**Advance Sustainable Science, Engineering and Technology (ASSET)**
**Vol. 6, No.3, July 2024, pp. 02403025-01 ~ 02403025-010**
**ISSN: 2715-4211 DOI:** https://doi.org/10.26877/asset.v6i3.798

# User-Centered Design Approaches to Enhance Employee Attendance Applications

**Wahyu Maulana Prawiro*, Egia Rosi Subhiyakto**

Faculty of Computer Science, Universitas Dian Nuswantoro Semarang, Jl. Imam Bonjol No 207 Semarang 50131, Central Java, Indonesia

*111202012605@mhs.dinus.ac.id

**Abstract.** In the current digital era, Human Resource Management (HRM) has undergone significant transformation with the advent of technology, including employee attendance applications. These applications replace inefficient and error-prone manual methods, facilitating effective attendance, leave, and monitoring of working hours. This study aims to apply a user-centered design (UCD) approach to developing an employee attendance application to enhance user experience (UX). Evaluation using the System Usability Scale (SUS) revealed a usability score of 86.37, classified as "Excellent." This score reflects positive user reception and underscores the importance of user-focused approaches in development. This research shows how user-tailored features can improve attendance management efficiency and effectiveness by aligning the application with user workflows. Despite the positive results of this study, recommended to continue periodic design iterations with regular user feedback to improve usability and satisfaction.

**Keywords**: Employee Attendance Systems, Human Resource Management, User Centered Design (UCD), System Usability Scale (SUS), User Experience (UX)

***(Received 2024-06-18, Accepted 2024-07-23, Available Online by 2024-07-31)***

## 1. Introduction

Technological advancements have permeated various aspects of life in the digital era, including Human Resource Management (HRM)[1]. HRM involves planning, organizing, leading, and controlling human resources to achieve organizational objectives efficiently.[2]. HRM has become a crucial aspect of modern organizations. One of the critical components of HRM is employee management, which includes monitoring employee attendance, leave, and working hours. Effective employee attendance management not only ensures smooth operations but also plays a role in enhancing productivity and employee well-being[3]. Before the digital era, manual attendance recording processes required significant time and effort, especially in companies with many employees. Traditional methods, such as manual attendance with signatures or punch cards, were often prone to errors. The potential for data manipulation and inefficiency was a common issue, and the manual processing of attendance data was time-consuming, with less effective analysis results[4].

Employee attendance applications are digital solutions designed to facilitate attendance management in the workplace. This technology efficiently monitors attendance, leave, and working hours, replacing manual processes that require significant time and effort. Employee attendance applications can reduce the potential for errors and data manipulation, as well as expedite the processing and analysis of attendance data. This allows for more timely and effective decision-making related to HR management[5]. Therefore, employee attendance applications can help companies improve overall productivity and employee well-being.

Although this technology offers many benefits, not all employee attendance applications can provide an optimal user experience. Some applications have complex interfaces that can confuse users, especially those who are not tech-savvy. Additionally, some applications offer features irrelevant to the users' needs or have confusing navigation, which can cause discomfort[6]. It is important to remember that the primary purpose of an employee attendance application is to assist companies and employees in managing attendance. Therefore, the design of the application should prioritize the needs and convenience of the users. The application should have an intuitive interface, relevant and easy-to-use features, and clear, understandable navigation.

The User-Centered Design (UCD) approach in this study will ensure that the employee attendance application is developed according to the users' needs and preferences, enhancing efficiency and user satisfaction. UCD is a design approach that focuses on a deep understanding of users, their needs, and the context of product use. UCD actively involves users through interviews, observations, and usability testing to ensure that the resulting product is easy to use[7]. Additionally, using the System Usability Scale (SUS) as an evaluation tool will provide objective quantitative data on the application's usability level. According to [8] SUS, it is a quick and simple usability evaluation tool that offers subjective measures of a product's effectiveness, efficiency, and satisfaction. The combination of UCD and SUS will result in an employee attendance application that is functional and easy to use, promoting broader adoption and contributing to overall employee productivity improvement.

Research related to employee attendance applications has been conducted by [9], demonstrates that attendance management using technology is more efficient and accurate compared to traditional methods. Furthermore, the study [10] discusses the analysis of the TSP Mobile application, showing user satisfaction after redesigning the application's design solution. Another study on the design of attendance applications was conducted by [11] using the UCD method and black box testing; the test results showed that the application could be used as an alternative but was unsuitable for some employees. Then, the use of the UCD and SUS methods on the matrix learning application by [12] showed a testing score of 85.6% and fell into the "Excellent" category in the adjective rating. Additionally, research related to the design of various applications using the UCD and SUS methods conducted by [13], [14], [15] showed quite effective results.

This study shows how a user-centered design (UCD) approach can be effectively applied to develop employee attendance applications that are both efficient and user-friendly. Unlike previous studies, this research focuses on aligning the application's features with the actual workflows and needs of end-users, ensuring that the application not only enhances operational efficiency but also significantly improves user satisfaction and engagement. By integrating UCD with the System Usability Scale (SUS), this study offers a comprehensive evaluation of the application's usability, underscoring the importance of user-focused design in creating practical HRM tools.

## 2. Research Methods

This study applies the User-Centered Design (UCD) method. UCD is used to ensure that the design of the employee attendance application meets users' needs optimally. UCD involves the active participation of users in every development stage, from planning to evaluation[7], [16]. This approach is expected to produce relevant and efficient design solutions. The stages of the method used in this study can be seen in Figure 1. This study consists of five main steps: problem identification, literature review, user-centered design, results, and conclusion.

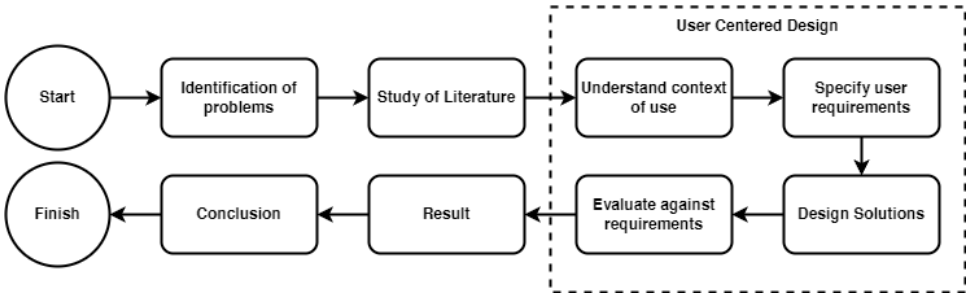


**Figure 1.** Research Methodology Stages

*2.1. Identification of Problems*

The initial stage of this study is essential for pinpointing the main issues through interviews with potential users. These interviews aim to collect detailed information on user needs and preferences for the design of the employee attendance application. Participants were employees aged 17 and older, all of whom had work experience, providing a diverse range of perspectives.

*2.2. Study of Literature*

The next stage involves reviewing literature to identify theories or studies addressing similar issues. This step is crucial for understanding the context and previously proposed solutions. In supporting this research, the focus will be on previous studies and other reference sources related to user experience, user-centered design, and employee attendance applications.

*2.3. User-Centered Design (UCD)*

User-Centered Design (UCD) is a design methodology that prioritizes the user throughout the design process. This approach focuses on deeply understanding users' needs, preferences, and behaviors by actively involving them at every stage of development[7]. UCD employs iterative research, design, prototyping, and testing cycles to ensure the final product is intuitive, efficient, and satisfying for the end-user. The detailed explanation of UCD is as follows:

a. Understanding Context of Use
   Understanding the Context of Use involves identifying and comprehending the issues users face. This stage serves as the foundational basis for creating an effective design. The outcome of this stage is a detailed description that informs the development of an appropriate design solution.
b. Specify User Requirements
   Specifying User Requirements is the data collection stage focused on establishing the success criteria for the design solution. During this stage, their specifications are developed to ensure that the resulting design meets the users' needs and expectations.
c. Design Solutions
   Once gathered information about the users' needs, the next step is to design the solution.. This stage involves creating wireframes, mockups, and prototypes using design tools like Figma. The resulting prototype will then be used for further evaluation.
d. Evaluate against requirements
   The next step is to evaluate the designed solution. The objective is to assess if the requirements of potential users have been fulfilled. The method to be used is the System Usability Scale (SUS), which will be explained as follows.

*2.4. System Usability Scale (SUS)*

The System Usability Scale (SUS) is a method for assessing product usability through a

questionnaire. SUS involves end users in the evaluation process using a Likert scale. The SUS instrument consists of 10 questions rated on a scale from 1 to 5. This scale allows participants to express their level of agreement, from strongly disagree to strongly agree.[8], [17], as shown in Table 1.

**Table 1.** SUS Questionnaire

| No | Question | Scale |
|---|---|---|
| 1 | I believe I would use this application regularly. | 1-5 |
| 2 | I found the application to be unnecessarily complicated. | 1-5 |
| 3 | I thought the application was simple to use. | 1-5 |
| 4 | I think I would need assistance from a technical person to use this application. | 1-5 |
| 5 | I found the various features of this application to be well-integrated. | 1-5 |
| 6 | I noticed a lot of inconsistencies within the application. | 1-5 |
| 7 | I would expect most people to learn how to use this application quickly. | 1-5 |
| 8 | I found the application to be awkward and difficult to use. | 1-5 |
| 9 | I felt very confident when using the application. | 1-5 |
| 10 | I needed to learn many things before I could start using this application effectively. | 1-5 |

Questions from Table 1: a score of 1 can be interpreted as "Strongly Disagree," a score of 2 as "Disagree," a score of 3 as "Neutral," a score of 4 as "Agree," and a score of 5 as "Strongly Agree." To compute the SUS score, you should subtract one from the score of questions with odd numbers (Score - 1) and subtract the score from 5 for questions with even numbers (5 - Score). Add up the outcomes for all the questions and then multiply the total by 2.5 to obtain the overall score.[8], as shown in Equation 1. In SUS, the results are interpreted using three perspectives: acceptability, grade scale, and adjective rating, as illustrated in Figure 2.

$$\text{SUS Score} = 2.5 \times \left( \sum_{i=1,3,5,7,9} (Score_i - 1) + \sum_{j=2,4,6,8,10} (5 - Score_j) \right) \quad (1)$$

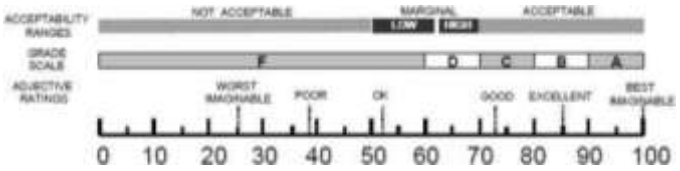


**Figure 2.** Grade rankings of SUS scores

Acceptance are categorized into three levels to measure user acceptance: not acceptable, marginal (low and high), and acceptable. The grading scale used includes A, B, C, D, and F, along with adjective ratings such as best imaginable, excellent, good, poor, and worst imaginable.

## 3. Results and Discussion

### *3.1. Understand context of use*

At this stage, the identification of potential users of the application is carried out through structured interviews. This technique involves asking respondents a series of pre-prepared questions to gather detailed insights. The structured nature of the interview ensures that all relevant topics are covered consistently across all respondents[18]. At this stage, the interviews involve five respondents who have work experience. The participation of respondents who have worked aims to obtain data that is more relevant to the needs and preferences of users in designing the employee attendance application.

Additionally, according to [19], [20], five respondents can represent valid test results. The outcomes of this process will be used in the user persona Table 3.

**Table 2.** User Persona

| Category | Details |
|---|---|
| Demographics | Age: 17 – 25 years<br>Gender: Female/Male |
| Ability Level | Proficient with using a smartphone and can handle work-related activities |
| Behavior | - Using manual paper records for clocking in and out<br>- Difficulty in ensuring accurate tracking of attendance, overtime, and leave.<br>- Data entry errors are common due to manual processes<br>- Complicated process for requesting leave authorization |
| Needs | - Need an intuitive and easy-to-use interface for attendance<br>- Need to provide real-time attendance tracking<br>- Need to provide real-time attendance reporting<br>- Need to simplify the process of requesting leave |

*3.2. Specify user requirements*

At this stage, we will create user requirements specifications based on the analysis of user characteristics obtained. By examining the insights gained from interviews with previous respondents, we can identify and understand the specific needs and preferences of our users.

**Table 3.** User Requirements

| Needs | Requirement |
|---|---|
| Need an intuitive and easy-to-use interface for attendance | Design the user interface to be intuitive and user-friendly, ensuring ease of navigation |
| Need to provide real-time attendance tracking. | Implement a real-time attendance tracking feature that accurately records |
| Need to provide real-time attendance reporting. | Develop a real-time attendance reporting system. |
| Need to simplify the process of requesting leave | Create a streamlined and straightforward leave request process |

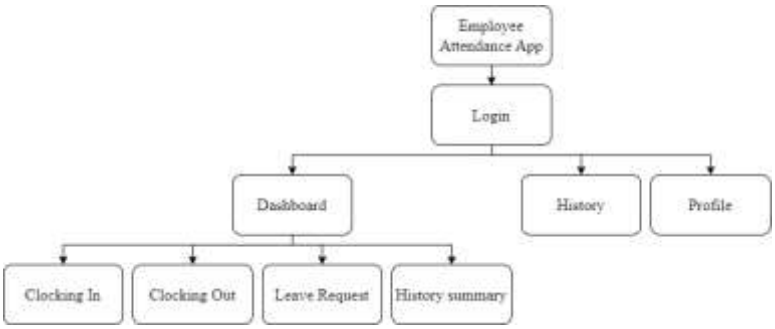


**Figure 3.** Information Architecture

After identifying user needs, as shown in Table 4, we can create the Information Architecture (IA) depicted in Figure 3. IA is the practice of organizing and structuring information to make it easily understandable and accessible for users[21]. Another essential aspect for identifying user needs is the use case diagram. The function of a use case diagram is to illustrate the interactions between users and the system, as shown in Figure 4.

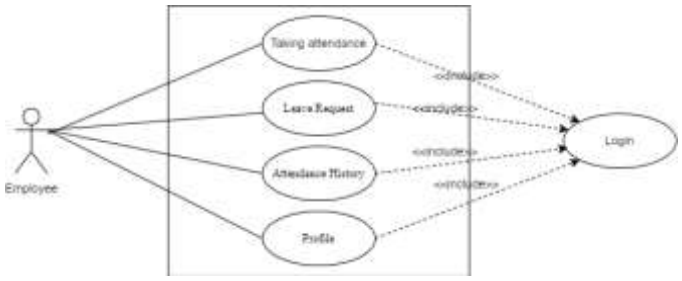


**Figure 4.** Use Case Diagram

*3.3. Design Solutions*

At this stage, both low-fidelity and high-fidelity designs are developed in parallel. These essential designs are created using the Figma tool. Below are the views of the low-fidelity and high-fidelity designs:

a. Employee Attendance Page

In Figures 5 and 6, the employee dashboard page is shown, displaying information about the user profile, work shift schedule, working hours, feature buttons, a summary of the employee's attendance history for one week, and the navigation menu. Additionally, users can view an illustration of the employee attendance feature usage, which includes real-time photo attendance. Each piece of information is depicted in both low-fidelity and high-fidelity formats.


**Figure 5.** Low-Fidelity Employee Attendance Page


**Figure 6.** High-Fidelity Employee Attendance Page

b. Employee Leave Page
This page contains information regarding employee leave. This feature can be accessed from the dashboard. Users need to press the left button. Users who want to request leave must fill out the available fields. A drop-down menu will appear with predefined categories such as overtime leave, vacation leave, sick leave, and early departure leave. As shown in Figures 7 and 8, each leave category is clearly defined and easy to select.


**Figure 7.** Low-Fidelity Employee Leave Page

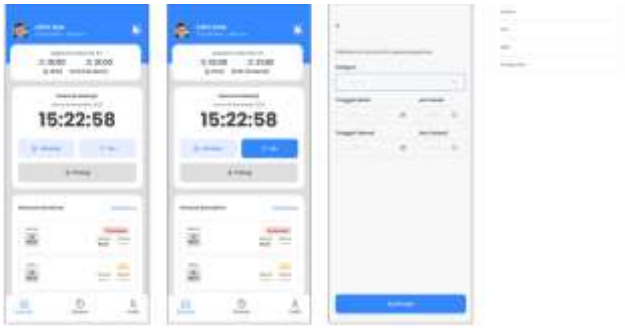


**Figure 8.** High-Fidelity Employee Leave Page

c. Attendance History Page
In addition to the attendance summary available on the dashboard, users can view a more detailed attendance history by clicking the history menu, as shown in Figures 9 and 10.


**Figure 9.** Low-Fidelity Attendance History Page


**Figure 10.** High-Fidelity Attendance History Page

*3.4. Evaluation*

Quantitative data for testing was gathered using a questionnaire. The study included 20 respondents who met the eligibility criteria. The questionnaire was distributed via Google Forms and comprised two sections: the first section collected respondent demographics, and the second section contained usability tests and the SUS questionnaire. The SUS method, which includes ten questions that evaluate the usability of a system or product based on user feedback, was used for evaluation. The SUS score offers insight into how easy and satisfying the system is to use. The results, presented in Table 5, were calculated using a specified formula to determine the SUS Score. Responses were gathered from 20 qualifying participants.

**Table 4.** Final SUS Score

| Respondent | Calculated Score | | | | | | | | | | Total | SUS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | | |
| R1 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 38 | 95 |
| R2 | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 35 | 87.5 |
| R3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 34 | 85 |
| R4 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 3 | 3 | 32 | 80 |
| R5 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 3 | 3 | 36 | 90 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| Final SUS Score | | | | | | | | | | | | 86.37 |

The Final SUS score results show an average of 86.37, which falls into the 'acceptable' category with an adjective rating of 'Excellent' and a grade of B. This indicates that users are well-received of the employee attendance application's design.

## 4. Conclusion

This study shows that User-Centered Design (UCD) in the development of employee attendance applications yields satisfactory results. The System Usability Scale (SUS) evaluation yielded a usability score of 86.37, categorized as 'Excellent' with a Grade 'B' and within the 'Acceptable' range. This indicates that the design is well-received by users, demonstrating the success of the User-Centered Design approach in creating a user-friendly and efficient interface. Despite the positive results, it is recommended to continue periodic design iterations to improve usability scores further by focusing on iterative application development involving regular user feedback to enhance usability and satisfaction. This high usability score reinforces the importance of a user-focused approach in interface development.

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