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Research Article

Analysis Design of UI/UX Models for Elderly Users in Digital Agricultural Business Transformation

Herdin Yohnes Madawara[1,*], Irwan Sembiring[2], and Budhi Kristianto[3]

[1,2,3]Magister Sistem Informasi, Fakultas Teknologi Informasi, Universitas Kristen Satya Wacana, Salatiga, Jawa Tengah

*Corresponding email: 972022010@student.uksw.edu

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Abstract: The research conducted explores the digital agriculture business transformation with a focus on elderly users. Despite significant growth in this field, challenges remain, such as suboptimal inventory management, lack of connectivity between farmers' markets, and difficulties in understanding consumer needs. This study aims to analyze and design a UI/UX model tailored to the needs, expectations, challenges, and preferences of elderly users. Using a Design Thinking approach, the research involves literature reviews, user interviews to identify problems, and needs analysis to prioritize issues. UI/UX prototyping was conducted to develop solutions aligned with user requirements, followed by an evaluation to gather feedback. The System Usability Scale (SUS) was used to assess the data, resulting in a "good" rating with an average final score of 74.391, indicating the designed solution meets usability standards for elderly users in digital agriculture. The findings show that elderly users require a simple, easy-to-understand interface, clear icons, large text, and adequate training and support. This research contributes to improving the effectiveness and adoption of technology for elderly users in digital farming, promoting inclusive and sustainable digital agriculture. Further development should focus on iterative design improvements based on user feedback, and future research should explore advanced technologies such as artificial intelligence and the long-term impacts on elderly farming practices.

Keywords: design thinking, digital agriculture business transformation, elderly people, system ui/ux, usability scale

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1 Introduction

Agriculture is a highly strategic sector as it is key to the sustainability of human life on Earth. Agriculture in its broadest sense includes food crops, plantations, and horticulture, all of which contribute significantly to human life [1]. Technological advances in the agricultural sector continue to increase every year, and farmers who do not keep pace with developments in the adoption of new technologies will not be able to reap the optimal benefits from their agricultural endeavors [2]. According to projections by the Central Statistics Agency (CSA), the economic growth of the agricultural sector in Indonesia is expected to increase between 5.7% and 6.0% per year over the next five years [3]. This growth will be driven by factors such as increased productivity, sustained investment, improvements in the labor market, and the quality of human resources. However, the older population (referred to as MANULA or senior citizens) who are still actively working will also play a crucial role in growth. According to a BPS report, the percentage of elderly people in Indonesia reached 53.93% in 2023, showing a significant increase from the previous year [4]. These factors become even more important when considering the declining interest of young people in the agricultural sector. According to CNBC Indonesia, agriculture is no longer an attractive option for young people, especially Generation Z. According to a Jakpat survey, only 6 out of 100 Generation Z people aged 15-26 are interested in working in the agricultural sector, with various reasons for their lack of interest [5]. In the era of digital transformation, many young people tend to move to other employment sectors that are perceived as more modern and technology-based. This could be due to the perception that agriculture is a less attractive career, limited access to modern technology in the sector, or possibly economic uncertainty in agriculture [6]. As a result, the agricultural sector relies heavily on older workers who continue to contribute actively to the sector.

It is important to note that successful digital agribusiness transformation requires the integration of older workers and digital platforms throughout the agricultural supply chain, from farmers to consumers [7]. Although digital agribusinesses have grown rapidly, several challenges still need to be addressed, including inefficient inventory management, lack of connectivity between farmers' markets, and difficulties in understanding consumer preferences [8]. 202.7 people are accessing the internet in Indonesia with a percentage of 73%, but internet usage among the elderly is still low [9]. Through these challenges, attention to User Interface (UI) and User Experience (UX) aspects is crucial. Not only to increase widespread adoption of digital farming business solutions, but also to ensure successful implementation by creating a comfortable interface, increasing user engagement, and optimizing efficiency in daily farming practices as well as providing in-depth understanding such as training on the use of technology.

While many studies have been conducted on technology adoption in agriculture, few focus on the specific needs of elderly users. The elderly play an important role in the agricultural sector, especially given the declining interest of the younger generation in agriculture. The research conducted is important from both an academic and practical perspective. Academically, this research will expand the literature on UI/UX by providing new insights into inclusive design for elderly users in the context of digital agribusiness. Practically, the results of the research can help create more effective and inclusive technology solutions, improve the productivity and sustainability of the agricultural sector, and support better policies to support digital transformation in agriculture. Using a design thinking (DT) approach, this research aims to create solutions that not only fulfill technical requirements, but also meet the needs, expectations, and challenges of older users in digital agribusiness. As such, this research is expected to make a significant contribution to improving the effectiveness and acceptance of older workers in digital agribusiness, in line with technological advancements and the evolving needs of the agricultural sector.

The research focus includes several main aspects. First, analyzing the needs of elderly users (MANULA) in the context of digital agribusiness and providing an understanding of expectations, challenges, and preferences in using agricultural technology. Next, assess the current condition of elderly users, analyze existing features and functions, and evaluate the level of the elderly in the digital agribusiness ecosystem. The design thinking approach will be the main methodological basis of this research. Through design thinking steps such as empathizing, defining, ideating, and prototyping, this research will engage key stakeholders including farmers, agribusiness practitioners, and technology providers to create innovative solutions. The design of an intuitive and effective UI/UX model will also be a key focus, to create a user interface that facilitates the use of elderly workers in daily agricultural practices. In addition, it includes evaluation through user testing to measure user response and satisfaction with the designed UI/UX model using the System Usability Scale approach. The process was to identify areas for improvement and refinement through iterative design based on feedback from users. Overall, the research carried out aims to make a significant contribution to improving the effectiveness and adoption of older workers in digital farming businesses, in line with technological advancements and the evolving needs of the agricultural sector.

Digital agribusiness has become a major focus in agricultural technology research. Research by [10] found that the application of digital technologies such as land management systems and IoT sensors can improve production efficiency and reduce operational costs. In addition, research [11] showed that agricultural digitalization can help farmers access a wider market and get better prices for the products they produce. However, the research conducted generally does not consider the specific needs of the aging population, which is a significant contributor to the agricultural sector in many developing countries. Another study [12] emphasized the importance of user-friendly interface design to increase technology adoption among farmers. Farmers found that simple and easy-to-use interfaces can reduce barriers to technology adoption. However, the study did not specifically target elderly farmers, who may have different needs and challenges compared to other age groups. This argument is also supported by [13] those who pointed out that training and technical support are critical to the successful implementation of agricultural technologies. However, the study did not explore how UI/UX design can be customized for elderly users. Similarly, previous research shows that technology adoption among elderly farmers is often hindered by factors such as the inability to operate digital devices and lack of trust in new technologies [14]. Research [15] found that providing ongoing training and support can help overcome some barriers in the context of agricultural technology, but did not explore in depth how UI/UX design can be customized to accommodate the specific needs of elderly users.

Based on the literature, it is clear that while many studies are highlighting the benefits and challenges of agricultural digitization, there is a significant gap in terms of attention to the specific needs of the elderly population. The research undertaken aims to fill this gap with a specific focus on UI/UX design tailored to meet the needs, challenges, and preferences of elderly users in digital agribusiness. Specifically, this research utilizes a design thinking approach to deeply understand the needs of elderly users, which includes the stages of empathy, problem definition, ideation, prototyping, and testing. This research also uses the System Usability Scale (SUS) evaluation method to measure the effectiveness and user satisfaction of the proposed design. Thus, this research not only makes a theoretical contribution by expanding the literature on inclusive UI/UX design but also offers practical solutions that can be implemented to increase the adoption of digital agricultural technologies by the elderly population. The research also differs from previous studies by emphasizing the importance of integration between elderly users and digital technologies in the context of agribusiness, which has not been widely discussed in previous literature. By identifying and addressing barriers that are specific to elderly users, this research has the potential to increase the adoption of technology and the effectiveness of its use in everyday agricultural practices.

2 Research Method

The research methodology serves as the basis for data collection, analysis, and interpretation of results. Focusing on elderly users (MANULA) in digital agriculture, the methodological steps taken related to the research objectives and research questions formulated in the introduction.

2.1 Research Stages

The process starts with approaching and gathering data to create a complex UI/UX design. Interviews are then conducted to understand existing issues. This is followed by requirements analysis, prototyping, and testing for user feedback. Data from user responses is analyzed and, if necessary, redesigned. If the design meets user needs, the research moves to the final stage, as shown in Figure 1.

1. Literature review: The research starts with a literature review on UI/UX design theories and the design thinking approach. The researcher collects references from various sources such as books, journals, articles, and online resources.
2. Interview: The next step is to conduct interviews with users and stakeholders to better understand their needs and expectations for the upcoming application. The researcher asks targeted questions about the users' specific needs, aspirations, and challenges.
3. Requirements analysis: Following the interviews, the collected data is analyzed to identify user challenges. The design thinking approach guides problem-solving and includes stages such as Empathy, Define (Pain Points and How Might We), Ideate (Application Features), and Wireframe/Mockup. In this stage, the researcher identifies common problems faced by users and prioritizes them.
4. Prototype: Develop an interactive prototype of the user interface design with functional features for testing.
5. Testing: Gather user feedback and identify necessary improvements by testing the prototype.
6. Implementation: Analyze the strengths and weaknesses of the design interface after testing and validation.
7. Conclusion: Summarize the results and conclude the designed solutions and user feedback received throughout the process.

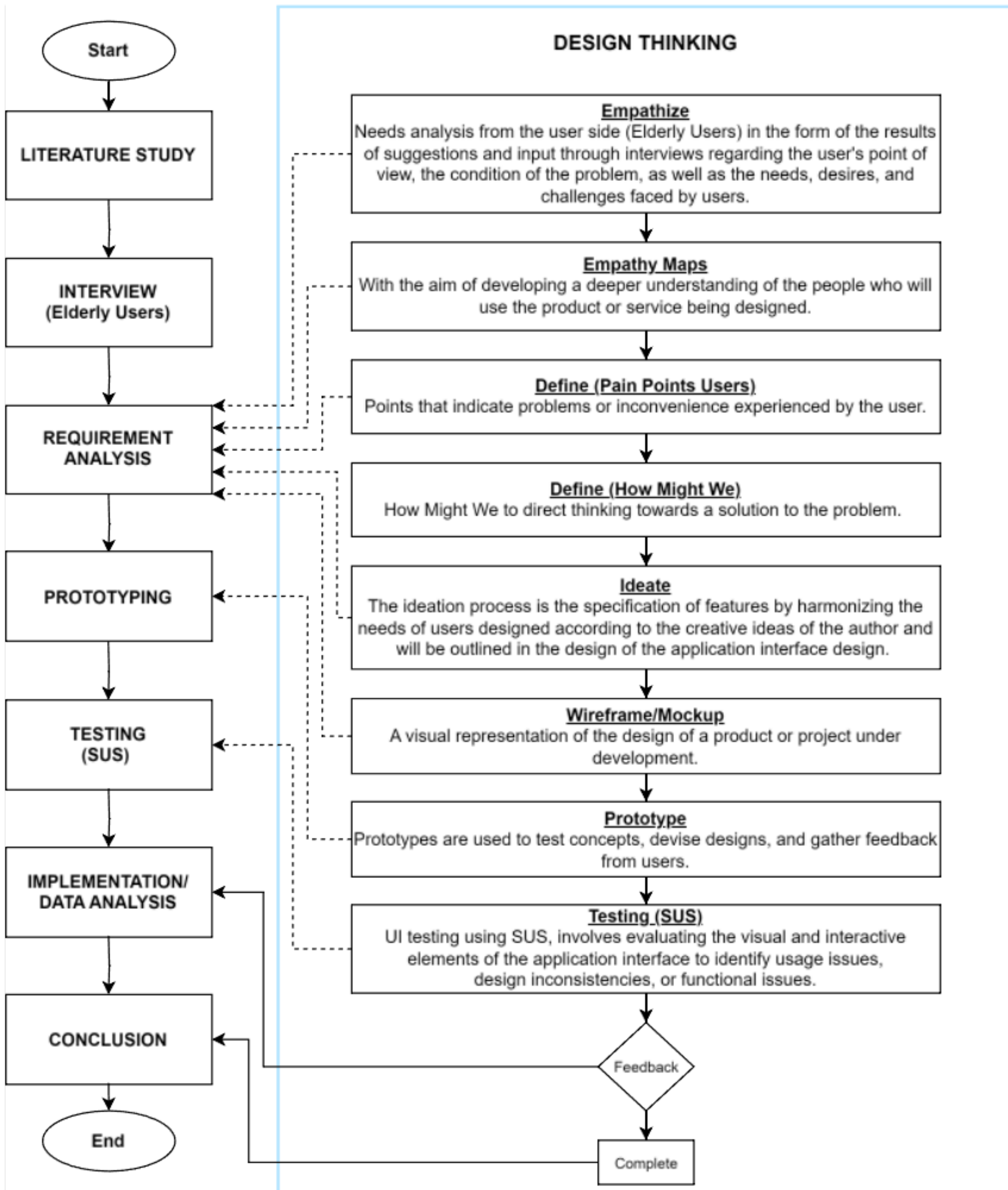

Figure 1: Research stages.

2.2 Design Thinking (DT)

Design Thinking is an approach or method used in design or problem solving with a focus on the user (user-centric) [16], involving a deep understanding of user needs and wants (empathy), defining the problem (define), ideating solutions (ideate), prototyping and testing the solutions produced [17, 18]. Below are the process stages of the Design Thinking method, along with an explanation of the Design Thinking approach.

1. Empathy: The design thinking approach starts with understanding user experiences and needs [19]. This stage involves collecting data and directly observing users, as well as interacting with users to understand their perceptions, challenges and needs [20]. The aim is to create a deep understanding of the users and to identify the problems to be solved [21].
2. Define: In this phase, the information gathered in the empathy phase is used to identify the problems to be solved. During the Define stage, the team interprets and analyses data to accurately identify and formulate the problems [22]. The result is a clear and focused problem statement [23].
3. Ideate: In this stage, the team begins to explore alternative solutions to the defined problems. The team can use various brainstorming techniques, such as mind mapping or SCAMPER, to generate as many ideas as possible [24]. The aim is to obtain creative and innovative ideas as a basis for the right solutions [25].
4. Prototyping: This stage involves creating prototypes of the alternative solutions generated [26]. The prototype can take the form of sketches, models or simple simulations [27]. The aim is to test ideas and gather feedback from users to improve solutions and identify shortcomings [28].
5. Testing: In this phase, the developed solutions are tested on users to validate whether the solutions effectively solve the defined problems [29]. The results are used to refine the solutions and ensure that they meet user needs.

Design thinking emerged in the 1990s when Tim Brown, CEO of the global design firm IDEO, introduced it as an approach to product design that integrates creativity and technology with a focus on user needs [30]. Design Thinking gained popularity for helping to solve complex problems by prioritising empathy with users as the primary basis for designing solutions [31]. The Design Thinking method can also be applied in various fields such as product design, business, healthcare, education and more [32].

2.3 Testing Instruments (System Usability Scale)

The test tool uses the System Usability Scale (SUS), which is one of the most commonly used approaches for measuring usability in product development, especially in the field of information technology and communication [33]. The SUS method is used to assess the extent to which an information technology product or system meets users' needs and expectations [34]. SUS was originally developed in 1986 by John Brooke at the University of Sussex, UK [33, 35]. The SUS method has been widely used for different types of products and systems, ranging from software, websites, mobile applications to hardware [36]. It is relatively easy to implement and can provide consistent results. With over 1300 articles and publications referencing it, SUS has proven to provide reliable and in-depth results in measuring aspects of usability, including efficiency, effectiveness and user satisfaction.

The SUS method consists of ten statements used to evaluate the usability of a product or system. Each statement has five response options rated on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree [37–39]. The ten questions of the SUS method are shown in Table 1.

Table 1: System usability scale questions

No.	Questions	Score
1	I feel interested in using this application, even though I am elderly/senior.	1 – 5
2	As an elderly/senior, I find it difficult to use this application.	1 – 5
3	I feel that this application is easy to use for elderly/MANULA.	1 – 5
4	I feel the need for technical assistance in using this application, considering the limitations of elderly/MANULA.	1 – 5
5	I consider that various functions in the application are well integrated.	1 – 5
6	I feel inconsistencies in this application that may cause confusion for elderly/MANULA.	1 – 5
7	I feel that the majority of elderly/MANULA can quickly learn to use this application.	1 – 5
8	I feel that this application is less comfortable to use for elderly/MANULA.	1 – 5
9	I feel confident and self-assured in using this application, even though I am elderly/senior.	1 – 5
10	I am aware that a lot of learning is needed before using this application, considering the abilities of elderly/MANULA.	1 – 5

In the calculation of the questionnaire, the scores are adjusted on the basis of the answers given by the respondents, with a total of 10 respondents. For odd questions, the score is subtracted from 1 (X-1), while for even questions, the score is subtracted from 5 (5-X) [40, 41]. In addition, considering that the average score is 68, if the score obtained falls below the average, it indicates the need for a reassessment to modify or improve the usability of a product [42,43]. The interpretation of the SUS score is shown in Table 2 [40,44].

- x = Odd values
- y = Even values
- $\bar{x}$ = Average score
- $\sum$ = Sum of SUS scores
- n = Number of respondents

The odd numbered questions, namely 1, 3, 5, 7 and 9, have scores calculated by subtracting 1 from the respondents' answers.

$$[\text{Odd SUS Score} = \sum_{x=\text{odd values}} x - 1] \tag{1}$$

The calculation is made by subtracting the score received by the respondent from 5 for the even numbered questions, 2, 4, 6, 8 and 10.

$$[\text{Even SUS Score} = \sum_{y=\text{even values}} 5 - y] \tag{2}$$

From the conversion, the next step is to add up the scores from the odd and even questions. The total score is then multiplied by 2.5 to give a range of values between 0 and 100.

$$[\text{Odd SUS Score} = \sum_{x=\text{odd values}} x - 1] + [\text{Even SUS Score} = \sum_{y=\text{even values}} 5 - y] \times 2.5 \tag{3}$$

The next step is to find the average score of the system usability scale by summing up all the scores obtained and then dividing by the number of respondents.

$$\bar{x} = \frac{\sum x}{n} \tag{4}$$

Table 2: Interpretation system usability scale

SUS Score	Grade	Adjective Rating
84,1 – 100	A+	Excellent
80,8 – 84,0	A	Very Good
78,9 – 80,7	A-	Good
77,2 – 78,8	B+	Above Average
74.1 – 77.1	B	Average
72,6 – 74,0	B-	Slightly Below Average
71.1 – 72.5	C+	Fairly Poor
65,0 – 71,0	C	Poor
62,7 – 64,9	C-	Slightly Poor
51,7 – 62,6	D	Unsatisfactory
0,0 – 51,6	F	Fail

2.4 Respondent Characteristics

According to the World Health Organization (WHO), the elderly (referred to as the elderly or elderly individuals) are defined as those aged 60 and above, with varying levels of education and a mix of men and women [45]. Due to limitations in fine motor skills, UI/UX design should consider larger buttons and sufficient spacing between interactive elements. The elderly have varying levels of technological proficiency; some are already accustomed to using digital devices, while others may require additional training, such as interactive tutorials. The approach used to obtain the sample involves applying the Slovin's formula (also known as Slonim's formula or Yamane's formula), introduced in 1960 [46]. The population in the agricultural sector in Kerep Kidul Village, Bagor District, Nganjuk Regency, Central Java, consists of 50 people with a margin of error of 5% (0.05). The Slovin's formula is as follows:

- n = Sample size required
- N = Population size
- e = Margin of error (desired level of error, in decimal form)

$$n = \frac{N}{1 + N(e^2)} \tag{5}$$

$$n = \frac{50}{1 + 50(0.05^2)}$$

$$n = \frac{50}{1 + 0.125}$$

$$n = \frac{50}{1.125}$$

$$n = 44.44$$

With a population of 50 people and a margin of error of 5%, the recommended sample size is approximately 44 people.

3 Results

The discussion starts with the identification of problems in the agricultural sector, especially among the elderly (MANULA). It focuses on the analysis and design of UI/UX models for elderly users in the context of digital transformation of agricultural businesses. The main focus of the discussion is on the key findings from the data collection and how these findings can provide insights and solutions to improve the user experience in the evolving digital agricultural business environment.

3.1 Emphatize

The first stage of design thinking is empathising. This process involves analysing user needs through feedback and input gathered from interviews conducted on user perspectives, problem conditions and understanding user needs, wants and challenges. This serves as a reference for interface design. Below is the representation in Table 3.

Empathy Maps is a visual tool that helps in understanding users' needs, feelings, and experiences based on data collected from various sources such as interviews and observations. In the context of design thinking in the UI/UX design of digital agriculture business applications focused on elderly users (MANULA), Empathy Maps serve to identify and analyse users' thoughts, feelings, needs, and experiences. This is further explained in the Empathy Maps in Table 4.

3.2 Define

The Define process is a stage in which the results of the Empathise stage are collected and the data collected is analysed. In this stage, the main problems faced by the elderly users (MANULA) are identified and articulated in pain points, which indicate the problems or discomfort experienced by the users. Questions such as "How could we?" or "How can we...?" are then formulated to guide thinking towards solutions to these problems. This can be seen in Table 5 "User Pain Points" and Table 6 "How Might We?" below.

3.3 Ideate

From the Define stage of the design thinking process, pain points and How Might We questions are obtained as a starting point for the ideation process of features for the digital agricultural business application. In addition, feature specifications are aligned with elderly users needs (MANULA), designed according to the author's creative ideas, and incorporated into the application interface design. The UI/UX is optimised to meet the needs of older users, such as using larger fonts and more contrasting colours to improve readability, and ensuring intuitive and simple navigation to avoid users feeling overwhelmed. The recommended features are shown in Table 7 of the interface design solutions.

Table 3: Empathize (needs analysis)

No.	Interview Results	UI/UX Question
1	Interviews with elderly users or MANULA revealed challenges in inventory management and stock availability in the agricultural supply chain. Such challenges can lead to uncertainty and difficulties in ensuring sufficient product availability for consumers.	How can interface design make inventory management easier? Would larger fonts and clear icons help?
2	Elderly users highlighted the lack of connectivity between farmer markets as one of the crucial issues. Additionally, difficulties in anticipating consumer demand and preferences are key factors affecting agricultural product availability.	How can communication or collaboration features be designed to be easy to use by elderly users?
3	Advanced users face difficulties in understanding consumer preferences, which can be a barrier in producing agricultural products that fulfil market needs. In addition, the failure of digital farming business implementation in the eyes of elderly users also creates further challenges.	How can the interface present consumer data in a way that is easy to understand? Are there clearer data visualisations?
4	Elderly users highlighted logistical and physical distribution constraints as important factors that slow down the journey of agricultural products from farmers to markets and consumers. This indicates the need for solutions to improve distribution efficiency.	Are there ways to make the distribution tracking process more transparent and accessible?
5	Interviews with elderly users also revealed difficulties in accessing financing and financial services needed to improve farmers' market capacity and infrastructure. This points to the need for further consideration of how digital agri-business solutions can support financial needs.	How can financing systems be integrated in a way that is easily accessible and usable by elderly users?

3.4 Requirement Model

The Requirement Model is a collection of models used to identify, explain and represent the needs or requirements of a system or project. In the context of software development, some commonly used models include flow system, mockup or wireframe, and UI/UX. These models are used to illustrate how the system should work and meet user needs in a structured and clear way. Different models provide a comprehensive view of the different aspects of the system requirements that need to be met.

3.4.1 System Flow

Flow system or system flow refers to the sequence of steps or stages in a system or process. In the context of the designed digital farm, the flow system illustrates the system's flow of information, data, or goods through various designed steps or phases, with each part interconnected and contributing to the overall digital farm system. This can be seen in Figure 2.

Table 4: Empathy maps

Says	Thinks
- I have difficulty managing inventory and stock well. - The system used for agricultural supply chains is inefficient. - Farmers' markets are not well connected, making it difficult to communicate between farmers. - Poor network connectivity makes it difficult to interact with consumers. - It's difficult to understand market trends and preferences. - New technology is difficult to adopt and integrate.	- How can we improve inventory management efficiency? - Are there better systems for monitoring and managing inventory? - How to enhance connectivity between farmers' markets? - Are there technological solutions to facilitate collaboration and information exchange? - How can we better understand consumer desires and needs? - What causes the failure of implementing digital agricultural business solutions? - How can technological solutions better align with everyday needs?
Does	**Feels**
- Facing physical logistics constraints in delivering agricultural produce. - Striving to improve the efficiency of distribution processes. - Seeking accessible sources of funding for the development of farmer's market infrastructure. - Making efforts to enhance accessibility to financial services. - Experiencing discomfort in using existing digital agricultural solutions. - Possibly delaying the adoption of new technology due to previous unsatisfactory experiences.	- Feeling frustrated by the constraints and challenges in the agricultural supply chain. - Feeling stressed by the lack of adequate connectivity and difficulties in understanding the market. - Feeling uncertain about the success of implementing digital agricultural business technology. - Feeling anxious about the lack of understanding of consumer preferences. - Hopes for Positive Change: - Hoping for better UI/UX solutions to facilitate the use of agricultural technology. - Hoping for positive changes in inventory management and distribution with the adoption of effective digital solutions.

3.4.2 Mockup/Wireframe

Based on the identification of system requirements, wireframes are designed using the Figma tool. The wireframe includes key elements such as displays, colours, icon layouts, representing the functionality of the application and considering UX aspects so that elderly users can understand the designed system. Below is the wireframe designed to represent the overall features of the application, as shown in Figure 3.

3.4.3 UI/UX

Wireframes serve as a primary key for UI/UX design. The interface design for the elderly users in Digital Agricultural Business Transformation application is created using Figma, taking into account the visual appearance of the application, including elements such as features, icons and page layouts.

Here is the UI view of the login page, where users must first gain access to perform actions such as viewing, editing or managing data within the system, as shown in Figure 4.

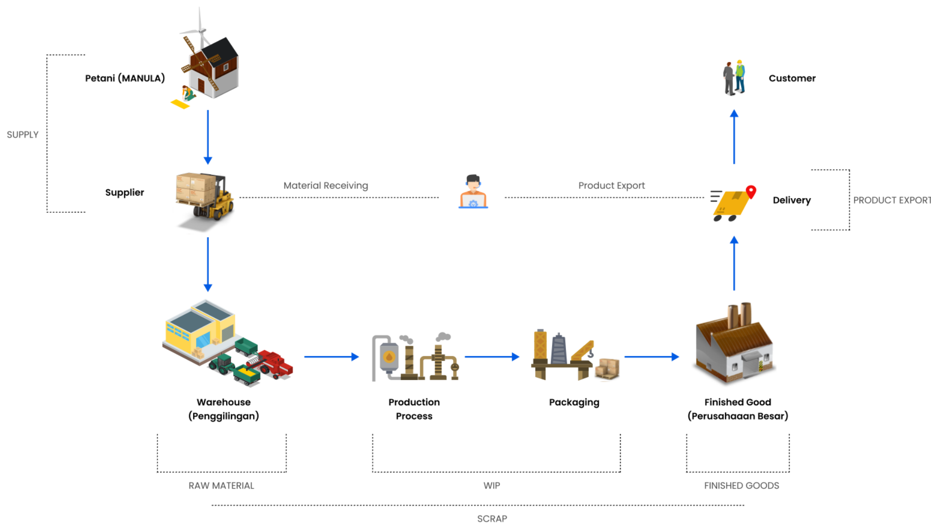

Figure 2: System flow.

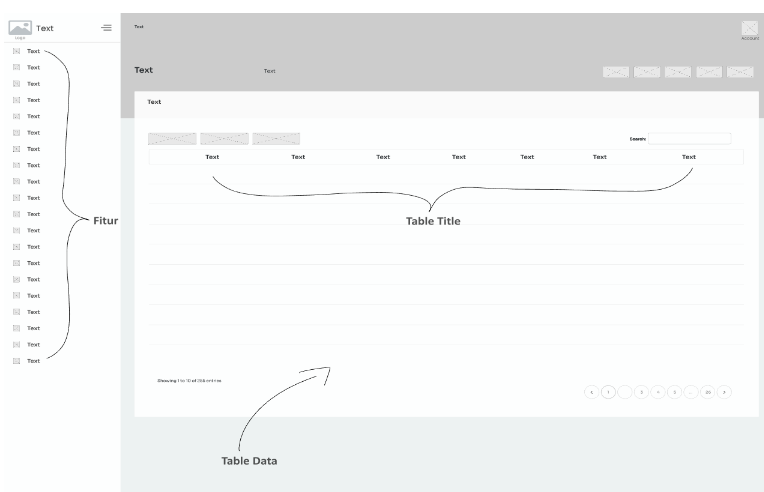

Figure 3: System flow.

Table 5: Pain points users

No.	Pain Points Users
1	Difficulties in managing inventory and stock that can be overcome with intuitive UI/UX design. Such challenges also lead to stock uncertainty and potential lost business opportunities.
2	Difficulty in establishing connectivity between farmers' markets, farmers, and consumers. This creates barriers to effective information exchange, hindering the growth and development of agricultural markets, thus requiring easily accessible communication features by focussing on UI/UX.
3	Difficulties in understanding consumer preferences can lead to challenges in producing agricultural products that meet market demands, resulting in decreased sales and missed business opportunities, which should be presented more clearly in UI/UX design.
4	Difficulties in accessing finance and financial services, which should be made more transparent in the UI/UX design, especially for farmers' market stakeholders looking to improve capacity and infrastructure.
5	Access to financial services needs to be integrated in a user-friendly way in the UI/UX design.

Table 6: Question (how might we)

No.	Question (How Might We)
1	How can we design an intuitive and efficient inventory management UI/UX to help elderly users and agricultural stakeholders monitor and manage inventory more effectively?
2	How to design UI/UX design for elderly users by focusing on features to improve connectivity between markets?
3	How to design a UI/UX design to present consumer data in a way that is clearer and easier for elderly users to understand?
4	How can UI/UX design focus on making the distribution tracking process more transparent and user-friendly?
5	How can financial services be integrated by focussing on UI/UX design for easy access by elderly users?
6	How can we design digital farming business solutions with more intuitive UI/UX and functionality that meets user expectations, including elderly users?

The Product Request feature, shown in Figure 5, allows users to request products from collectors or traders to farmers for collection of their agricultural produce. This request can include the date and quantity of products to be collected.

The Production Planning UI, shown in Figure 6, is used to plan and manage production activities. As soon as the farmer elderly users creates a product request, the system automatically sends it to the production report.

The Purchasing section consists of two parts: the Purchase Request in Figure 7 and the Purchase Order in Figure 8, both of which are integral parts of the Supply Management process.

The warehouse, as shown in Figure 9, plays a role in recording the physical receipt of goods or materials from suppliers after the purchasing process (following the purchase order stage).

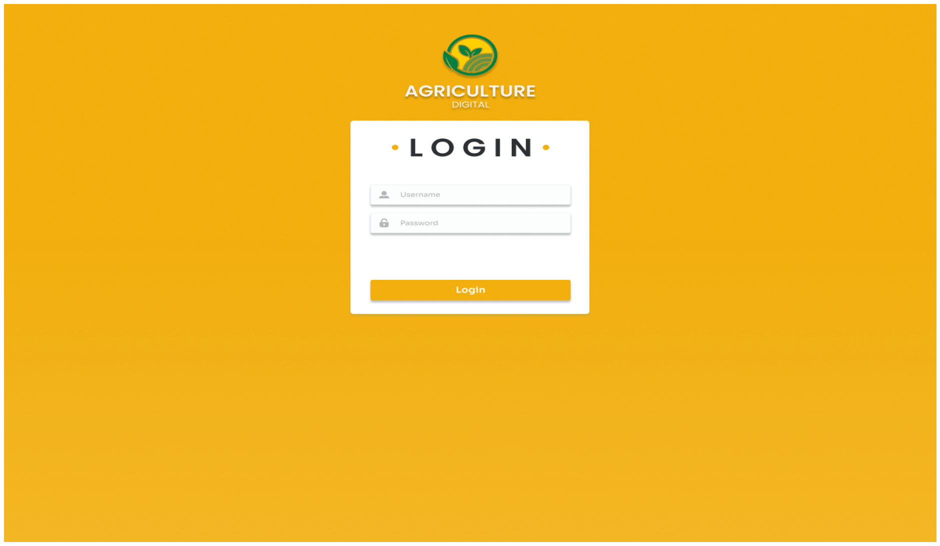

Figure 4: UI login.

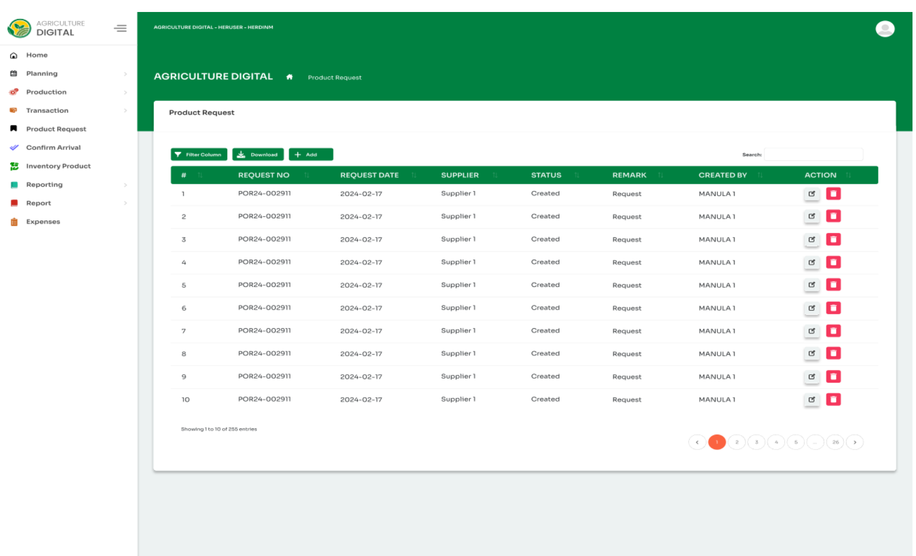

Figure 5: UI product request.

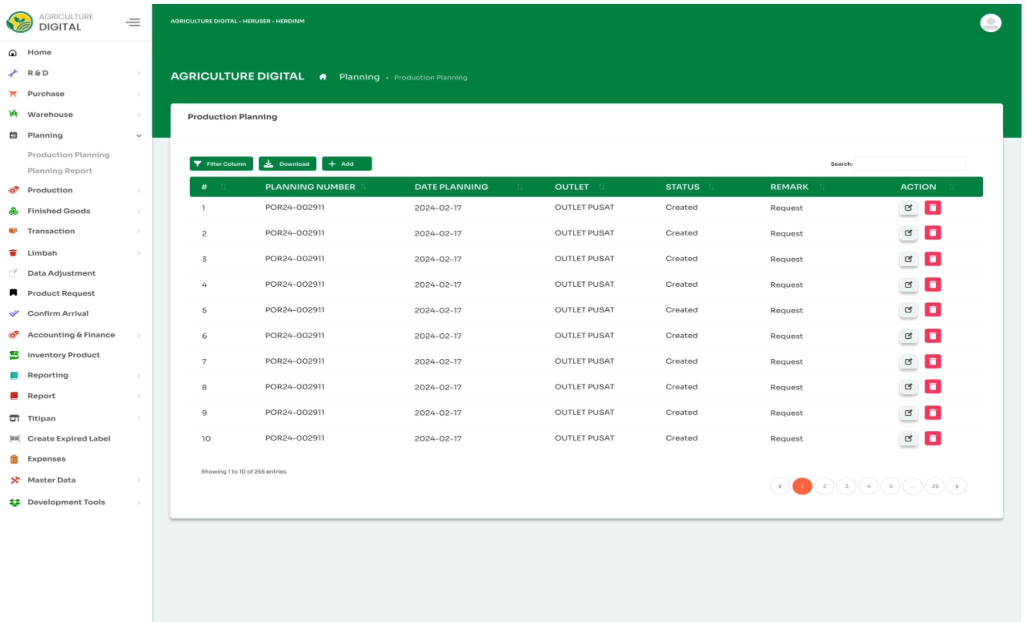

Figure 6: UI production planning.

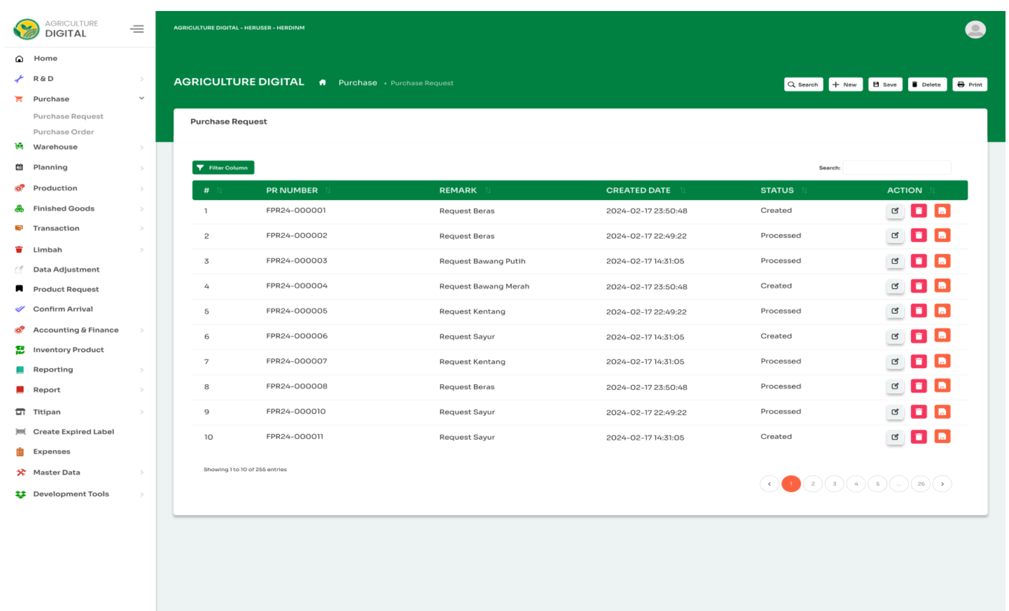

Figure 7: UI purchase request.

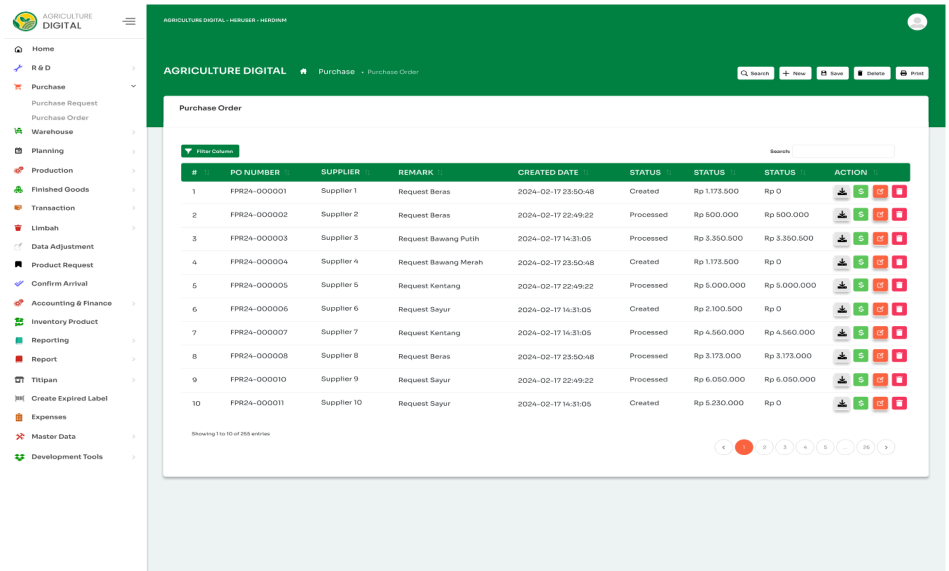

Figure 8: UI purchase order.

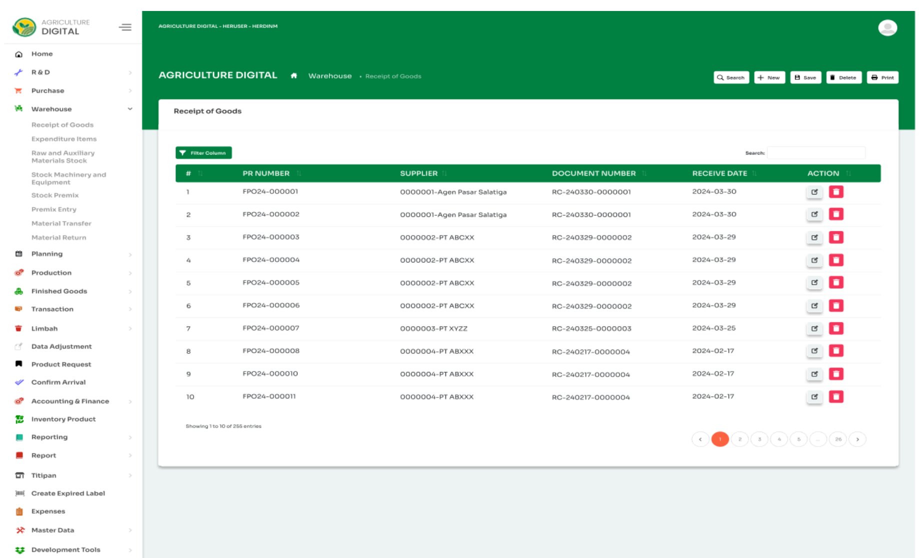

Figure 9: UI warehouse.

Table 7: App feature interface design

Feature Requirement Specification	Feature Requirement Specification
Login	The login interface should be simple with large text and easily accessible buttons.
Main Menu	The main menu should be clear with large icons and simple descriptions.
Product Request	This feature should make it easy for users to request products with an easy-to-understand interface.
Production Planning	The planning feature should have clear visualisations and step-by-step instructions.
Purchase	The purchase process should be easy with clear steps and large buttons.
Warehouse Outlet Centre	This feature should provide goods receipt information with an easy-to-use interface.
Production	The production feature should have intuitive controls and an easy-to-understand interface.
Finished Goods	This feature should display the status of finished goods in an easy-to-understand manner.
Confirm Arrival	There should be clear confirmation with easy-to-follow instructions.

The Production feature, shown in Figure 10, is a function within Business Operations used to plan, monitor, and optimize the production process.

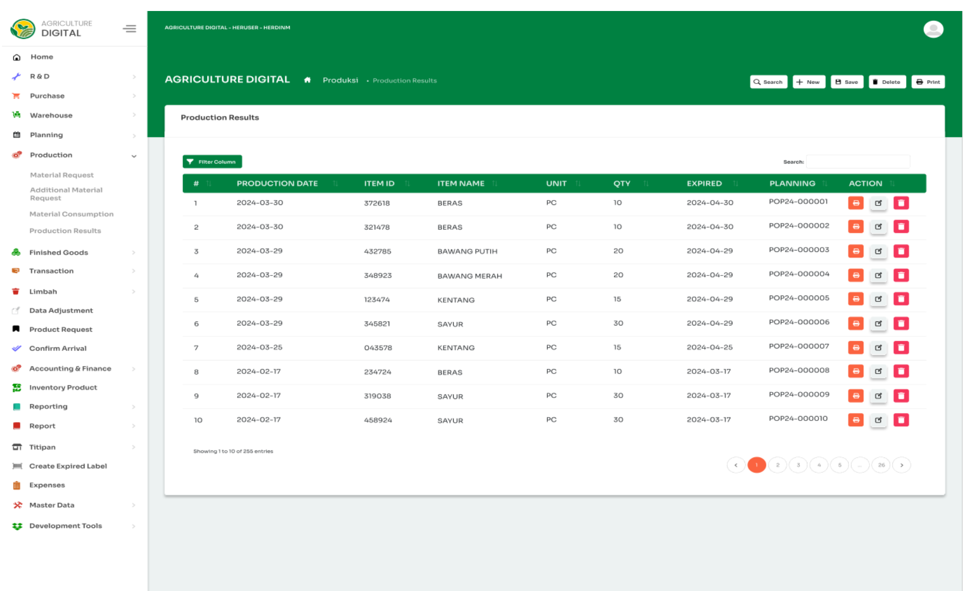

Figure 10: UI production.

The Finished Goods feature in Figure 11 comes into play after passing through the production stage and following existing protocols. Its role is to manage and control the inventory of finished goods in the production and distribution process.

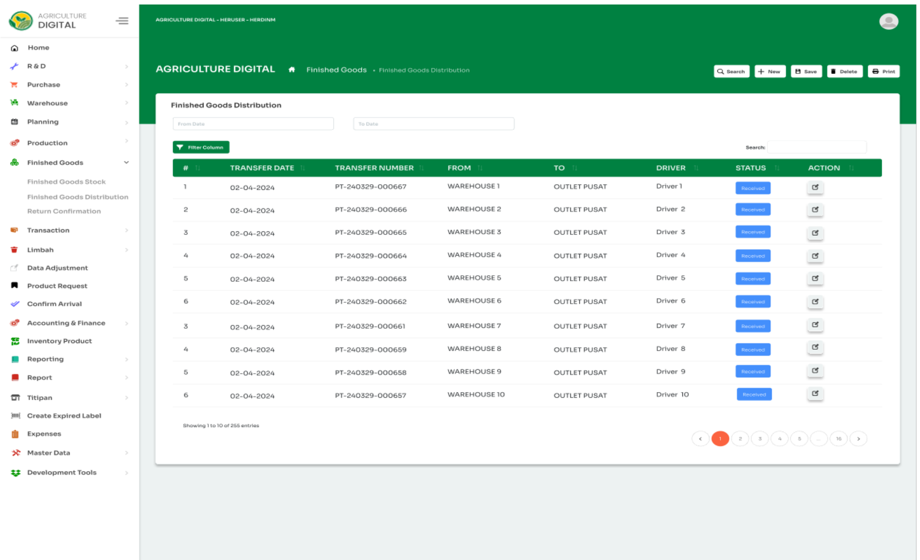

Figure 11: UI finished goods.

The Arrival Confirmation feature in Figure 12 relates to confirming or recording the arrival of goods or transfers to the central outlet.

3.4.4 Stages of System Usability Scale

User feedback on the UI focusing on Digital Agricultural Business Transformation is obtained through directly distributed questionnaires, as shown in Table 8, providing an in-depth evaluation as a measure of user satisfaction. After obtaining the results from the questionnaire, the next step is to calculate the final score from the raw System Usability Scale (SUS) score. This is done by multiplying the raw SUS score by 2.5. Referring to the sum of the average scores, the final SUS score obtained from the respondents' responses totalling 41 is 74.391. It can therefore be concluded that this score falls into category B or good. The presentation in the form of the SUS scale is shown in Figure 13.

User feedback on the UI that focuses on Digital Agricultural Business Transformation is conducted through questionnaires distributed directly to users, thus providing an in-depth evaluation as a measure of user satisfaction and the effectiveness of the designed prototype. In the process of testing the application design prototype, the author did it directly in Kerep Kidul village, Bagor, Nganjuk Regency, East Java. In addition, the author also provides an explanation of the topic and purpose of the prototype test during the test, so that users can understand the basic concepts of the prototype that has been designed clearly and in detail to the user. After the test was completed, a questionnaire was administered to collect feedback from each participating user.

From the questionnaires filled out by 41 respondents, the author used Microsoft Excel to calculate the System Usability Scale (SUS). For each odd-numbered question, the score is subtracted from 1 (X-1), while for even-numbered questions, the score is subtracted from 5 (5-X). Furthermore, after getting the score results through the questionnaire, the next step

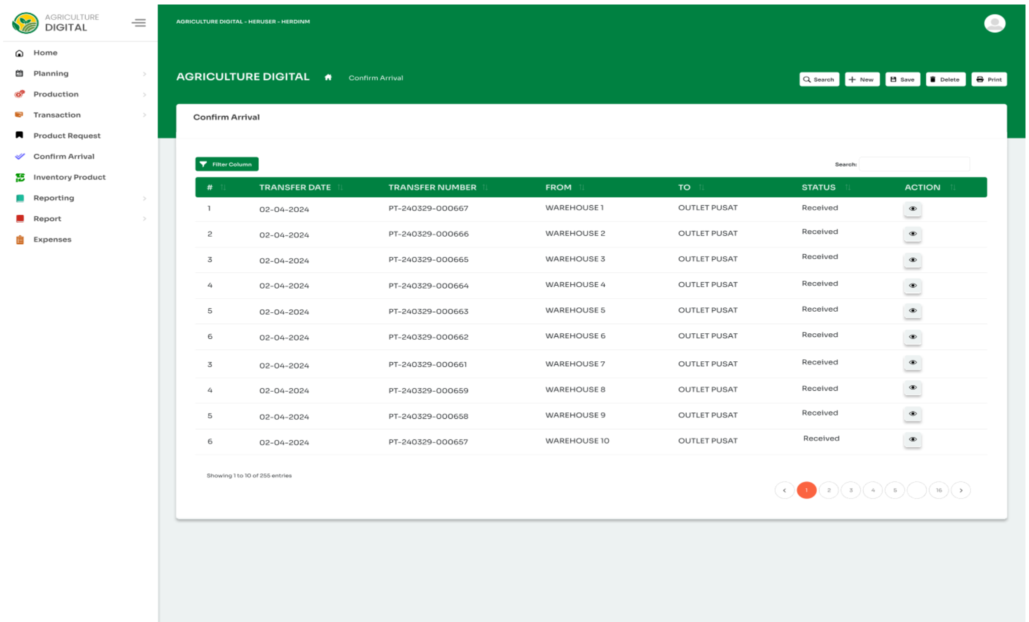

Figure 12: UI confirm arrival.

is to calculate the final value of the Raw System Usability Scale (SUS) score. This is done by calculating the results of the Raw SUS score with 2.5. By referring to the summation of the average score of the final SUS value obtained from the responses of 41 respondents. The average value is calculated by summing the final SUS score of all respondents and then dividing it by the number of respondents. From this calculation, the average value is 74.391, thus it can be concluded that the value is included in category B, or good. The following is a representation in the form of a SUS scale in Figure 13.

4 Discussion

During the process of testing the application user interface design prototype, there is still feedback in the form of suggestions and input from users that need to be evaluated. The components that received input include those in Table 8.

The research conducted identified the needs, expectations and challenges faced by elderly users (MANULA) in the context of digital agricultural business transformation. Key findings show that elderly users need a simple and easy-to-understand interface, with clear icons and large text. The need for training and assistance in using applications designed with a focus on the interface needs to be realized, so that it can help agricultural businesses especially among elderly users, as well as considering the feedback that has been submitted by users. The findings suggest that elderly users' engagement in digital farming can be enhanced by providing intuitive interfaces and adequate support. The implication is that the adopted digital farming technology should consider usability aspects that are specific to elderly users in order to increase the adoption and effectiveness of technology use,

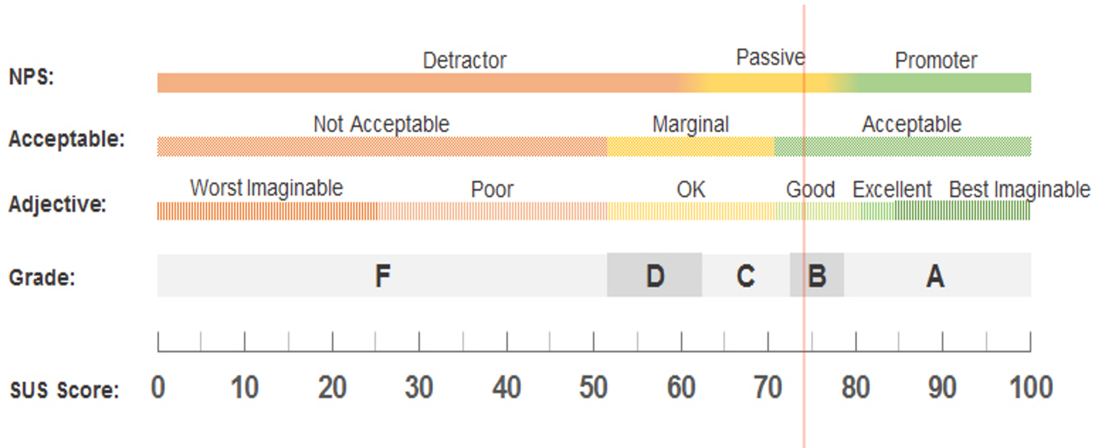

Figure 13: System usability scale.

which is in line with technology adoption theory which states that ease of use and convenience greatly influence the adoption of new technologies in agriculture, especially for the elderly [2]. The findings of this study are in line with existing literature which states that technology adoption among the elderly is still low due to interface complexity and lack of training [9]. However, it makes a novel contribution by showing that interfaces designed specifically for older people, taking into account their needs and limitations, can improve user effectiveness and satisfaction. This adds a new dimension to the literature on UI/UX design for elderly users in the context of digital agriculture.

Furthermore, the research conducted shows that age-conscious UI/UX design, such as large text size and clear icons, can significantly increase user satisfaction and engagement in daily agricultural practices. As such, it is consistent with previous findings showing that successful technology adoption among elderly users is highly dependent on the ease of use and clarity of the interface [12]. Design thinking emerged as an effective method to identify and address the challenges that elderly users face in using digital technologies in the agricultural sector. This research also underscores the importance of considering demographic and psychological factors in successful UI/UX development. Designs that take into account the preferences of elderly users not only increase the success of technologies in the field, but also reduce barriers to adoption and increase efficiency in the agricultural supply chain [47]. This is consistent with technology adoption theory which suggests that perceived benefits and ease of use are major factors in users' decisions to adopt or reject new technologies [48].

Some limitations of this study include the data collection methodology being limited to interviews and surveys, which may not cover all aspects of elderly users' experience. In addition, the scale of the study was limited to a specific region in Indonesia, so the results may not be fully generalisable to a wider population. The UI/UX prototyping conducted is still in its early stages and requires further development to ensure sustainability and improved functionality. Future research should consider longitudinal studies to evaluate the long-term impact of using an interface designed specifically for older adults. In addition, further development and testing of UI/UX prototypes involving more samples of elderly

Table 8: User feedback

Features/Components	Feedback	Conclusion
Interface View	Suggested that the overall font in the application should not be too small, then for the icon needs to be enlarged. So that it can be seen well and clearly.	Accepted
My Special View as elderly users	Suggested that which features will be used for elderly users such as production planning features and others.	Accepted
Transaction View	Suggested to add info about the basic explanation of the faculty, where when new students want to know the teaching and curriculum in the faculty they want to choose.	Accepted
Accounting and Finance View	Suggested the need for transaction reporting between the parties concerned (supervisory body, suppliers, companies, and other parties).	Accepted
Product Inventory Display	There needs to be a feature in monitoring product stock at a certain time or period, so that the relevant parties such as farmers can ensure that the stock of goods for production is still sufficient or not.	Accepted
Arrival Confirmation Display	There needs to be a confirmation feature, in order to know the complete data when and where the data is confirmed, and to know the complete status of the goods.	Accepted
User Guide and Tutorial	If this application is realised, there is a need to provide usage guides and interactive tutorials to help users understand how to use the application, especially for those who are not familiar with technology.	Accommodated
User Feedback and Support	Provide communication channels for feedback and technical support that are easily accessible to users so that they can report issues and suggest improvements.	Accommodated
Application Socialisation	Providing input for the future that there is a need for socialisation of the web application to be realised, because considering the target users are elderly people aged 50 years and over, so that elderly users can fully understand the need for technology in helping agricultural businesses to be effective.	Accommodated

users from different regions to obtain more representative results. There is also a need for more in-depth research on other factors that influence technology adoption among the elderly, such as social support, community involvement, and economic factors. The use of assistive technologies, such as voice recognition and augmented reality, to better facilitate elderly users in the use of digital agricultural technology could be the focus of future research. By addressing existing limitations and continuing research in this area, we can increase the effectiveness and adoption of digital technologies among elderly users, thereby contributing to a more inclusive and sustainable agriculture.

5 Conclusion

The research conducted focused on elderly users in Digital Agricultural Business Transformation and developed a UI/UX model tailored to the needs of elderly users. By applying a design thinking approach and the System Usability Scale (SUS) method, this study successfully analyzed, designed, and evaluated a solution that met rigorous standards. Evaluation through user feedback showed that the designed UI achieved a “good” rating on the SUS scale, with an average final score of 74.391, indicating conformity to user needs. However, continuous improvement through iterative design based on user feedback is important to address areas for improvement. The research conducted also emphasized the importance of continuous efforts in digital agriculture business transformation to create inclusive and accessible solutions for all stakeholders, including elderly users. By addressing the unique needs, preferences, and challenges of these users, wider adoption of digital farming technologies can be facilitated. The findings of this study make a significant contribution in improving the effectiveness and adoption of digital technologies among elderly users in the context of agriculture, as evident from the positive SUS ratings obtained. This study implies that the adoption of digital farming technology should consider usability aspects specific to elderly users to increase the adoption and effective use of technology. However, this study makes a novel contribution by showing that interface design that considers the needs and limitations of older adults can improve user effectiveness and satisfaction, filling a literature gap on UI/UX design for older adults in the context of digital agriculture.

Nonetheless, this study has some limitations. The data collection methodology is limited to interviews and surveys, which may not cover all aspects of elderly users' experience. In addition, the scale of the study is limited to a specific region in Indonesia, so the results may not be fully generalizable to a wider population. The UI/UX prototyping conducted is still in its early stages and requires further development to ensure its sustainability and improved functionality. Future research should consider longitudinal studies to evaluate the long-term impact of using an interface designed specifically for the elderly, as well as further development and testing of the UI/UX prototype involving a larger sample of elderly users from different regions to obtain more representative results. To overcome the limitations, more in-depth research is needed on other factors that influence technology adoption among the elderly, such as social support, community involvement and economic factors. The use of supporting technologies, such as voice recognition and augmented reality, to better facilitate elderly users in the use of digital farming technologies could be a focus of future research. By addressing existing limitations and continuing to conduct research in this area, we can increase the effectiveness and adoption of digital technologies among older adults, thereby contributing to a more inclusive and sustainable agriculture.

Overall, this study made a significant contribution to improving the effectiveness and adoption of elderly users in digital farming businesses, achieving a "good" rating based on the SUS methodology. Recommendations for future research include improving device compatibility and integration of multilingual support to increase accessibility, as well as regularly incorporating user feedback for continuous improvement. Future research could also explore advanced technologies such as machine learning and artificial intelligence to provide a more personalized user experience and predictive analytics and evaluate the long-term impact of these digital solutions on elderly users' farming practices and the socio-economic benefits of digital farming transformation.

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