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# HRIS Development Using Extreme Programming Approach to Increase Competitiveness in Society 5.0

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**Abstract:** The increasing use of information technology since the Industrial Revolution 4.0 has encouraged Human Resources (HR) to adapt to progress. The Society 5.0 era emerged as an anticipation of the issue of disruption due to the Industrial Revolution 4.0 which will degrade human resources. The large amount of HR information that must be managed gives rise to new problems, namely sloppy data management, difficulty accessing employee data, difficulty finding salary slips, and employee attendance not being fully recorded, causing HR to be unable to contribute properly to the industry. Based on the background of these problems, a desktop application-based information system is needed to manage human resources. The Human Resource Information System (HRIS) makes it easier for HR to utilize information technology which includes five main processes, namely attendance, salaries, bonuses, holiday allowances, and reporting. The urgency of this research is to implement HRIS in human resources for the goods transportation services industry so that it can minimize gaps in people and the use of technology. This research aims to develop HRIS in the goods transportation services industry to help human resource management. The HRIS development method used is extreme programming with five stages, namely planning business needs, design, coding, testing, and implementation. The result of this research is the implementation of HRIS in the goods transportation services industry to manage attendance, payroll, and reporting. In this way, technology will coexist with human resources to sustainably improve the quality of life in the goods transportation services industry.

**Keywords:** Human Resource Information System, Extreme Programming, Society 5.0, Industrial Revolution 4.0

## Introduction

Digital transformation shows a rapid evolutionary process in information and communication technology. The existence of science and technology is currently important in the modern era (Felicia *et al*., 2024). Many industries face problems in making decisions in this digital era (Khan *et al*., 2023). Currently, industry in Indonesia is facing the era of Industrial Revolution 4.0 which opens up new avenues for the use of information technology (Wolor *et al*., 2020). Civilization in the increasingly advanced world also increases technological development. The industry needs a system that can have an impact on all lives, especially in providing information and processing data quickly and precisely (Savithi and Suttidee, 2024). Therefore, industry needs to think about how to make a more advanced society coexist with technology. In anticipation of the disruption of the Industrial Revolution 4.0 which has the potential to reduce the role of humans, a new concept of "society 5.0" has emerged (Islam *et al*., 2020). The society 5.0 concept is a development of the Industrial Revolution 4.0 and is built on the basis of human-centered which coexists with technology to help daily processes (Gladden, 2019).

The society 5.0 era means that society is faced with a life accompanied by technological sophistication (Pereira *et al*., 2020). However, Human Resources (HR) competencies in the industry currently do not meet the appropriate

requirements to coexist with technology. Failure to fulfill HR competencies in industry occurs especially in the field of transportation services. Good HR management can certainly contribute to improving industrial performance (Anwar and Abdullah, 2021). The large amount of information that must be managed regarding HR gives rise to problems with a high level of complexity (Tambe *et al*., 2019). Data management is not neat, it is difficult to access employee data, and it is difficult to find pay slips, causing HR to be unable to contribute properly. Apart from experiencing problems with data completeness, the goods transportation services industry experiences problems with employee attendance not being fully recorded due to manual data collection and chaos in performance appraisals which cause errors in awarding bonuses. Problems that arise will be difficult to resolve using traditional processes.

After the COVID-19 pandemic in Indonesia, the industry has once again improved the management of human resource productivity with the help of information technology. Therefore, the industry needs to improve HR competency with information technology that produces the latest management solutions, namely the Human Resource Information System (HRIS). HRIS is a system for collecting, storing, and analyzing data related to people in a resource organization. HRIS support is able to meet superior human resource quality standards because it connects with the industry directly. The features available on HRIS include attendance, payroll, and reporting. Therefore, it is important to develop HRIS in the goods transportation services industry so that the conventional human resource processing process changes to become digitalized. To adapt to technological advances, there are several challenges faced by human resources. These challenges include limited skills and technological knowledge to manage sophisticated HRIS. Therefore, users require additional training to understand and use the HRIS platform effectively.

Based on the background of these problems, the goods transportation services industry requires a desktop application-based information system, namely the Human Resource Information System (HRIS). This research aims to develop HRIS in the goods transportation services industry to optimize human resources in the era of digitalization or society 5.0. The problems in the current research era that we want to overcome are related to employee data management not being updated in real-time, complicated payroll processes, and timely reporting. HRIS offers technological assistance in improving the quality of human resources using applications for the society 5.0 era. HRIS includes managing employee data, payroll, bonuses, holiday allowances, attendance, and producing statistical reports. Personnel data that has been collected in HRIS is able to provide conformity in salary calculations, accuracy of performance assessments, and real-time monthly reporting. HRIS implementation will use the help of the Extreme Programming (XP) method, divided into several stages, namely planning, design, coding, testing, and implementation. In the rapidly changing era of Society 5.0, changes in business needs or organizational policies can become commonplace. XP offers great flexibility in accommodating these changes quickly and efficiently so that HRIS can always be relevant and responsive to evolving needs. Unlike conventional approaches in HRIS development, this research adopts XP to ensure higher user satisfaction, and faster response to changes and is relevant to the needs of industrial users in the current era.

## Materials and Methods

### *Human Resources Information System (HRIS*)

The Human Resource Information System or HRIS is used to process and distribute information related to human resources in an organization (Hmoud and Varallyai, 2020). HRIS is a concept of managing human resource management functions and applications (Andry *et al*., 2021). The implementation of HRIS will create standardization of service processes, so can provide more accurate information services for employees. HRIS can include HR management, payroll, career planning and development, performance management, personal data, and much more (Madyatmadja *et al*., 2020). The use of HRIS can provide a competitive advantage for organizations in producing the required business data and reports.

### *Extreme Programming*

Extreme Programming, better known by the abbreviation XP is an agile software development method. XP has a short development cycle, so it is very responsive to changing user desires (Alsari *et al*., 2020). The XP stages are divided into 5, namely planning, design, coding, testing, and implementation (software increment) (Sudarsono *et al*., 2020).

### *Society 5.0 in Industrial Revolution 4.0*

Society 5.0 aims to create a more sustainable and inclusive society by utilizing advanced technology (Fukuda, 2020). Industry 4.0 and Society 5.0 are closely related. Industrial Revolution 4.0 provides a strong technological basis for creating innovative human resources (Dhanpat *et al*., 2020). Therefore, the era of Industrial Revolution 4.0, provides an important technological foundation for realizing the vision, while Society 5.0 describes the transformation of society through the use of technology.

### *Research Stages*

Based on Fig. 1, a design plan for creating an HRIS is carried out using extreme programming starting from:

1. Literature study: The initial stage begins with collecting library data from several books, research journals, written materials, and references relevant to the research as data processing material. The scope of this research focuses on the implementation of HRIS to overcome human resource problems in the society 5.0 era.
2. Data collection: Conduct interviews and observations. The interview process involves conducting direct questions and answers between the researcher and the resource person. Researchers have prepared what information they want to extract from the sources by making a list of questions related to current industrial business constraints and processes. There were five sources interviewed, consisting of the owner, manager, and three employees. Next, observation aims to understand the process that occurs during the interview, including observation of the subject, the subject's behavior during the interview, and the subject's interaction with the current business process, so that it can provide additional data on the results of the interview (Fatimah *et al*., 2020). Observations were carried out by direct observation from the location of the car transport service industry in terms of the business process of delivering goods to consumers
3. Business planning: The initial stages of system development aim to understand the business concept, collect system requirements, and describe the required output including features and functionality to be built (Sohaib *et al*., 2019). The planning stage begins with writing a user story (Akhtar *et al*., 2022)
4. Application design: Data obtained from the business requirements planning stage is used to design system modeling, architecture, and databases. Design planning is divided into three processes, namely creating Class, Responsibilities, and Collaboration (CRC) cards, wireframes, and databases (Zarwono and Hidayanto, 2020). In addition, Unified Modeling Language (UML) diagrams were drawn. Making wireframes aims to organize items related to text, images, and layout (Le, 2022). The aim of creating a database is to get an overview of the fields that will be used as application data storage
5. Application coding: This stage is an activity of applying modeling that has been created into a user interface using a programming language.
6. Application testing: Find out what errors arise when the HRIS application is running and find out whether the system being built meets the user's needs. The testing method used at this stage is the black box, where testing is carried out on whether the form is running according to its respective function (Martino and Andry, 2020). This test is carried out by the customer and focuses on the overall features and functionality of the system (acceptance test) (Ivgantius and Andry, 2019)

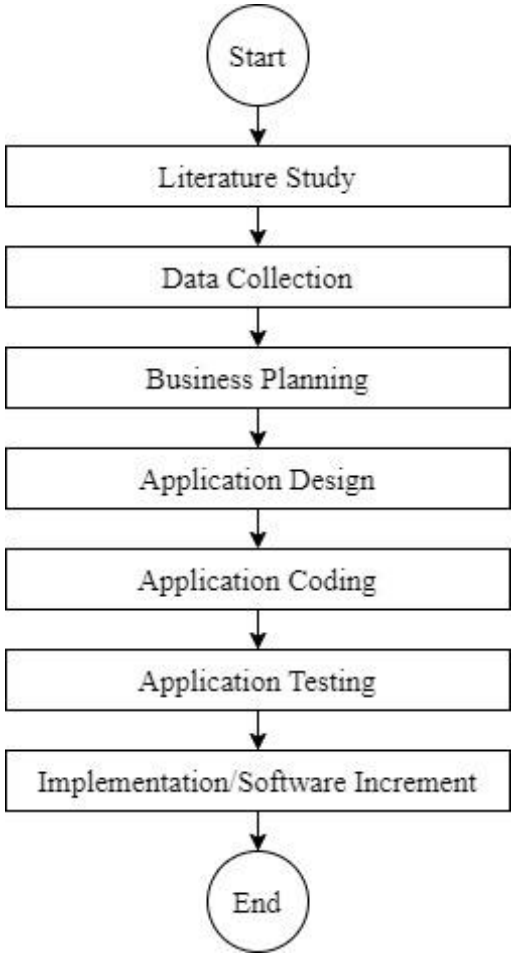


**Fig. 1:** Research stages (Pasaribu and Wahyudi, 2022)

7. Application implementation: System development in the form of ready-made applications for user use. The HRIS applications that have been created can be used in various industrial fields.

## Results

### *Business Planning*

The planning stage begins with writing a user story to describe the various needs of users of the goods transportation services industry. An example of a user story card is shown in Table (1).

Table (1) shows an example of a user story card to explore system user needs. Based on the results of needs planning, the goods transportation services industry needs a system that can overcome the following problems. The problems are system user access rights, the addition of new digitized, and delays in making reports. Employee data, which is currently not centralized, salary calculation errors, employee absenteeism that is not.

**Table 1:** User story

| Title | Description | Acceptance criteria |
|---|---|---|
| Access rights | As SuperAdmin, I need a user data menu to manage user access | The user data menu includes the following fields: username, passwords, options (pre-take, loan, attendance, salary, report, utilities, repair, user)<br>The User Data menu displays the buttons: New (adds new user data), edit (change user data), save (save data), delete data, next (view the next user's data), prev (view previous user data) |
| Employee data | As SuperAdmin, I want to add employee data to the add employee menu | When the user clicks on the add employee menu, the system displays a form that include the following fields: identity number, employee name, active period, department (combo box), date of entry, food, allowance (checklist), daily month (combo box)<br>The Add Employee menu displays the buttons: new (add new Employee data), record (save Employee data), edit (change employee data) |

### *Application Design*

Data obtained from the planning stage is used for Responsibility Collaboration design modeling, which is divided into three processes, users namely:

1. Creation of Class, Responsibilities, and Collaboration (CRC) cards. Table (2) shows the CRC card from user data with several responsibilities for using HRIS. Making the CRC card aims to collect ideas for designing the HRIS design (Arisantoso *et al*., 2022). Digitized and delayed in making reports. Next, a Unified Modeling Language (UML) by create Use Case Diagram in Fig. (2)
2. Creation of Wireframes. The aim is to organize an item on an application page and determine the features that need to be included. An example of a wireframe is shown in Fig. (3)
3. Database creation. An example of a salary master master section. The components described in creating this database are shown in Table (3)

### *Application Testing*

After coding the HRIS application, the development process continues with system testing. The testing Table (3) shows the database or storage of the salary master section. The components described in creating this database are the attribute name, data type used, and length/limit value of each attribute. After creating the CRC Card, wireframe, and database, the HRIS development process continues at the application coding stage.

### *Application Coding*

This stage is an activity of applying modeling that has been created into a user interface using a programming language. The programming language used is Microsoft Visual with a structured method. In this section, a prototype example of salary data management by administrators is shown in Fig. (4). Figure (4) shows the actual results of HRIS implementation. The method used is black box testing. Table (4) shows the test scenario in the salary data menu. Testing was carried out after coding the HRIS application, the development of the functionality in the menu which focused on adding, process continues towards system testing. The testing changes and deleting data.

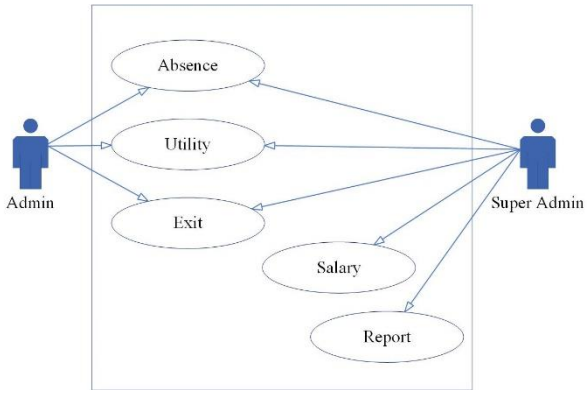


**Fig. 2:** Use case diagram of HRIS

**Table 2:** Example CRC card of user data

| Class Name: User data | |
|---|---|
| Responsibility | Collaboration |
| Username | |
| User code | |
| Take | |
| Borrow | • Create |
| Roll call | • Update |
| Wages | • Delete |
| Report | • View |
| Utilities | |
| Index | |
| User | |

**Table3:** Salary master database

| Attribute name | Data type | Length |
|---|---|---|
| Id_number | Character | 5 |
| Employee_name | Character | 30 |
| Active_month | Character | 6 |
| Month_salary | Numeric | 12 |
| Daily_salary | Numeric | 12 |
| Weekly_incentive | Numeric | 12 |
| Bonus_month | Numeric | 12 |
| Meal_allowance | Numeric | 12 |

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### *Implementation/Software Increment*

This stage is the stage of system development that has been created in stages and is carried out after the system is implemented in industry by adding services which result in increasing the functional capabilities of the system. However, this research focuses on implementing HRIS based on a previously created prototype.

The menus developed are divided into:

1. Absence: Assist with attendance data collection
2. Salary: Help calculate overtime, bonuses, meal allowances, basic salary and others
3. Report: Generate salary and attendance reports
4. Utilities: Helps retrieve attendance data, update settings, and manage user data

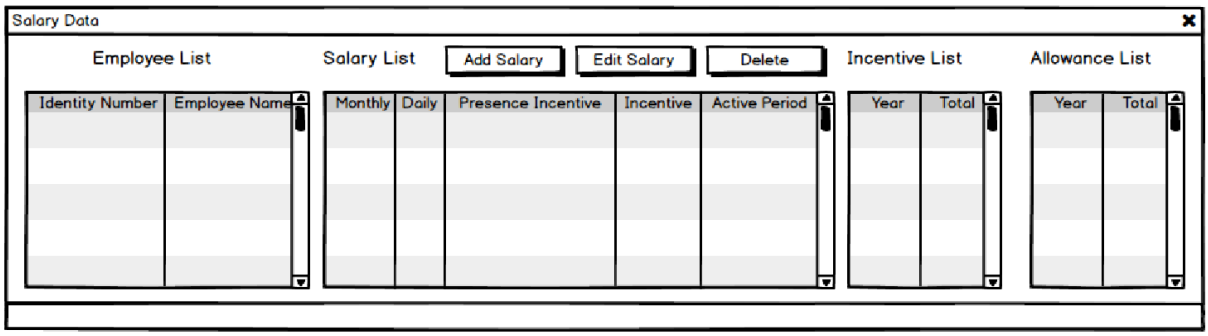


**Fig. 3:** Example wireframe of salary data

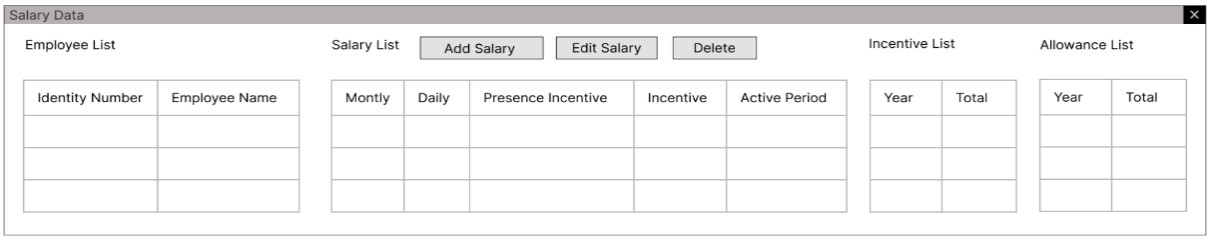


**Fig. 4:** Salary data prototype

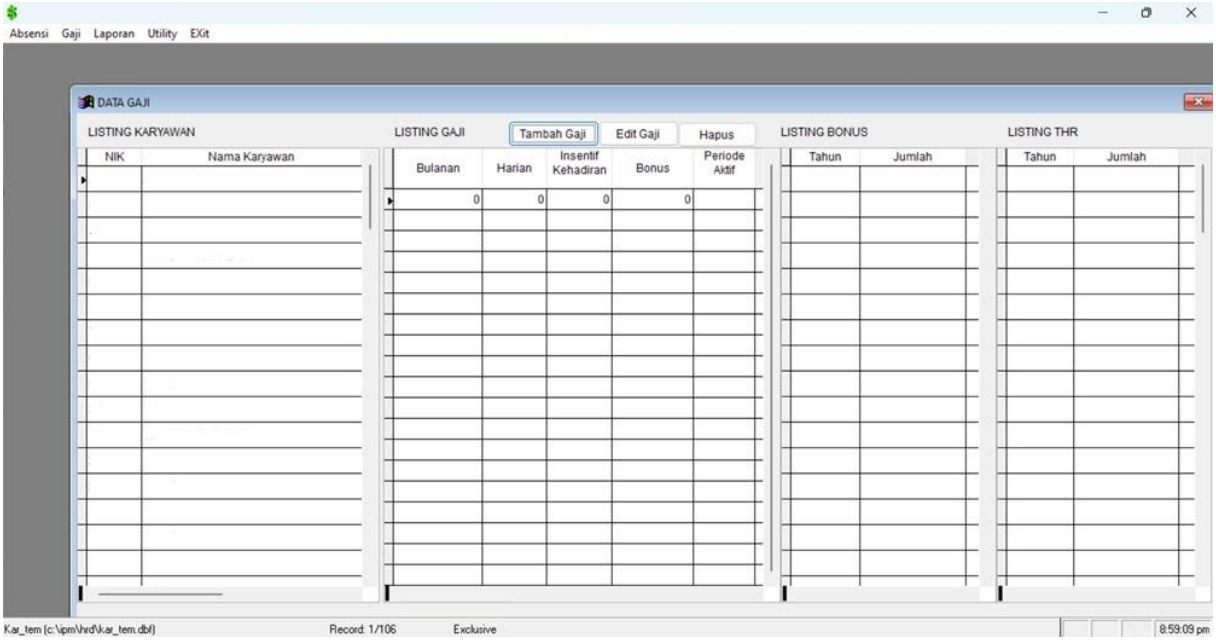


**Fig. 5:** Example of HRIS implementation

**Table 4:** Testing scenarios on salary data

| Test case | Pre-condition | Test steps | Expected results | Actual result |
|---|---|---|---|---|
| Add salary button | The user opens the salary data menu and has not been selected employee data | Click the "add salary" button<br>Select an employee from the list<br>The system displays salary bonuses and holiday allowance data from selected employees, but cannot make changes<br>If appropriate, the salary payment process can be carried out | Display employee data along with salary calculations correctly | Successfully selected employee data and display the calculation details correctly |
| Edit salary button | The user opens the salary data menu and has not been selected employee data | Click "edit salary" button<br>Select an employee from the list<br>The system displays the salary and bonus, and holiday allowance data from the selected employees.<br>Administrators can make data changes<br>Salary calculations are done automatically by the system | The salary form fields is open and can be changed the administrator by the administrator | Successfully opened the fields on the salary form and can be changed by the administrator |
| Delete button | The user opens the salary data menu and has not selected employee data | Select an employee from the list<br>Click the “delete” button<br>The system displays a data delete confirmation pop-up | Displays a pop-up message confirming deletion | Successfully displays the delete data confirmation pop-up |

After implementing HRIS in Fig. (5), it can be concluded that the way HRIS is implemented is divided into 3 aspects, namely:

1. Attendance management
    - Record employee attendance data based on a connected attendance system. This can reduce human error and increase data accuracy.
    - Monitor employee attendance and provide notifications or reports about unexpected delays or absences.
    - Make it easy to apply for and manage employee leave.
2. Payroll
    - Calculate employee salaries automatically based on attendance data, number of hs worked, and other information. This reduces the risk of calculation errors.
    - Manage various salary components, including allowances, bonuses, and deductions. This ensures transparency in the payroll.
    - Maintain salary history for each employee.
3. Reporting
    - Generate employee attendance and absence reports automatically, assisting management in monitoring absenteeism patterns and identifying trends.
    - Create detailed payroll reports, including details of salary components, deductions, and taxes.

## Discussion

Humans can utilize digital technology to achieve significant progress in various aspects of life. Society 5.0 integrates digital technology into the daily life of human resources. Previous research entitled “Role of Human Resources Information System (HRIS) in Accelerating Organizational Effectiveness–It Companies Perspective” stated that HRIS is utilized in software companies, namely recruitment and determination, training and development, and payroll (Anupa, 2021). Then, in the previous study entitled "global experience on navigating digital transformation in human resource development towards maritime society 5.0 in the maritime sector status, challenges and strategies" focused on the development and implementation of human resource processes characterized by strategic intelligence and innovation (Autsadee, *et al*., 2024). Therefore, HRIS development is needed to facilitate human resource management in the goods transportation services industry. The HRIS development process uses the help of the extreme programming method, which is divided into 5 stages. The initial stage starts with planning business needs, which maps user stories and problems experienced by the industry. These problems are related to system user access rights, new employee data is not centralized, salary calculation errors, employee absences are not digitized, and delays in making reports. Next, development continues to the design stage.

The second stage focuses on application design, which is divided into CRC card, wireframe, and database design. CRC cards handle interactions/relationships between classes. Making CRC cards focuses on absence classes, user data, salary slips, salary recaps, and reports. The next stage is coding, which produces several menus/modules in prototype form. These menus include fetching user data, attendance, utilities, salary, reports, and exit. Next, testing was carried out on HRIS. Application testing focuses on the functionality of the buttons used to observe the input and output results from the HRIS. Based on the test results using the black box testing method, it was concluded that HRIS was running as expected. All features and functions of each menu in the HRIS application run well and are in accordance with the design objectives.

The final stage is implementing HRIS. In addition, the implementation/software increment stage focuses on improving system functionality. In this research, the

implementation stage only focuses on developing basic modules to form a Minimum Viable Product (MVP) and establishing HRIS infrastructure in terms of technology and business operations. Implementing HRIS can help the goods transportation services industry implements full digitalization in human resources functions. HRIS can help achieve this by automating routine tasks and efficient data management. The application of HRIS in attendance management, payroll, and reporting can provide great benefits for the goods transportation services industry.

## Conclusion

Implementing HRIS in the Society 5.0 era can provide significant benefits in managing human resources and adapting to environmental changes driven by technology. HRIS development can automate routine tasks, such as attendance management, payroll, and reporting. This can increase employee productivity and the efficiency of human resource management processes. Society 5.0 principles emphasize data security and privacy. Therefore, HRIS facilitates users with user data features so that not just anyone can access the system. Additionally, HRIS enables automation of traditional HR processes, increasing productivity and strengthening employee engagement. This research produces HRIS applications that can be used in various industrial fields, not only limited to the goods transportation services industry. With a focus on skills management and human resource development, HRIS supports the Society 5.0 vision which integrates smart technology to improve human welfare. The HRIS application can help improve human resources utilizing technological assistance. By tracking absences, payroll and providing in-depth analytics, HRIS helps organizations adapt to the flexibility and mobility needs of the future work environment. Research on HRIS development in the society 5.0 era using the XP approach has significant implications for industrial digital transformation. By utilizing XP, you can produce an HRIS system that is more responsive to user needs and rapid market changes. Future research could develop a predictive analysis for employee performance to support the integration of more sophisticated technology. This research has limitations in that HRIS adoption is often met with resistance from employees who are used to manual processes or old systems. This resistance can hinder the effective implementation and use of HRIS. Therefore, industrial employees need to be given training in using the HRIS application so that they are familiar with using the technology.

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## Author's Contributions

**Glisina Dwinoor Rembulan:** Defining the research concept, collecting related literature, interpreting the results, and preparing the manuscript.

**Evaristus Didik Madyatmadja:** Developing user requirements, analysis, implementation, and interpretation of results.

**Johanes Fernandes Andry:** Formulating problems, collecting data, and interpreting results.

**Lydia Liliana:** Development of HRIS applications, analysis, implementation, interpretation of results, and preparation of manuscripts.

**Lili Tresha:** Developing user requirements, data collection, analysis, implementation, interpretation of results, and preparation of manuscripts.

## Ethics

This article is original and unpublished. Corresponding authors confirm that all other authors have read and agree that the manuscript does not involve ethical issues.

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