the content/ menu display.
3. The need to minimize errors in pressing buttons.	Therefore, it is necessary to design a larger button with sufficient spacing.
4. The need to understand the meaning of an icon image more easily	Therefore, the selection of icon images should be simple so that elderly users can understand more easily.
5. The need to minimize errors when typing text on smartphones.	Therefore, the letter/ number keys design on the keypad can be enlarged to minimize errors when typing.
6. The need to read unreadable text on mobile banking applications.	Therefore, it is necessary to design the right text size so that it can be easily read by elderly users.

After knowing the utilities and needs of elderly users for mobile banking applications, the next stage is to design an interface. In this stage, there are three steps that aim to produce the final design of the mobile banking application interface (Rot et al., 2017). The first stage is the basic concept of design and development of the initial design (wireframe/low fidelity).

The basic concept of the design is containing about the concept that will be used in the development of mobile banking applications (Cheng & Sabran, 2017). The basic concept consists of the selection of logos, colors, typography, icons, and illustrations (Fig. 4). In the development of the design interface, color selection becomes the most important aspect because color can communicate visuals, comfort and present a brand. For developing a mobile banking interface design for elderly users, researchers set the visual display of mobile banking applications for a self-made bank called Lansia Bank as a reference for the case study.

Figure 4**.** Lansia Bank logo and colors

In the interest of developing mobile banking applications, San Serif is chosen as typography. San Serif typography does not have fins and will be easier to recognize the letters than those that have fins. In addition, San Serif is easily recognized by the elderly who have vision limitations according to the website uxmatters.com in the article titled Designing for Senior Citizens | Organizing Your Work Schedule. Whereas the typefaces that will be used in the interest of developing mobile banking applications is Inter.

The next step is the design of the icon display that uses icon fill type. The use of icon fill in the

development of mobile banking applications because it uses only one color and the icon is solid or contained. The interface design of mobile banking applications for elderly users does not use many illustrations (Warpenius et al., 2015). While illustration aims to provide information in visual form so that it is easy to understand, entertain and beautify the appearance of the interface.

Low fidelity design development can also be called wireframe which is an initial design that has the purpose to determine the layout and process (Fig. 5). Low fidelity design is yet a low-level design because it does not attach importance in terms of color, font,

and size. Here in Figure 11 is a wireframe of mobile banking application.

From the results of the questionnaire, elderly users can still recognize the login display because there is a username and password form. So, the login page has not changed much but only has some additional parts. When the elderly users start to log in, a login button and two instant feature buttons will appear on the login display. After selecting the login button, the users go to the password form page. Elderly users will be more facilitated because they only have to remember the password without the username.

Figure 5. Wireframe of Lansia Bank application

The contents/menu page is shown after entering the password on the login page of the mobile banking application. From the questionnaire results, elderly users can still recognize the contents/ menu display of the mobile banking application. So, the content/menu page has only been changed on the size of the feature button and icon images.

On the transfer service page, researchers attach importance to the element of convenience so that elderly users will not experience difficulty and confusion when facing a complicated transfer display. In addition, on the transfer service page, the text is also enlarged and there is a help button at the top right corner to help elderly users when experiencing confusion. After conducting the initial draft, the next step is to evaluate the initial design to

get feedback from three selected respondents. This evaluation uses the Prott application on iPhone smartphones to create an initial design type that can later be used by respondents. After trying the two services that existed in the initial design of the mobile banking application, the three respondents gave their feedback (

Table 2).

Table 2. Evaluation results of the initial design

Display	Feedback
Login	Respondent one commented about being unfamiliar with the design at the initial login, but after getting an explanation from the researcher, respondent one understood what was the purpose of the login display.
Menu/contents	The three respondents commented that the menu/ content display accentuates features that were more widely used by elderly users.
First stage of transfer	All three respondents had no difficulty in the early stages of the transfer process from the addition of new recipients, choosing a bank, and entering the transfer amount. Respondents gave recommendations about the part of inputting transfer amount to be made more simple and informative to easier the input process.
Last stage of transfer	In the final stage of the transfer, the respondents commented that it will be better if the receipt is immediately shown rather than having to press the "view receipt" button.

The development of the final design (High fidelity design) is the final stage that produces the actual display that will be seen and used by users. The development of the High fidelity design of mobile banking applications was carried out using the Figma prototyping application. The final design is based on the initial design with added feedback from the three respondents who tried the initial design. Here are the results of the High fidelity design mobile banking application of Lansia Bank.

The first time a user enters the application, a splash screen that describes the Lansia Bank will be displayed, then the user will go to the login page for the first time (Fig. 6). In this login section, users must enter a username and password if they have registered or already have an account at Lansia Bank. After entering the user's username and password, users will proceed to the mode selection display for the user to choose. Two modes can be selected by users, namely the Elderly Mode and the All Ages Mode. The Elderly Mode is specified for elderly users in the Lansia Bank which purpose is to ease the elderly in using the application.
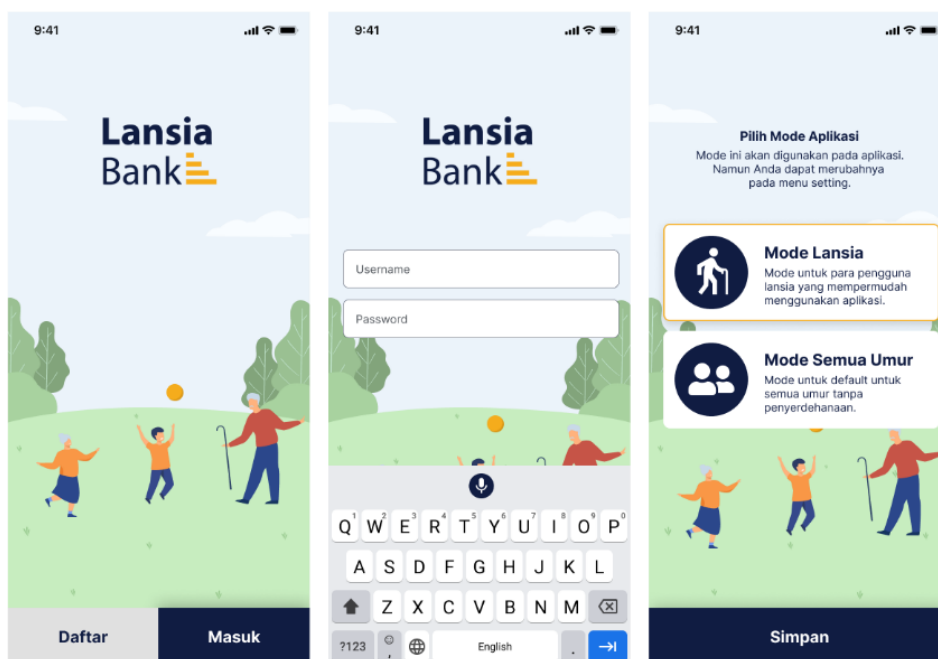

Figure 6. The display of before and after login

Before entering the menu/content page, there is a help display which the purpose to explain what is contained in the menu/content page (Fig. 7). In this help display, the user is given an explanation in two ways, text and voice. This help view can be accessed manually via the question mark (?) button located at the top right of the menu display (Diaz-Bossini & Moreno, 2014).
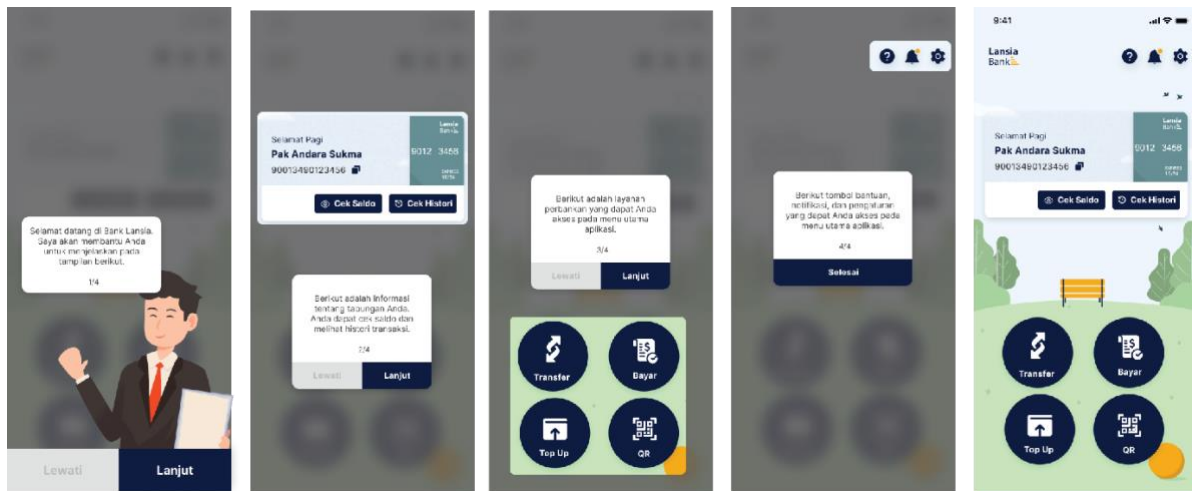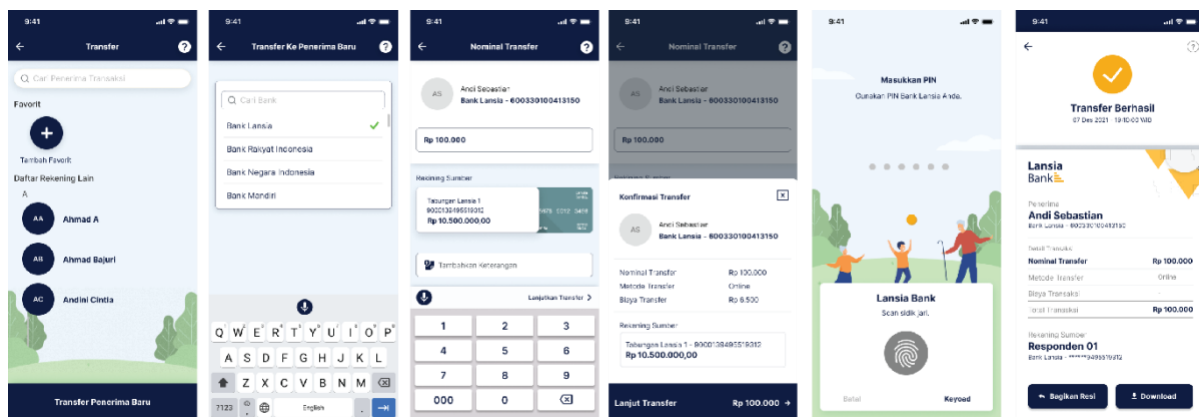
Figure 7. Help view and content menu/app

Figure 8. Transfer service view of the application

On the mobile banking application of Lansia Bank, the transfer service page is made simple and the texts are enlarged to ease the elderly users to read and understand. This matters because there is a lot of important information on the transfer service page so it must be easy and simple. Upon entering the transfer service page the user will be shown the list of favorite recipients, which is a list of old recipients' accounts, and a transfer button to enter a new recipient. If pressing the "new recipient transfer" button, it will proceed to the display of bank names field and account number. When on the form page, the default bank recipient is the Lansia Bank, but when clicked, there will be a banks list and a search button. Elderly users can immediately type the bank name in the search button. The next display is the transfer amount form which contains the recipient's information, transfer amount field, source account, description field, and numbers keypad. After entering the transfer amount, it will proceed to the transfer details section and continue to enter the PIN credentials. The transfer will be successfully made after the elderly user enters the PIN credentials, and there will be a "Transfer Successful" display along with the transfer receipt.

After finishing with the final design of the mobile banking application, then followed by evaluating the final design based on the requirements that have been predetermined for each display part. The goal is to find out whether these requirements have been included in the final draft. In the final design of the mobile banking application, Lansia Bank has an only-password form feature when they will log in to the application, with the condition that they have once logged in first. The final design is different from the initial design because, based on the evaluation results of three respondents', the appearance of the menu/ contents display was not simple. Previously in the initial design, there were six buttons for banking services. Now, in the final design of banking services, there are only four feature buttons.

Generally, the display of mobile banking application services contains text and fill. Therefore, in the final design of mobile banking applications, the display of transfer or payment services is made as simple as possible so that elderly users can easily understand. Visual elements are designed in such a way as to enhance memory for users. The regularity and

consistency of a visual display, according to Murwonugroho (2019), makes it easier for visual design connoisseurs to understand the meaning of the icons that serve as menu symbols. Thus, the visual appearance of the user interface can have power over visibility and enjoyment.

Evaluation stage of interface design results

The completion of the final design (High Fidelity Design) is

followed by the evaluation stage using the SUS questionnaire. The SUS questionnaire is used to determine the experience and perception of respondents to the final design (High Fidelity Design) mobile banking application that has been created by researchers. Ten statements will be asked to the respondents who have tried the final design prototype of the mobile banking application (

Table 3). Each statement will have five answer options that respondents must choose.

Table 3**.** Ten SUS Questionnaire Items

Question	Questionnaire Items
Q1	I will often use the mobile banking application of Lansia Bank
Q2	I think the display of mobile banking applications of Lansia Bank is too complicated.
Q3	In my opinion, the mobile banking application of Lansia Bank is easy to use.
Q4	I need technical assistance to be able to use this Lansia Bank mobile banking application.
Q5	In my opinion, various features are well integrated in the mobile banking application of Lansia Bank,
Q6	In my opinion, many things are inconsistent in the display of mobile banking applications of Lansia Bank.
Q7	I think the majority of users will learn to use this Lansia Bank mobile banking application quickly.
Q8	I find that the mobile banking application menu of Lansia Bank is very impractical.
Q9	I deeply trust in using this Lansia Bank mobile banking application.
Q10	In my opinion, users must learn a lot first before they can use the mobile banking application of Lansia Bank.

From the questionnaire answer, there will be a value that will be calculated to be given a graded SUS Score. However, there are rules to calculating an SUS score, which are the following:

- For each odd-numbered question, the final score is the result from subtracting the user's score (x) by 1.

- For each even-numbered question, the score

is finally obtained by subtracting 5 by the user score (x).

- SUS score grading is obtained from the sum of all user scores multiplied by 2.5.

The SUS value of the 12th respondent is considered invalid and therefore excluded in the final calculation (the value is extreme) and everything was average (Table 4).

Table 4**.** Calculation data of SUS final design questionnaire

No.	R	Questionnaire										TTL	Score TTL*2,5
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
1.	R1	3	4	4	3	3	3	4	4	3	4	35	87,5
2.	R2	4	3	3	2	4	3	3	3	2	3	30	75
3.	R3	4	3	4	3	4	3	4	2	4	4	40	87,5
4.	R4	3	1	3	4	2	1	4	2	1	1	25	62.5
5.	R5	3	1	4	1	4	2	3	1	4	1	24	60
6.	R6	3	3	3	3	3	3	4	3	3	3	29	72,5
7.	R7	4	3	4	2	4	3	4	2	4	2	32	80
8.	R8	4	3	4	2	4	3	4	3	4	2	33	82,5
9.	R9	3	3	3	4	3	3	3	4	3	3	29	80
10.	R10	2	3	4	3	4	3	4	3	4	2	32	80
11.	R11	2	4	4	4	4	3	4	3	4	4	36	90
Total													880
Average													80

Based on the calculation results of 11 respondents, it can be determined that the final design of the mobile banking application of Lansia Bank is as follows:

1. The final design of the Lansia Bank has a SUS value of 80, and by the Acceptability Ranges category, the final design of Lansia Bank is included in the Acceptable criteria. Criteria that get Acceptable must have a value between 70 to 100. Therefore, the final design of the Lansia Bank can be operated and accepted by elderly users.

2. The final design of the Lansia Bank has a value of 80, and by the Adjective Ratings, it can be categorized as Excellent. Having an Excellent category means that the final design of the Lansia Bank is very good in addressing the needs and issues of elderly users when using mobile banking applications.

3. The final design of the Lansia Bank is included in B Grade Scale because it values between 68-80.3. This means that the final design of the Lansia Bank is good enough in both interface design and the experience provided to elderly users.

CONCLUSION

The results from questionnaires and bodystorming simulations show that the interaction process of elderly users towards mobile banking applications has differences due to some special needs, specifically (a) a more simplified display to make it easier for elderly users to understand (b) accommodate enlarged text size for easy reading (c) enlarged the button size and given a wider space to minimize mistake in pressing the button (d) icon shapes that are adjusted to the elderly comprehension about the operational meaning of each icon display for easier understanding (e) highly considered arrangement of display layout to make interaction process more comfortable.

The design results of the mobile banking application interface for elderly users show that the application is more acceptable, understandable, and easier for the elderly to use. This is indicated by the SUS score on the interface design development that has been categorized as Acceptable in Acceptability, Excellent in Adjective Rating, and has a B in Grade Scale category. As a graphic work, the visual design in Lansia Bank pays attention to aspects that Murwonugroho & Atwinita (2020) often highlight, namely focus, lighting, and transitions (whether a graphic object is intentionally kept still or moving).

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