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Design of a Web-based Human Resource Information System (HRIS) Using Design Thinking and Agile Methods at CV Solusi Teknologi Kreatif

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Abstract— *CV Solusi Teknologi Kreatif, an information technology company with 13 active employees, still manages its HR administrative processes manually through informal communication channels, causing leave approval delays of up to 3 to 5 working days and payroll compilation delays of 3 to 5 days after each monthly period closes. This study develops SWIFT, a web-based Human Resource Information System (HRIS) built through an integrated Design Thinking and Agile Development methodology, consolidating four core HR modules geolocation-based attendance with photo authentication, leave management, structured reimbursement workflows, and centralized payroll distribution into a single platform deployed in a live operational environment. The backlog totals 25, Black Box Testing across 22 test scenarios achieved a 100% pass rate, User Acceptance Testing involving 7 respondents yielded an average acceptance score of 89.2% categorized as Very Good, and System Usability Scale evaluation produced an average score of 83.57 categorized as Good, confirming that SWIFT is ready for phased full-scale implementation.*

Keywords— *Human Resource Information System (HRIS), Design Thinking, Agile Development, User Acceptance Testing, System Usability Scale*

SDG: 8 – Decent Work and Economic Growth

I. INTRODUCTION

Information system design focuses not only on functional information system design focuses not only on functional aspects but also on the quality of the user experience. The Design Thinking approach has proven effective for gaining a deep understanding of user problems through the stages of empathize, define, ideate, prototype, and test [1], while Agile Development Lifecycle supports iterative system development through short work cycles that allow rapid adaptation to changing requirement [2]. The integration of both produces an approach that not only understands user needs but also ensures development remains adaptive and responsive. Prior studies have shown

that applying Design Thinking to digital HR systems consistently improves process efficiency and user experience quality [3], yet most of these studies remain partial and have not extended the user-centered design approach through to full system deployment and post-implementation testing [4].

These gaps were identified concretely at CV Solusi Teknologi Kreatif, an information technology company with 13 active employees that still manages all HR administrative processes manually through informal communication channels. This has resulted in leave approval delays of up to 3 to 5 working days and payroll compilation delays of 3 to 5 days after each monthly period closes, in addition to data duplication and overall process inefficiency. Studies on the design of mobile-based attendance application interfaces have not included integration of leave, reimbursement, or payroll modules within a single unified platform [5]. Research on web-based personnel information systems using Design Thinking has also remained limited to interface design and has not covered end-to-end administrative workflow automation [6]. Similarly, mobile-based HR management applications have developed features only partially and have not integrated geolocation-based attendance validation into the same HR ecosystem [7].

Therefore, this study introduces a novel approach through the integration of Design Thinking and Agile Development Lifecycle executed through to full deployment and UAT testing stages, with a development scope covering a web-based system encompassing four critical administrative modules namely geolocation-based real-time attendance with photo authentication, transparent leave requests, structured reimbursement management, and automated payroll distribution, all unified into a single platform called SWIFT and deployed directly within the

live operational environment of CV Solusi Teknologi Kreatif.

II. LITERATURE REVIEW

Human Resource Information System (HRIS) is defined as a system used to acquire, store, manipulate, analyze, and distribute human resource information within an organization, with the primary goal of automating routine administrative tasks such as attendance tracking, payroll calculation, and leave management [8]. Its effectiveness in supporting organizational digital transformation is influenced by information quality, executive innovativeness, and staff IT capabilities [8], while studies on HRIS adoption in SME contexts indicate that employee acceptance is also shaped by psychological factors such as performance expectancy and social influence [9].

Design Thinking is an iterative, human-centered problem-solving approach consisting of five stages: empathize, define, ideate, prototype, and test [1]. Its application in digital HR systems has been shown to improve both process efficiency and user experience quality, as demonstrated [4] in the context of digital recruitment. [5] Who showed that a Human-Centered Design approach applied to internal HR processes increased employee satisfaction and engagement at the organizational level. The integration of Design Thinking with Agile Development has further been shown to produce systems that are more innovative, adaptive, and responsive to user needs across digital service domains [10], while the application of Human-Centered Design principles to large-scale HRIS platforms has been shown to reduce administrative burden and increase user adoption rates [11].

Several studies have applied Design Thinking to the design of personnel information systems and evaluated results using the System Usability Scale (SUS) [7]. recorded SUS scores of 88 and 91 for a web-based personnel information system, [10] reported SUS scores of 88 and 77 for a mobile-based HR management application, [12] achieved a SUS score of 87 for a university information management system, [13] demonstrated usability success rates of 100% and 90% for web and mobile versions of a campus academic information system, and applied Design Thinking to design an employee monitoring and control application that met user operational needs [14]. These results consistently confirm that Design Thinking produces systems with high usability outcomes.

Based on this review, most existing studies remain partial in terms of both features developed, and stages completed and generally do not extend to full deployment or post-implementation testing. Studies on Agile methodology have largely focused on coordination mechanisms [15], requirements engineering frameworks [16], and UX integration practices [17] without addressing the specific administrative challenges of HR systems in small-scale organizations. No study was found that integrates geolocation-based attendance with photo authentication, leave management, reimbursement workflows, and centralized payroll distribution into a

single platform built through a combined Design Thinking and Agile Development methodology and validated through Black Box Testing, UAT, and SUS in a live operational environment. This study addresses that gap through the development and full deployment of SWIFT at CV Solusi Teknologi Kreatif.

III. RESEARCH METHODOLOGY

Qualitative data was collected through in-depth interviews and direct observation of five representatives of user groups at CV Solusi Teknologi Kreatif. The informants were selected through purposive sampling to represent all levels of the organization, consisting of one representative from the Human Resources division, one General Manager, and three employee representatives from different technical departments.

The findings indicate that the HR administration process is slow and confusing because it is still manual and not centralized. The main challenge identified is the lack of visibility into information, making it difficult for employees to track their daily attendance status, remaining leave balances, and the progress of reimbursement claims. All of these empirical issues were then used as the primary basis for defining the functional requirements for the "SWIFT" HRIS.

Design Thinking was selected because the administrative problems at CV Solusi Teknologi Kreatif are fundamentally human-centered, rooted in the day-to-day experiences of employees and the HR division who have long operated without a centralized system. This approach enables the team to deeply understand user needs before any solution is designed. Agile Development was chosen as the development methodology because SWIFT encompasses four complex and interdependent functional modules, requiring an iterative approach to ensure each module can be evaluated and refined incrementally without disrupting the overall development timeline.

SWIFT was developed as a web-based application using Next.js as the fullstack framework, Supabase as the database and authentication service, and Tailwind CSS and shadcn/ui as the user interface foundation. The system consists of two main portals, an employee portal and an admin/HR portal, both accessible via browser and deployed on a cloud-based production environment using Kubernetes as the container orchestration platform to ensure system availability and scalability.

The research process follows the Design Thinking approach shown in Figure 1, which illustrates the stages of the process from empathizing to testing as a framework for solution development.



Figure 1. The Design Thinking Process Method

The Design Thinking approach is used comprehensively to analyze needs, identify patterns, and solve user problems in depth through a human-centered design approach[18]. This process consists of the following five stages:

1. Empathize

Collected data through interviews and observations of 13 employees and the HR division to identify user needs, challenges, and pain points.

2. Define

Analyzed the findings to formulate the main problems and develop user personas for each stakeholder.

3. Ideate

Developing alternative feature solutions and designing the HRIS system's information architecture.

4. Prototype

Transforming ideas into visual designs, ranging from sketches and wireframes to responsive UI.

5. Test

Conducting prototype testing with potential users to gather feedback prior to system implementation.

A. System Development Methods

1. The Design Thinking Process Method

Data from interviews and observations were analyzed using a Design Thinking approach to identify user patterns, needs, and challenges. The results of this qualitative analysis served as the foundation for the Design Thinking stages, particularly the Empathize and Define phases, to formulate the problem statement and system requirements.

2. Agile Methodology

The Agile approach is used as a method for designing and developing systems based on identified requirements[19], [20].



Figure 2. Stages of the Agile Method

These steps include:

1. Requirements

The requirements phase is the initial phase of system development. During this phase, information regarding system requirements is gathered to ensure that development proceeds as planned.

2. Design

The design phase is the process of designing a system based on previously analyzed requirements. The design includes the system architecture, process flows, database, and user interface that will be used in the system.

3. Development

The development phase is the process of implementing the system design into program code. During this phase, the development team begins building the system's features in accordance with the design that has been created.

4. Testing

The testing phase is conducted to ensure that the developed system functions properly and meets user requirements. The purpose of this testing is to identify and fix any errors or bugs in the system.

5. Deployment

The deployment phase is the process of deploying or implementing a system so that it can be used by users. During this phase, the developed system is installed and run in a production environment.

6. Review

The review phase is a phase in which the developed system is evaluated. During this phase, the results of the development are assessed, and feedback is collected from users to inform improvements and further development in the next cycle.

B. Usability System Matric

1. System Usability Scale (SUS)

The SUS is a standardized instrument consisting of 10 standard statements used to measure the overall ease of use of a system. Each statement is rated on a 1–5 Likert scale, where odd-numbered statements are positive, and even-numbered statements are negative.

The SUS score is calculated using the following formula:

$$\text{SUS Score} = (\text{contribution of each item}) \times 2.5$$

The contribution of each item is calculated as follows: for odd-numbered statements, the response value is subtracted by 1 for even-numbered statements, 5 is subtracted from the response. The total contribution of all items is then multiplied by 2.5 to produce a score ranging from 0 to 100. The system is classified as usable if the SUS score is ≥ 68 .

IV. RESULT

A. Proposed System Design

The "SWIFT" HRIS system consists of two main components: an employee portal for accessing personal information, submitting leave requests, viewing attendance records, and accessing personnel documents; and an admin/HR portal for managing employee data, verifying requests, monitoring attendance, and generating reports.

a) The Empathize Stage

Interviews were conducted with three user groups to identify their respective needs and pain points. The results are summarized in a table to facilitate understanding and analysis, as shown in Table 1 below:

TABLE 1. STAGES OF THE AGILE METHOD

Actor/Informant	Methods and Timing	Key Points of the Statement
1 HR Staff Member	Interviews & Observations	Manual attendance tracking is prone to calculation errors, payroll is completed on Day 5, pay stubs are often sent twice.
1 General Manager	In-Depth Interview	It's difficult to monitor the team's workload during unexpected leave, a system is needed that syncs with the project timeline.
3 Employees	Interviews & Observations	No transparency regarding remaining vacation days, pay stubs are hard to find in email, reimbursement claims are delayed because physical receipts are often lost.

b) Define Phase

Analysis of the data shows that employees are not yet able to independently track the status of their requests or directly access leave and payroll information. In addition, HR administrative processes are still handled manually, there is no integrated attendance tracking

system, the General Manager does not have direct access to request and attendance data, and communication between parties is still scattered across chat and email, meaning that the flow of information is not centralized.

1) Design of Interactions Among Actors

The four main roles (HR, Employee, General Manager, and Admin) have different roles and access rights, as illustrated in the Use Case Diagram below. Activities include the login process, leave requests, attendance checks, and leave approvals.

2) System Flowchart Design and Development

The Ideate phase produced an HRIS system concept with the following key features: attendance management, leave requests and approvals, reimbursement processing, and employee data management. Development using the Agile methodology is divided into 4 iterations (estimated at 55 working days):

1. Iteration 1: Authentication, Home Page, and Employee Profiles
2. Iteration 1: Authentication, Home Page, and Employee Profiles
3. Iteration 3: Employee Management and HR Operations
4. Iteration 4: General Manager Approval, System Configuration, Deployment, and Testing

B. Employee System Design and Implementation

Here is a screenshot of the main interface of the SWIFT system that has been implemented for employees:

1) Login

Users are directed to the SWIFT login page to authenticate using the credentials (username and password) provided by HR. The system then verifies this information, and if it is valid, the user is successfully logged into the system. This login process is shown in Figure 3.

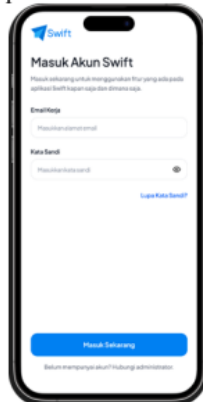


Figure 3. Employee Login Page

2) Dashboard

The employee dashboard displays an attendance summary, navigation to key features, and real-time notifications regarding approvals and pay stubs, serving as a quick information hub. The interface is shown in Figure 4.

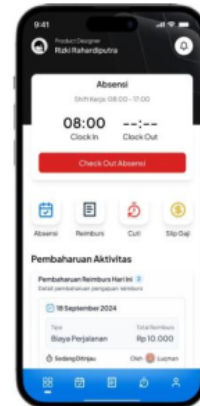


Figure 4. Employee Dashboard Page

3) Attendance

This system features an integrated attendance tracking system with real-time geolocation validation and selfie verification as proof of employee attendance. This mechanism is implemented to prevent manipulation of work hours, thereby ensuring more accurate HR data. The interface is shown in Figure 5.

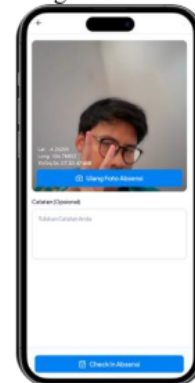


Figure 5. Employee Attendance Page

4) Leave Requests & Reimbursements

Administrative processes that were previously manual have now been digitized on a single centralized platform, allowing users to fill out forms and track the status of their requests in real time. The transparent leave quota page gives employees independent access, while the reimbursement request feature which allows users to upload digital receipts prevents the loss of physical documentation and speeds up the verification of operational cash flow. The interface is shown in Figure 6 and Figure 7.



Figure 6. Employee Leave Request Page

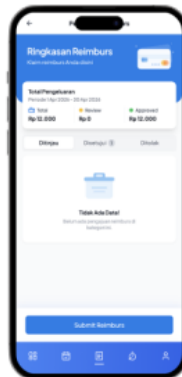


Figure 7. Employee Reimbursement Request Page

5) Payroll

The system provides a digital archive of pay stubs, replacing manual distribution via email, so employees can track their compensation history on their own. This helps eliminate the risk of critical document misdelivery via email while reducing the HR department's monthly administrative workload. The display is shown in Figure 8.

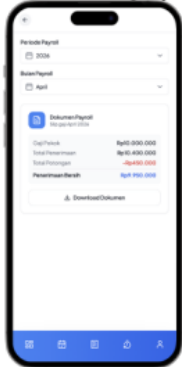


Figure 8. Employee Payroll Page

6) Attendance Report

The Employee Attendance Report is a feature accessible to HR and Admin staff that allows them to view a summary of employee attendance data, including name, date, clock-in time, clock-out time, and total working hours, for the purposes of monitoring and managing attendance.



Figure 9. Attendance Report Page

C. System Testing

The testing was conducted using 22 black-box test cases covering all major features, and the results showed that all functions worked as intended. Table 2, contains details of the test scenarios and the results of each test case to illustrate the system's functional compliance.

1) Black Box Testing

TABLE 2. BLACK BOX TESTING

No	Test Case Name	Step Details	Expected Result	Actual Result
1.	Valid Login	1. Go to the login page 2. Enter a valid email address and password 3. Click Login	The system directs users to the dashboard based on their role	As Expected
...	...	...	...	...
22	Reject Leave Request	1. Go to Other Features 2. Select the Manage Leave menu 3. Select the leave request under the "Pending Review" tab 4. View details 5. Reject the request	The leave status changes to "Rejected" and the employee's remaining leave balance remains unchanged	As Expected

2) User Acceptance Test (UAT)

A User Acceptance Test (UAT) was conducted to determine the level of user acceptance of the system developed based on end-user requirements. Table 3 presents the test results from the users, while Table 4 provides a summary of the UAT results based on evaluation criteria.

TABLE 3. USER ACCEPTANCE TEST (UAT)

	R1	R2	R3	R4	R5	R6	R7	Total	Maximum Score	Percentage (%)
Q1	5	4	4	4	4	5	4	30	35	85%
Q2	4	4	4	5	5	5	4	31	35	88%
Q3	4	4	3	4	4	5	3	27	35	77%
Q4	5	4	3	4	4	5	4	29	35	82%
Q5	5	4	4	4	5	5	4	31	35	88%
Q6	5	4	3	4	5	5	4	30	35	85%
Q7	5	4	5	4	4	5	4	31	35	88%
Q8	5	4	4	5	5	5	5	33	35	94%
Q9	5	4	5	5	5	5	4	33	35	94%
Q10	5	4	4	5	5	5	5	33	35	94%
Q11	5	4	5	5	5	5	5	34	35	97%

Q12	5	4	3	4	4	5	5	30	35	85%
Q13	5	4	5	5	5	5	5	34	35	97%
Total	63	52	52	58	60	65	56	406	455	
Score	96.9 ^a	80.0 ^a	80.0 ^a	89.2 ^a	92.3 ^a	100.0 ^a	86.1 ^a			88.7%

Based on Table 3 above:

1. Maximum Score = Number of Questions × Highest Score × Number of Respondents = $13 \times 5 \times 1 = 65$
2. Percentage (%) = Total Score / Maximum Score × 100% = $406/455 \times 100 = 88.7\%$

UAT Score Interpretation Criteria:

81% – 100% = Excellent (system is very well accepted)

61% – 80% = Good (system is well accepted)

41% – 60% = Fair (the system needs improvement)

≤ 40% = Poor (the system needs significant overhaul)

TABLE 4. SUMMARY OF UAT RESULTS BY ASPEK

Rekapitulasi Hasil UAT per Aspek				
No	Testing Aspect	Total Score	Maximum Score	Percentage (%)
1	System Functionality	117	140	83.5%
2	System Performance	92	105	87.6%
3	User Interface & Usability	133	140	95.0%
4	Efficiency & Productivity	64	70	91.4%
Grand Total		410	455	89.2%
Admission Category		Excellent		

System development using the Agile Development approach has successfully improved operational efficiency significantly and resulted in a high level of user acceptance. HR administrative processes that previously took up to H+5 can now be completed in real time. The Agile approach also enabled the team to adapt and overcome technical challenges related to GPS geotagging accuracy through optimization in each iteration. This success was supported by a User Acceptance Testing (UAT) result of 90.1%, indicating a “Very Good” acceptance rating.

3) System Usability Scale (SUS)

The results of the System Usability Scale (SUS) test are presented in Table 5 below:

TABLE 5. SUMMARY OF THE SUS QUESTIONNAIRE

	R1	R2	R3	R4	R5	R6	R7	Average SUS Score
Q1	5	5	4	5	5	5	5	
Q2	2	1	4	5	2	1	1	
Q3	4	5	4	5	5	5	5	
Q4	2	1	4	4	1	1	1	
Q5	4	5	4	3	5	5	5	
Q6	2	1	4	2	2	2	1	
Q7	4	5	4	5	4	5	5	
Q8	2	1	4	1	1	1	1	

Q9	4	5	4	4	4	5	5	
Q10	2	1	4	2	1	1	1	
SUS Score	77.5	100	50	70	90	97.5	100	83.57
Grade	C	A	F	C	A	A	A	B (Good)

The SUS score is calculated using the following formula:

1. Odd-numbered items (Q1, Q3, Q5, Q7, Q9): contribution = response value – 1
2. Even-numbered statements (Q2, Q4, Q6, Q8, Q10): contribution = 5 – response value
3. US score = Σ contribution of all items × 2.5 (range 0–100)
4. The system is categorized as usable if the SUS score is ≥ 68

SUS Grade Criteria:

A (90–100) = Excellent

B (80–89) = Good

C (70–79) = Okay

D (60–69) = Poor

F (< 60) = Awful

The application of the Design Thinking method has proven to be successful and effective in designing the user interface (UI/UX) of the “SWIFT” application to meet user expectations. Through a user-centered approach, all of the informants’ actual pain points were successfully transformed into intuitive features. The success of this method was scientifically validated through System Usability Scale (SUS) testing, which yielded an average score of 83.57 (Grade B – Good), confirming that the system has a high level of usability and low friction for employees.

D. Discussion

The implementation of the “SWIFT” HRIS system was very well received by users thanks to the success of the Design Thinking approach, which focused on deep empathy from the outset, enabling the team to identify actual pain points and translate them into an intuitive interface that met employee expectations. This was evidenced by a UAT score of 90.1% (Very Good) and a SUS score of 83.57 (Grade B).

This high level of acceptance was also supported by the Agile Development approach, which greatly helped the development team remain adaptive and responsive in mitigating technical challenges in the field such as the occasional lack of precision in indoor GPS geotagging coordinates by optimizing fallback algorithms during the ongoing iteration cycle without disrupting the project timeline.

The synergy between these two methods has proven crucial in delivering reliable digital solutions to instantly resolve operational issues based on the PIECES framework, ranging from payroll document automation and transparent leave tracking to the secure archiving of monthly pay stubs at CV Solusi Teknologi Kreatif.

V. Conclusion

This study successfully addressed all research questions empirically through the application of Design Thinking and Agile Development, resulting in the “SWIFT” HRIS system with a high level of usability (SUS

score of 83.57 / Grade B) and excellent operational acceptance (UAT score of 89.2%), while also providing a scientific contribution in the form of a case study guide on the digitization of conventional administrative processes for digital agencies or small-scale SMEs.

However, this study has limitations, including a small sample size of employees, a scope of features limited to only four core administrative modules (attendance, leave, reimbursement, and payroll), and the technical dependence of geotagging validation accuracy on fluctuations in the GPS signal strength of devices indoors.

For future development, we recommend adding interface customization features (dark/light mode), a performance evaluation module (KPIs), expansion to mobile platforms (Android/iOS), as well as structured outreach and training programs.

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Availability of Data and Materials. Our research data is publicly available and can be accessed via the following link: <https://doi.org/10.5281/zenodo.20566752>

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