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Designing a User-Friendly Inventory Management System Interface for Employees with Low Digital Literacy: A Design Thinking Approach

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Abstract. This study addresses the challenges faced by chicken slaughterhouses in Indonesia due to the prevalence of manual inventory management processes and the low digital literacy of employees. The aim is to design and develop a web-based inventory management system (IMS) with a user-friendly interface that caters to the needs of low digital literacy users. The design thinking methodology is employed to ensure a user-centered approach throughout the development process. The study involves conducting interviews with key stakeholders, creating wireframes and prototypes, and conducting user acceptance testing (UAT) with employees of varying digital literacy levels. The resulting IMS demonstrates the successful application of design thinking principles in creating an intuitive and visually clear interface that enables users to effectively navigate and interact with the system. The findings highlight the importance of considering user characteristics, such as digital literacy, in the design process and provide insights into the effective use of color, typography, and visual elements to enhance usability. This research contributes to the field of user interface design for low digital literacy users and offers practical implications for businesses seeking to digitalize their inventory management processes.

Keywords: Design thinking, User Interface, Inventory management system, Low digital literacy, Chicken slaughterhouse

1. Introduction

Nowadays, countless organizations all over the world are fast expanding to compete in the market. Some of these businesses have one thing in common: they all manage inventory to overcome supply issues and eventually meet client needs. Inventory management is critical to the growth and profitability of any organization, particularly those that sell products, with inefficient and disorganized inventory management resulting in a decrease in sales and profit (Fang & Chen, 2022; Khan et al., 2019). Furthermore, inventory is required to support the seamless operation of every business's workflow since it functions as a mediator between the production and distribution processes (Jose et al., 2013).

Despite the COVID-19 pandemic's faster use of technology across a wide range of businesses, digital literacy in Indonesia has remained poor over the last two years, according to a recent index rating (Harsono, 2022). Many organizations still manage their inventories manually, necessitating paperwork and manual labor. However, this may cause many issues for enterprises. Employees, for example, may forget or incorrectly record the arrival or departure of products, resulting in inaccurate recorded data (Yinyeh & Alhassan, 2013). Furthermore, because they have no way of tracking them, the chicken slaughterhouse will be more prone to stockouts or overstocks, which will naturally lead to another problem down the road. These untracked things will eventually result in lost items and money, especially as the business expands (Khan et al., 2019). Finally, it is time-consuming and involves a lot of human intervention, which increases the chances of human error. VUCA conditions are causing difficulties for the Indonesian poultry industry, which is now facing issues due to a lack of technology involvement especially in inventory management (Retno Ali et al., n.d.). Nonetheless, thanks to technological advancements, inventory management may now be done utilizing electronic devices in the twenty-first century. This is what we call an Inventory Management System (IMS), which is a piece of software that tracks and manages inventory stock levels (Islam et al., 2019).

A chicken slaughterhouse IMS is essential for streamlining operations, meeting consumer demand, maintaining product quality, adhering to legal guidelines, and optimizing financial resources (Solano-Blanco, González, & Medaglia, 2023; Solano-Blanco, González, Gómez-Rueda, et al., 2023). To begin with, such a system boosts operational efficiency by allowing real-time tracking and control of raw materials, processed commodities, and other vital supplies. This ensures that production processes are well-coordinated, lowering the chances of shortages or overstocking (Solano-Blanco, González, & Medaglia, 2023). By facilitating exact demand estimates, an IMS enables the slaughterhouse to coordinate output levels with market demand. This not only saves resources but also helps to meet customer needs on time, enhancing customer satisfaction and maintaining a competitive advantage in the market. The system makes it easier to adopt a 'first in, first out' (FIFO) approach, which ensures that older stock is used first to avoid the risk of rotting and product expiration. It also helps with cost control by removing overstock situations, which use capital and warehouse space.

The user interface is the most significant component of any computer system since it can be seen, heard, and touched. The stacks of software code are buried under screens, keyboards, and mice. The goals of interface design are straightforward: to make computer use simple, productive, and pleasurable (Galitz, 2007). A well-designed User Interface (UI)/User Experience (UX) contributes significantly to user satisfaction and the purpose of UI/UX design is to develop interfaces that are easy to use and navigate. Due to most of the IMS users in chicken slaughterhouses having low digital literacy employees, a well-designed UI for them must promote simplicity and intuitiveness. Clear and simple interfaces help consumers comprehend how to browse and engage with digital products, decreasing cognitive burden. When confronted with sophisticated interfaces or technical vocabulary, those with low digital literacy may have difficulties. A good user interface reduces learning obstacles by providing information in an easy-to-understand format, hence speeding up the learning process and allowing them to easily interpret information. Icons, labels, and images that are well-designed add to visual clarity and understanding. An effective UI design reduces the dependency on text-heavy interfaces for people with poor literacy skills. Text is provided clearly and succinctly as necessary, making it accessible and understood. The design thinking methodology is particularly applicable to the creation of UI/UX for individuals with limited digital literacy because of its user-centric approach, iterative nature, and focus on empathy and problem-solving. By adhering to this paradigm, designers can develop digital interfaces

that are more accessible, intuitive, and efficient.

According to Medhi et. al. The textual interfaces are not useable by first-time users with low literacy levels, and they are prone to errors for users who are literate but not very experienced. Our research indicates that a live operator is up to 10 times more accurate than text-based interfaces in the field of healthcare. Furthermore, in countries like India, live operators can be more cost-effective than text-based interfaces. Our research indicates that a graphical user interface is the most effective method for completing tasks in the context of mobile banking. However, individuals who can comprehend the spoken dialog system can utilize it more rapidly due to their comfort level and familiarity with speech (Medhi et al., 2011). Darejeh et. al. pointed out that Literature identified rules for minimal computer literacy users in user interface design, addressing their usability issues. This includes reducing the number of features available at once, designing an easy-to-use interface, using larger components and icons to highlight key functions, avoiding computer terms, and offering font, color, and size customization. Make sure to use descriptive text and relevant graphics, such as avatars or icons. By considering these principles in software design, users with lower computer literacy can better comprehend software and web site structure, leading to increased interest in computer use. Considering user interface design principles based on target users' goals and cognitive abilities can address learnability issues for various user groups (Darejeh & Singh, 2013).

Currently, the majority of chicken slaughterhouses in Indonesia have not adopted any IMS in their business, which causes issues in their business process. Because of increased product demand, Chicken Slaughterhouse needs an effective and specific IMS to meet its business process and promote speedier workflow. To address the issues confronting chicken slaughterhouses, we created a digitalized and accurate web-based IMS that would supplement the chicken slaughterhouse's business process and is usable for low digital literacy employees. This study's objective will be centered on the creation of a web-based IMS application that is acceptable and usable for low digital literacy employees in chicken slaughterhouses to tackle their current challenges.

2. Literature Review

2.1. Chicken Slaughterhouse

A chicken slaughterhouse or chicken processing factory is a facility where hens are transported, slaughtered, processed, and prepared for distribution and consumption (*Poultry Definition & Meaning - Merriam-Webster*, n.d.; *Slaughterhouse Definition & Meaning - Merriam-Webster*, n.d.). The process includes several steps that ensure that live chickens are changed into a variety of goods such as whole chickens, cut-up parts, or further processed chicken products such as nuggets, sausages, or deli meats. Modern chicken processing plants adhere to strict hygiene and safety regulations to ensure the production of safe and nutritious chicken products. These regulations cover a wide range of issues, such as animal care, worker safety, hygiene, and quality control. Furthermore, many slaughterhouses take precautions to lessen stress and suffering for the chickens throughout the killing process.

2.2. Inventory Management System

Inventory management is the practice of controlling and monitoring stock levels to keep them at the required level (Muller, 2003). To accomplish this, businesses utilize Inventory Management System (IMS) software. An IMS is a software that is designed and developed to automate the process of maintaining and monitoring inventory stock levels, which can range from raw materials such as wood to finished products such as papers that are ready to be purchased by or sent to end customers (Yinyeh & Alhassan, 2013).

Every organization has the option of using traditional inventory management methods such as paperwork and physical labor or investing in a computerized inventory management system (Muller, 2003). However, organizations increasingly use an IMS to keep and monitor every item in their internal structure, because, without one, they may face problems sooner or later (Solano-Blanco, González, Gómez-Rueda, et al., 2023). In general, an IMS is created and built to give its customers benefits such as inventory stock level tracking

and monitoring, faster overall business process, more transparency, better organization, reduced dead stock, and improved and clearer cash flow (*What Is Inventory Management and How Does It Work? | IBM*, n.d.).

2.3. User Interface/User Experience (UI/UX) Design

User Interface/User Experience (UI/UX) was defined by Garrett as a "set of concepts, guidelines, and workflows for critically thinking about the design and use of an interactive product" (Garrett, 2011). Despite their similarities, the terms UI and UX have distinct meanings. While UI is defined as something with which the user may interact and communicate, UX refers to the user's experience while using the UI, which can be positive, negative, or neutral (*UI vs UX | Difference Between UI and UX | What Is UX or UI*, n.d.). Simply put, users interact with UI but do not experience interactions (UX), and user experience is one of the factors that define an application's success (Norman, 2013). According to Canziba (Elvis Canziba, 2018), Table 1 summarizes the fundamental differences between UI and UX:

Table 1: UI and UX Comparison

User Experience (UX) Design	User Interface (UI) Design
Interaction Design	Visual Design
Wireframing	Color Palette, Layouts, User Interface
Information Architecture	Typography

While UX design focuses on the interaction between users and the application, UI design focuses on visual design, which includes the use of color, typography, images, and other elements to produce visually appealing designs. Furthermore, UX designers produce wireframes, which are then transformed into colored layouts in the form of user interfaces by UI designers. Finally, UX design focuses on effectively organizing, structuring, and labeling content, whereas UI design focuses on establishing the ideal typographic combination that is best suited for the application.

2.4. Eight Golden Rules of Interface Design

The eight Golden Rules of Interface Design, according to Ben Schneiderman, that can serve as a broad guideline for UI/UX best practices are (Shneiderman et al., 2016):

1. **Aim for consistency**. In comparable circumstances, consistent design patterns and activity sequences should be necessary. This includes using the same terminology, typography, and colors in your application's menus, prompts, and so on.
2. **Provide global usability**. A developer must comprehend and recognize the demands of distinct users and design flexibility while building an interface. Consider including abbreviations, function keys, and hidden commands for specialists, for example.
3. **Provide useful feedback**. When a user acts, they should constantly be kept up to date on what is going on in their stage of the process. This can be in the form of visual feedback or any other simple/significant response. The user will be notified that the program has replied to their desired action in this manner.
4. **Create a dialogue that will result in closure**. Action sequences must be divided into three parts: beginning, middle, and end. After each activity is accomplished, inform the user that they have completed one step before providing an indicator to prepare them for the next task.
5. **Error avoidance**. This is to prevent the user from making mistakes when using the application. Though errors cannot be completely avoided, they should be reduced as much as feasible, and the program should return an error-handling mechanism if one occurs. One method for dealing with mistakes is to offer a clear error message that addresses the issue. For example, a user must input a valid email address in an email address box, or the program will display a notice informing the user that the form cannot be submitted.
6. **Allow for simple action reversal**. When users make a mistake, they should be able to undo as much of their actions as feasible. Users will be less afraid to explore more options and features if they know they can undo their actions if a mistake is made.

7. **Maintain user control**. When using an application, experienced users typically want to feel in command. This can increase the user's enjoyment of the program, which ultimately reflects on its success.
8. **Reduce the stress on short-term memory**. The attention span of humans is limited. By adopting this rule, users are not required to recall every single piece of information that the system can alternatively offer. Simply said, perceiving information is preferable to recalling it. In an online store, for example, the user picks the desired item, and the system immediately takes input of the product code that the user wishes to be processed later in the payment process.

2.5. User Acceptance Test (UAT)

UAT is an abbreviation for User Acceptance Test, it is the final stage of the software testing process and is essential before releasing a software product to end-users or consumers (Leung & Wong, 1997). UAT is used to guarantee that the software fits the criteria and performs as expected in a real-world setting. The primary purpose of UAT is to determine whether the system is ready for deployment to end users (Gordon et al., 2022). UAT is often performed following the conclusion of system testing and any necessary regression testing. It serves as a last verification that the program is ready for production deployment and will meet the needs of its intended customers. UAT is a team endeavor that includes both the development team and end users. It is a critical quality assurance process that aids in the prevention of the deployment of software with substantial flaws or issues that could negatively affect user satisfaction and the overall success of the product.

3. Method

Dell'era et. al categorize design thinking into four distinct types: Design Thinking as Creative Problem Solving, Design Thinking as Sprint Execution, Design Thinking as Creative Confidence, and Design Thinking as Innovation of Meaning (Dell'Era et al., 2020). In this study, we are referring the Design Thinking as a creative problem-solving strategy that is centered on humans. It is said to have put the human at the center of the design process, and many products trace their success to its use. Other products attribute their success to the fact that they were designed using Design Thinking. The majority of people who engage in Design Thinking do not require or significantly benefit from such a process, even though it is helpful and straightforward to conceive of Design

Thinking as a process that involves design activities. This is because Design Thinking is a distinct mentality, viewpoint, and thought pattern that already guides their activities. A human-centered problem is the emphasis of these acts, which are concentrated on the development and testing of novel items that are intended to solve, respectively. However, design thinking is particularly useful for the following categories of problems: problems that people care about, problems with high uncertainty, problems that have historically resisted solutions, problems that affect diverse groups of people, and problems involving shifting markets and behaviors. Design thinking is not a good strategy for all aspects of problem-solving.

Rather than focusing solely on ergonomics, design thinking places a strong emphasis on designing for the individual as a whole (Simon, 1996) (von Thienen et al., 2019). According to Rowe and Cross, the concepts of design thinking were introduced into the fields of architecture and education before the name became widely acknowledged and promoted (Rowe, 1991) (Cross, 2016).

The implementation of design thinking as a methodology is not a novel idea. According to Simon in 1996, the first attempt to turn it into a process was made in 1969 (Simon, 1996). This way of thinking has been prevalent for many years. The five-step approach that is illustrated in Figure 1 is the most frequent of the modern varieties of that procedure, which was given by the Stanford Design School in 2005. There are still

numerous recent variations of that procedure.

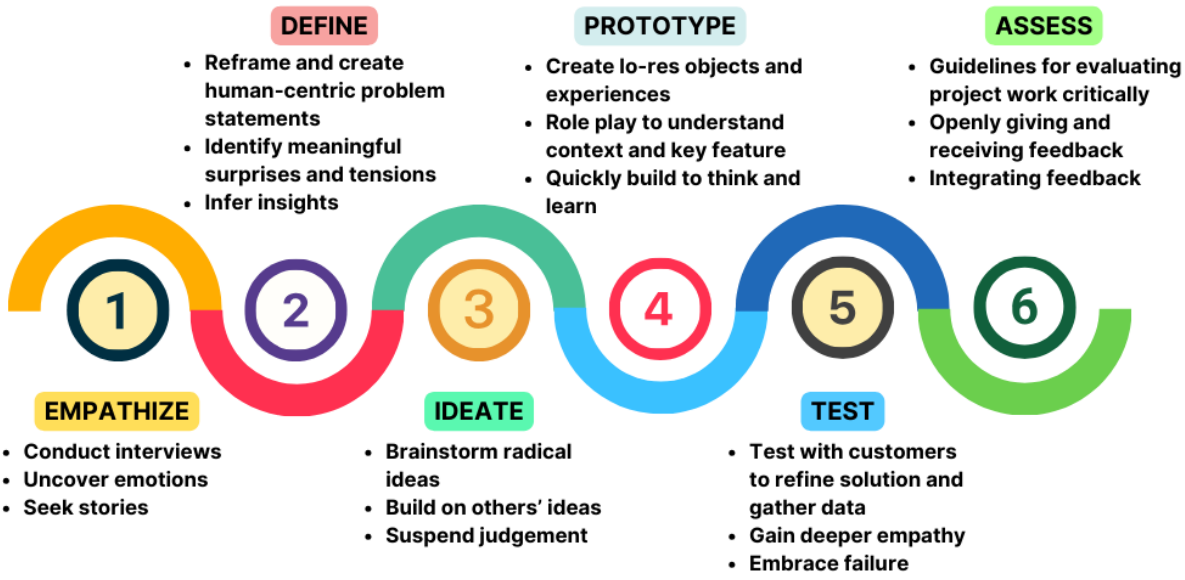

Fig. 1: Design Thinking Process (Source: Adopted from Leifer, 1991)

Design Thinking is a problem-solving and innovation process that emphasizes understanding user needs, challenging assumptions, and redefining challenges to provide innovative solutions (Plattner, 2010). Empathy, ideation, prototyping, and testing are all part of this human-centered approach. The following is a summary of the important stages in the Design Thinking methodology (Namino et al., 2018):

3.1. Step 1: To get insights, empathize with others facing the difficulty.

Empathy refers to the ability to understand and share the emotions of another individual, particularly someone who is different from oneself. This stage in the Design Thinking process is crucial for fostering creativity as it "enables us to gain a new understanding of the world." (Dorst, 2007), allowing us to notice problems that were previously hidden from us. During this step, the authors will conduct numerous interviews with 3 different key users for each phase including the owner to gain a comprehensive understanding of the issues. The details of key users and phases can be seen in Table 2.

3.2. Step 2: Define the problem in terms of people.

To characterize the problem in human-centric terms, incorporate all of the knowledge gathered in Step 1 (empathize) and identify where your constituents' difficulties reside. We construct (or deliberately devise) the bounds of the design problem when we define the problem. Donald Schön, a former professor of urban planning, wrote: "To formulate a design problem to be solved, the designer must frame a problematic design situation; set its boundaries, select particular things and relations for attention, and impose on the situation a coherence that guides subsequent moves" (Schön, 1988). After gathering all of the facts from the previous step, the authors will conclude or summarize all of the material to list down the true problem so that the authors can create proper remedies.

3.3. Step 3: Ideate human-centered solutions

To provide human-centered solutions, it is important to explore different methods for addressing the design problem that focuses on the needs and experiences of individuals, as described in Step 2. The visibility of this part of the Design Thinking process is prominent, but, it is accompanied by complexities and is not as infallible as it may seem. At this step, the authors will attempt to brainstorm by creating various pages of

wireframes, which are then given as the solution idea.

3.4. Step 4: Prototype potential solutions early and often to learn quickly and gain new understanding

Prototyping is the actual production of artifacts at various resolutions for design teams, clients, and users to test ideas (Hannington & Martin, 2019). Engineering often uses prototypes to capture things we can't model or don't have time to model. Humans in the loop constantly add complexity to human-centered design. IDEO engineer Andrew Burroughs says, "Despite the attempts of designers and engineers to anticipate every twist of an object's fate, the unforeseen usually happens" (IDEO & Burroughs, 2007). Physical prototypes and testing with solution users disclose some surprises while they can be fixed. After the wireframes have been finalized, the authors will begin creating the UI and experimenting with color combinations to see if it is user-friendly.

3.5. Step 5: Put solutions to the test with real customers/users to learn more about the solution and the problem.

To complete the feedback loop, solutions are tested with actual customers or users, typically using a prototype. It requires the designer to return to tactics similar to those utilized in Step 1 (empathize) and utilize the empathy-driven solution/prototype to re-engage the folks we are working for. To gain new perspectives on the issue and its solution, which can only be obtained through user interaction with a prototype, the goal is to observe, listen, and record pertinent events. Designers should act as " students, not teachers" while putting their products through human testing (Kumar, 2012). So, all the designers can do is put the prototype and the subjects in the same room and see what happens. During the UAT, the authors test all of the phases in the business flow. Table 2 below depicts the four phases of business flow and their associated important users.

Table 2: Phases and Key Users

No.	Phases	Key Users
1.	Live Chicken (LC) Delivery	LC Delivery Supervisor
2.	Production	Production Supervisor
3.	Packaging	Packaging Supervisor
4.	Storage	Storage Supervisor

The flow of the UAT process is determined by each phase, and the system will be used by the primary user. The UAT will involve eight users, all of whom are key users from the table above. There are 75% of the 8 important users have a high school diploma, while the remaining 25% have a middle school diploma.

Design Thinking has been utilized for innovation and value creation in a variety of disciplines, including business, law, primary school education, science, and medicine, to name a few—the influence of Design Thinking on the transformation of goods, services, processes, and even strategy. Design Thinking is the best technique to be inventive in the design field. Despite a lengthy history of academic study and discussion, the design thinking process may be overlooked or taken for granted (Buchanan, 1992; Johansson-Sköldberg et al., 2013; Pande & Bharathi, 2020). Applying the design thinking technique to create UI/UX for those with low digital literacy guarantees that the design process is characterized by empathy, user focus, and iteration. It promotes creativity, inclusiveness, and cooperation, resulting in functional and user-friendly solutions for users with different levels of digital literacy. This strategy ultimately facilitates the development of more efficient solutions, extensively embraced, and capable of tackling the distinct issues encountered by end users with low digital literacy.

4. Result

4.1. Empathize

Chicken Slaughterhouse is currently experiencing various issues with its business process as a result of the manual inventory management that is currently in place in its workflow. First and foremost, the company's reliance on paper for data recording and inventory control is producing various issues in the company's business flow. The environment inside the chicken slaughterhouse is generally always wet. As a result, the possibilities of the sheets being exposed to physical degradation (e.g., water) are relatively high, making data capturing problematic. The paper also encourages people to manually compute and search for data (e.g., multiplying weight data, searching for specific data), which can be difficult, especially when the organization has a large amount of data to manage. Any data that could have been computed automatically must be computed manually, by using a calculator and entering data into the appropriate form. The interviewee also pointed out that "*we have experienced multiple events of having overstock and makes the chickens turning blue and rotten. And in some events, we have run out of stock while the demand is high, and as a result, we missed the opportunity to gain profit in in some opportunity.*"

Another crucial point is that the manual data entry method can be time-consuming and there is also the possibility of human error such as input error that leads to the inconsistent number of stocks. This condition will lead to overstock or understock. Furthermore, there have been reports of the corporation losing live chickens and items during the manufacturing process for unknown reasons. It might be because the chickens fled, or it could be stolen. There is no way to trace the number of hens or identify the employees who are held accountable. The interviewee said, "The *system must be user-friendly, especially for the low digital literacy*" and pointed out that the "*data entry process must be as easy as they are doing manually in a piece of paper*". The process shouldn't continue before the data entry has been finished, as additional information that "*the system must halt the process before the previous step has been finished*" The interviewee put more attention on the user-friendliness of the system for the low-digital literacy people. "*There are many times that the staff stole some chickens every day and this is because there is monitoring between the number of chickens bought or ordered,*" The interviewee said.

4.2. Define

With all the problems listed above, the author is asked to design and develop a specialized and automated web-based IMS that can digitally record all data, receive real-time input from weighing scales, handle multiple roles (different user interface per role) in a single platform, and so on, to ultimately speed up their workflow and keep up with customer demand. The system should be able to be used by all of the employees, all of whom are low in digital literacy. Low digital literacy is indicated by a restricted proficiency in efficiently utilizing digital technologies, such as difficulties in navigating digital interfaces, comprehending online information, and utilizing digital tools. This may encompass challenges in doing fundamental activities, such as operating a computer mouse, inputting text on a keyboard, or maneuvering around a website or application.

4.3. Ideate

The authors construct wireframes for multiple pages at this stage. The wireframe designs are focused on user demands and involve describing the important features and structure of a user interface in the previous stage to fulfill specific user requirements. The challenges are difficulty in navigating through multiple menus or understanding non-intuitive icons, struggling to process large amounts of information simultaneously, and having difficulty reading small fonts or deciphering poor color contrasts. Here are some of the generated wireframes (Figure 2 and Figure 3).

Fig. 2: Wireframe of Live Chicken Delivery Process

In Ben Shneiderman's "Eight Golden Rules of Interface Design," the principle of "Strive for Consistency" highlights the importance of maintaining consistency and coherence in user interface design. In Figure 2, design consistency between windows helps users form a mental picture of the system, making it easier for them to predict how the interface will behave and understand the significance of various features. Keep the layout and design consistent across all screens and interface components. Consistently also shown in Figure 3, especially in the use of controls such as buttons, checkboxes, and radio buttons.

Fig. 3: Wireframe of Final Checklist of Live Chicken Delivery Process

Users should be able to rely on well-established interaction patterns, which will aid in lowering the learning curve for using the interface. Buttons, menus, and navigation should all have a similar appearance so that users can readily identify and interact with them as shown in Figure 4 and Figure 5. Creating consistent procedures and action sequences is important. Users should be able to complete comparable jobs throughout the system by following similar processes. This consistency increases user confidence in their interactions.

Several iterations occurred throughout the ideate stage to determine the layout based on the specified UI. Users provide some input in this stage, for example, the shape of the button, the position of the menu, and the table design.

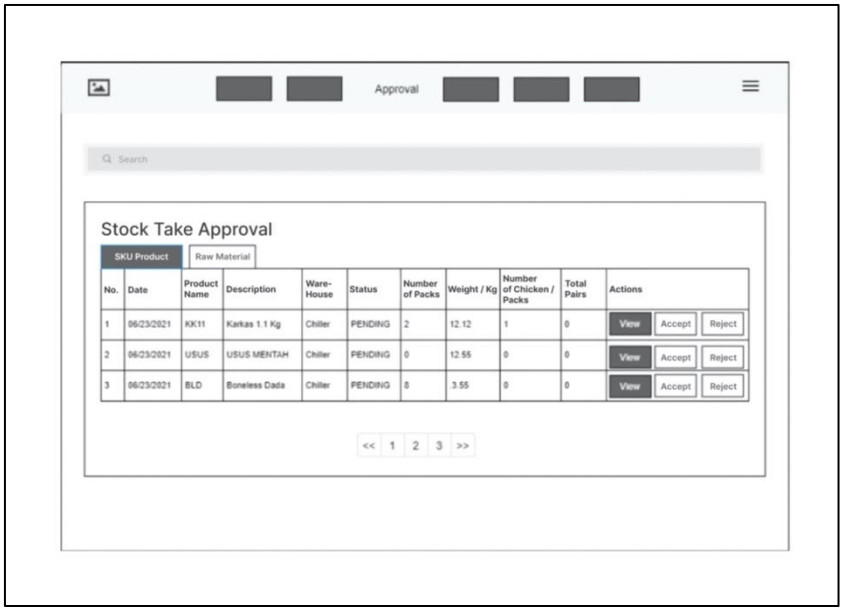

Fig. 4: Wireframe of Stock-Taking Approval

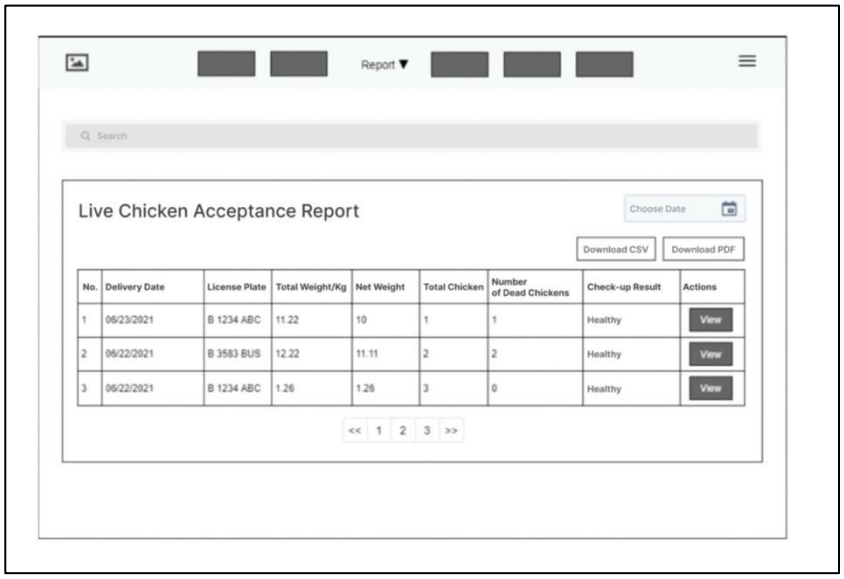

Fig. 4: Wireframe of Live Chicken Acceptance Report

4.4. Prototype

After the wireframe has been approved, the authors go on to the next step, which is to create the prototype. As previously stated, the system followed three of the eight Golden Rules of Interface Design. (1) Rule 2 - Strive for Consistency is one of the three principles that must be implemented in the user interface. For simplicity and uniformity, the application's user interface will ensure uniform button placement, with only a few colors used across the interface. (2) Rule 3: Give Informative Feedback. The majority of user feedback will be delivered in the form of alert messages. For example, after successfully submitting a form, users will

be notified with a human-readable message. (3) And, as Rule 5, error prevention. To avoid making major mistakes, the application will attempt to prevent them by spotting them and suggesting simple solutions. Users will be warned of which non-nullable fields remain unfilled before submitting a form.

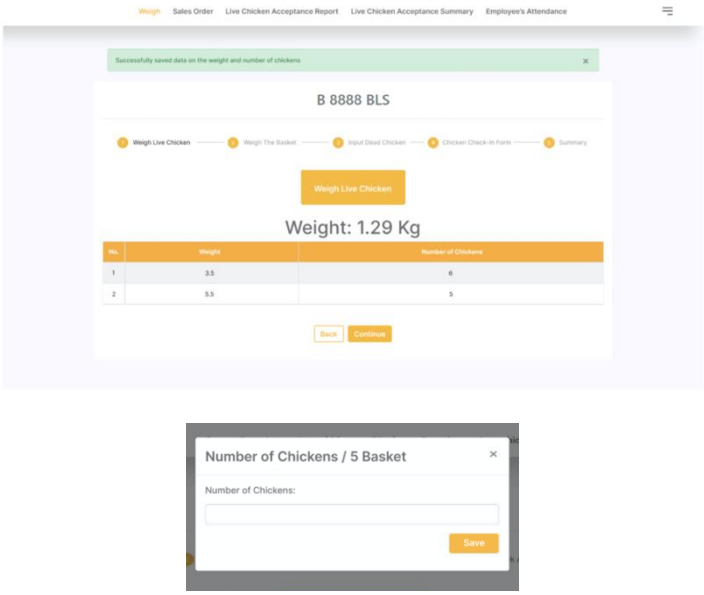

Fig. 5: Live Chicken Delivery Process

Iteration occurred when selecting the color for the UI to determine which color was appropriate for the users. Several examples of user interfaces can be seen in Figure 6 and Figure 7. The color white has several psychological links in user interface design and can have a significant impact on the overall user experience. The color white has long been associated with traits such as tranquility, peace, gentleness, pleasantness, and beauty (Demir, 2020). A mostly white interface in UI design can communicate a sense of simplicity and cleanliness and it is widely used in applications and websites that require a minimalist and modern appearance. White is also well-known for its ability to create a clean, uncluttered look. It is frequently used as a backdrop color to improve readability and emphasize other UI components. Text and images can stand out against white backgrounds. This is especially useful in applications that require a sense of openness, such as productivity tools or creative platforms. White is a major color in many modern and minimalist designs. The simplicity of white backdrops and clear lines complements current design trends, offering a sleek and elegant image.

Color psychology is important in user interface design because different colors can elicit different emotions and alter user perceptions. Throughout history, orange color has been associated with a wide range of feelings, including enthusiasm, courage, unease, distress, pleasantness, and excitement (Demir, 2020). As a result, it is appropriate for applications or websites that seek to portray excitement or originality. Orange is a conspicuously vibrant and attention-grabbing hue. When used intelligently, it can attract users' attention to specific features, such as buttons or calls to action. It is a suitable option for interfaces linked to artistic endeavors, design, or technology, particularly when there is a need for originality and a forward-thinking approach.

User interface colors, especially for action buttons like "view," "accept," and "reject," can alter how users perceive and act on the interface. When used to mean "reject," red is associated with warning and stop signals (see Figure 8). An extreme state of attention requires immediate behavior modification. Red is generally associated with transgression or restriction. Blue represents dependability and would be a good symbol for "Accept". Color can convey stability and serenity. Blue can convey enthusiasm and affirmation when used to promote an action. Orange "view" conveys energy (see Figure 9). As a warm, welcoming color, it draws attention and curiosity. An aesthetically pleasing setting, enhanced with orange, may entice users to explore and engage with the data. It has the potential to arouse enthusiasm and curiosity.

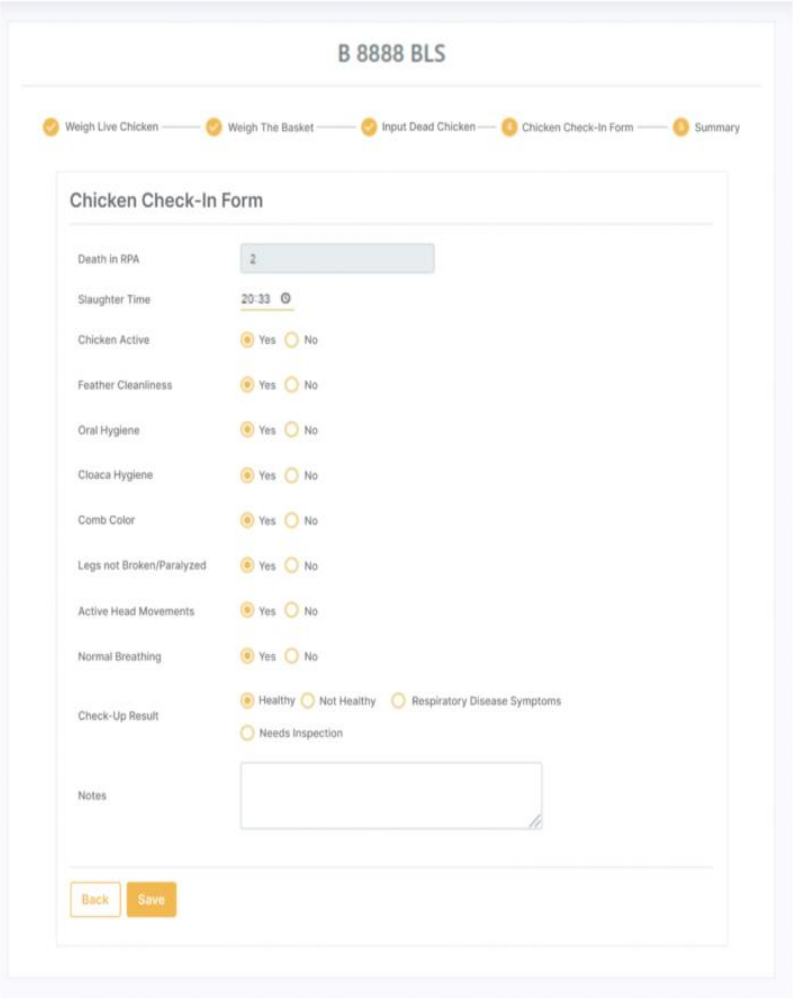

Fig. 6: Final Checklist of Live Chicken Delivery Process

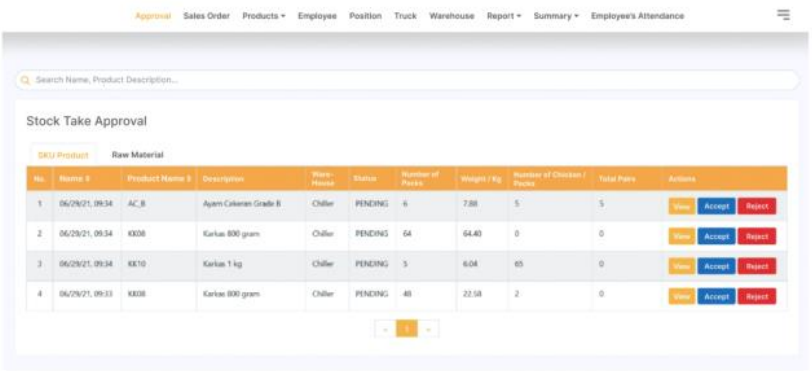

Fig. 7: Stake Taking List and Approval

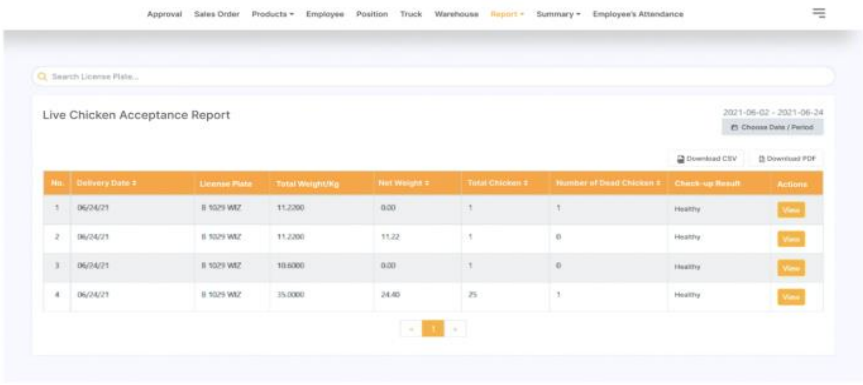

Fig. 8: Live Chicken Acceptance Report

When combining colors, it is critical to consider contrast, accessibility, and cultural connections. Furthermore, the entire design and context of the user interface influence how consumers interpret and respond to these colors. The goal is to produce a visually appealing and psychologically engaging experience that corresponds to the desired user activities.

4.5. Test

Before the UAT process, we realized that all users have low digital literacy and are between middle and high school grads. The goal of ensuring the users is to demonstrate that the system is usable for such kinds of people. We ran the UAT from receiving the live chicken or chicken delivery to production, packaging, and storage by picking the Sales Order (SO) from the available list. To tackle the challenges that have been addressed by them, the authors opt to employ easily identifiable icons accompanied by text labels, steer clear of intricate hierarchies, divide information into smaller, more manageable sections, strategically utilize whitespace to prevent overcrowding and improve legibility, and provide prompt and unambiguous feedback for user interactions.

The LC Delivery phase initiates the business flow, with the LC Delivery Supervisor as the principal user/person in control. A delivery vehicle transporting live chickens will arrive. The live chickens will then be unloaded and sorted into five containers before being weighed and numbered. The LC Delivery Supervisor and other employees will then begin weighing the chickens per 5 crates on the digital weighing scale, and the weight and quantity of chickens per 5 crates will be manually recorded on paper each time. The procedure is repeated until all live chickens from the truck have been weighed. The LC Delivery Supervisor will next weigh and record the total number of dead chickens from the same truck delivery if any exist. The weighing live chickens will then be immediately processed in the manufacturing step, and the delivery phase will conclude here.

The production phase begins after the live chickens from the delivery phase have been weighed. During this time, the Production Supervisor is the primary user/controller. At this stage, live chickens will be processed, and the processed chicken parts will be referred to as raw materials. Following that, the Production Supervisor and other people will weigh each raw material generated on a digital scale before physically writing down the weight. The manufacturing process comes to an end here.

Next is the packaging phase. The Packaging Supervisor is the principal user/person in this phase, which follows the production phase. During this phase, all products weighed are based on Sales Orders, and the products referred to here are the SKU (Stock Keeping Unit) of the Chicken slaughterhouse. The Packaging Supervisor will assign employee(s) to weigh and pack materials into packages based on products mentioned in the SKU (stock-keeping unit) and sales orders based on materials handled during the production phase. Normally, more than one person would be assigned to a single Sales Order. Employees must pack and weigh the merchandise in line with the Sales Order specifications. The supervisor will record the weight of the parcels, and once the Sales Order is completed, the packed packages will be temporarily stored in the delivery

storage before being shipped to end customers. When there are no Sales Orders left, for example, when there are leftover raw materials from the production phase, the same process will be repeated, except the employees will pack the materials into packages based on SKU for storage in cold storage for future SO rather than packing the materials into packages based on Sales Orders.

The Storage Supervisor is in charge of all storage facilities at the Chicken slaughterhouse. All products that have been prepared and packed in the packaging process are kept here until they are dispatched or removed for future usage. Products can be transferred between sites because The Chicken Slaughterhouses manages more than one storage facility. The results of the UAT for all of the phases are shown in Table 3.

Table 3: UAT Result

No.	**Supervisor in LC Delivery Phase**	**No**	**Yes**
1	The IMS can receive weight from the scale accurately and automated		✓
2	The weight can be displayed in real-time		✓
3	Error messages are easy to understand and provide a clear solution to justify		✓
4	The Interface and the flow of weighing the live chicken is correct		✓
5	The report is clear and can be filtered by date		✓
6	The displayed instructions are clear		✓
7	The search feature can be used		✓
No.	**Supervisor in Production Phase**	**No**	**Yes**
8	The IMS can receive weight from the scale accurately and automated		✓
9	The weight can be displayed in real-time		✓
10	Error messages are easy to understand and provide a clear solution to justify		✓
11	The Interface and the production flow is correct		✓
12	The Interface and form to transfer raw materials are correct		✓
13	The report is clear and can be filtered by date		✓
14	The displayed instructions are clear		✓
15	The search feature can be used		✓
No.	**Supervisor in Packaging Phase**	**No**	**Yes**
16	The IMS can receive weight from the scale accurately and automated		✓
17	The weight can be displayed in real-time		✓
18	Error messages are easy to understand and provide a clear solution to justify		✓
19	The Interface and the packaging flow is correct		✓
20	The report is clear and can be filtered by date		✓
21	The interface for Sales Order (SO) and assigning employee is correct		✓
22	The displayed instructions are clear		✓
23	The search feature can be used		✓
No.	**Supervisor in Storage Phase**	**No**	**Yes**
24	The IMS can receive weight from the scale accurately and automated		✓
25	Error messages are easy to understand and provide a clear solution to justify		✓
26	The interface for storage list and product list is clear and correct		✓
27	The report is clear and can be filtered by date		✓
28	The search feature can be used		✓

To summarize, this section encompasses the achievements and confirmation obtained from our UAT step. The observed good effects and smooth user interactions highlight the efficacy of our design and development

endeavors, which are rooted in the design thinking methodology. The success of the UAT results serves as evidence of the careful planning and user-focused approach that has influenced the direction of our project.

5. Discussions

The application of Design Thinking aided our study efforts by generating valuable insights, improving problem-solving, and producing more user-centric outcomes. Design thinking offers a pragmatic approach that acknowledges the tangible elements and authentic essence of the inquiry. This study demonstrates that it enables a deeper comprehension of users' perspectives, needs, and encounters, while also facilitating the exploration of a wider range of possibilities and fostering the generation of more innovative concepts and solutions (Rusmann & Ejsing-Duun, 2022). Based on user feedback, we can quickly confirm assumptions, uncover faults, and develop the prototype. The approach can be changed depending on early discoveries, lowering the danger of following ineffective pathways and optimizing efficiency. Design Thinking also enables us to effectively convey difficult concepts and conclusions to a wide range of users, resulting in increased engagement and comprehension.

During the ideate stage, the authors develop wireframes for some pages. After the ideate stage is finished, the authors proceed to the prototyping stage, and in this stage, the authors develop UI based on the developed wireframes from the previous stage. At this stage, the authors choose a minimalistic layout and design. Have more white color and combine it with orange color (N. Singh & Srivastava, 2011). The white color represents a clear and simple interface that helps consumers comprehend how to browse and engage with the IMS, decreasing cognitive burden (S. Singh, 2006). When confronted with sophisticated interfaces or technical vocabulary, those with lesser education levels may have difficulties. While colors affect different people in different ways, the authors chose orange as the secondary color. After being tested for the association between colors and emotions, and designated yellow, orange, and blue as happy colors, as they signify a happy, balanced, and enthusiastic mind (Purbasari et al., 2021). Due to the simplicity of the design and the color combination it is easily accepted by the users.

The juxtaposition of colors in the background of digital text can have a substantial influence on reading effectiveness, and extended periods of digital reading can impair text comprehension and offer a pronounced disparity, resulting in a visually captivating effect (Guo et al., 2022). This can enhance the visibility of crucial components, such as buttons or call-to-action elements. Employ the color orange judiciously to direct focus toward particular features or sections of the interface. The color orange is commonly linked to attributes such as vitality, warmth, and zeal. The combination of white as a background, creates a clean and energetic appearance, conveying a sense of positivity and ensuring enough distinction between the orange elements and the white backdrop to comply with accessibility standards for visually impaired users. This takes into account the need for accessibility, which promotes sustained focus, captures attention with ease of reading, and enhances user-friendliness. (Lewandowska & Olejnik-Krugly, 2022). Ensure that the gray font utilized on the white background maintains a strong contrast to ensure excellent legibility. Experiment with various tones of gray to discover the shade that achieves a harmonious blend of legibility. The white backdrop evokes a feeling of immaculateness and minimalism. Make sure to use ample negative space to prevent visual congestion and improve the overall legibility and user experience. White, gray, and orange provide a clean, modern look, which is ideal for UI designs that value simplicity, elegance, and modernity.

For user interface design, sans-serif typefaces are usually utilized because of their better legibility on digital screens, particularly when employed at lower sizes. This is especially true when text size is lowered. Sans-serif typefaces are modern and elegant, and they match user interface design trends. These adaptable typefaces can be employed efficiently for a broad variety of user interface components, including headings, body text, buttons, and labels. Sans-serif characters make the design look cleaner and more organized. Sans-serif typefaces are known for their scalability, which maintains readability and visual clarity across multiple dimensions. It is vital for responsive design since it is more consistent and has fewer rendering issues than some serif fonts on devices with lower resolutions or changing rendering capabilities. The UI must

accommodate different screen sizes and resolutions. The study found that sans serif typefaces made electronic writing easier to read (Dogusoy et al., 2016).

The implementation of UAT has been a success because of Design Thinking. The iterative and user-centric method of Design Thinking is the best way to create solutions that closely match what users want and anticipate. Good results from UAT are an endpoint; but, they can also provide valuable information that can be used for subsequent iterations and modifications. The technique of Design Thinking necessitates the provision of ongoing feedback and the willingness to modify the solution by the experiences of the users.

Implementing digital inventory management systems for users with low digital literacy necessitates a careful strategy that emphasizes user-friendliness, thorough training, strong support, and continuous enhancement. Businesses must take into account the unique requirements and difficulties faced by these users in order to guarantee the successful implementation and efficient utilization of digital solutions. By considering and attending to these elements, firms may optimize productivity, minimize errors, and raise overall satisfaction with the digital inventory management system.

6. Conclusions

This study demonstrates the successful application of the design thinking methodology in creating a user-friendly inventory management system interface for employees with low digital literacy in the context of chicken slaughterhouses in Indonesia. The iterative and user-centered approach, involving interviews, wireframing, prototyping, and user acceptance testing, enabled the development of an intuitive and visually clear interface that caters to the needs of the target users.

The findings highlight the importance of considering user characteristics, such as digital literacy, in the design process. The use of a minimalistic layout, a white and orange color scheme, sans-serif typefaces, and clear visual hierarchies contributed to the usability and accessibility of the interface. The positive results from the UAT indicate the effectiveness of the design decisions made based on user feedback and the design thinking principles.

However, the study has some limitations that should be acknowledged. The sample size for the interviews and UAT was relatively small and limited to a single chicken slaughterhouse. Future research could involve a larger and more diverse sample to enhance the generalizability of the findings. Additionally, the long-term usability and impact of the IMS on the chicken slaughterhouse's operations were not assessed in this study.

Despite these limitations, this research makes valuable contributions to the field of user interface design for low digital literacy users. It provides insights into the effective use of design thinking principles and specific design elements to create user-friendly interfaces. The findings have practical implications for businesses aiming to digitalize their inventory management processes and highlight the importance of considering user needs and characteristics in the design process.

7. Implications

Two-fold contributions are brought to the table by this study, from an academic perspective and a practical perspective. When viewed from an academic perspective, our method has been demonstrated to be suitable for individuals who have a poor understanding of digital technology, such as those who work in chicken slaughterhouses. Through the application of design thinking as the methodology, our study has shown how to construct a User Interface (UI) that is satisfactory for individuals with a low level of digital literacy.

From a practical perspective, our study has demonstrated how to create a decent UI for those with poor digital literacy using design thinking as the technique. Future academicians or practitioners can use our study as a basis to get a better understanding of how to build an information system for low digital literacy people. Further study can also be conducted to extend the capability of the system, for example by creating a mobile version of it.

8. Limitations

This study was subject to various limitations. Firstly, even though it has succeeded in showing that the resulting system can be used by low digital literacy employees, the number of stakeholders involved is still limited to one chicken slaughterhouse company. Further study that involves many chicken slaughterhouses will be able to enrich the study results. Furthermore, it is quite probable that the solution will not be compatible or appropriate in an alternative agricultural company sector or domain, such as the production of tea or coffee.

In the future, researchers could consider conducting a larger number of interviews and observations to acquire more comprehensive perspectives from a broader range of stakeholders. Additionally, it would be advisable to experiment with various company ventures to ascertain that the optimal user interface for individuals with limited digital literacy is contingent upon the specific industry.

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