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Development of Employee Payroll System using Rational Unified Process (RUP) on Odoo Platform

Fauzi Imaduddin Adhim[1], Raisya Fiany Martin[2], Slamet Budiprayitno[3], Lucky Putri Rahayu[4]

[1,2,3,4]*Department of Electrical Automation Engineering, Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia*
Kampus ITS, Sukolilo, Surabaya, 60111

[1*]fauzi@eea.its.ac.id, [2]raisyafiany@gmail.com, [3]slamet@elect-eng.its.ac.id, [4]lucky@eea.its.ac.id

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Abstract

Payroll process mostly done manually in Indonesian companies. Manual process takes longer time than automated process. In this research, an employee payroll system was developed on the Odoo platform by implementing the Rational Unified Process (RUP) method. There are four phases in this method, the inception phase includes business process modeling activities both ongoing business processes (as-is) and proposed business processes (to-be). Then from the business process needs analysis is carried out. The elaboration phase includes system design activities using use case diagrams, activity diagrams, configuration, use case scenarios, and salary rules. The construction phase includes implementation activities based on the system design in the previous phase. The results of the implementation will then be evaluated at the testing stage. In the final phase, namely the transition, the deployment or installation process is carried out to the user. The results obtained after testing the system by comparing salary calculations on Microsoft Excel and Odoo show that the total salaries of employees received are similar. The time needed to calculate an employee in Microsoft Excel is 15 minutes, while in Odoo the time needed is 6 minutes faster. In the User Acceptance Testing (UAT) test, the respondents involved were a limited circle of various departments at a sample company totaled 11 people by giving 12 statements from 3 UAT test criteria and obtained a final score of 86.97%. From the final score, the respondents accepted the developed system well.

I. INTRODUCTION

The payroll system is tasked with recording and processing the data used to pay employees for the services they provide [1]. In other words, payroll provides compensation to employees/employees in the form of salary by returning financially to them as their contribution to the organization/agency. Salary can also be used as an evaluation of employee performance so that it can increase their enthusiasm and motivation at work. Given the important role of the payroll system, the system must be well designed so

[1*] Corresponding author

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that it can provide adequate services for employees and can help provide information support for management in making decisions, which can be in the form of quality information presented in the form of reports [1]. Examples of problems that are often encountered in the payroll system are calculation errors or delays in payment of salaries. In addition, if the company wants to make updates in an integrated manner, it needs careful planning in using a payroll system that fits the needs of the company [2].

The payroll system of many companies in Indonesia is still done manually, where attendance data is mostly inputted into and calculated in Excel. The manual process causes delays in the employee payroll process. Increasing business competition has pushed companies to be more competitive, companies are required to seek flexibility in terms of systems and efficiency in the company's business process flow applications. Sooner or later, if the company's business processes are increasingly complex, the need for integrated application programs will focus on open-source ERP [2]. Therefore, the author uses Odoo version 12.0 which is an open-source ERP software. In addition, Odoo can be downloaded and used for free and provides various modules that can be modified according to the company's business processes [3].

Based on the problems described, an employee payroll system was developed on the Odoo platform by implementing the Rational Unified Process (RUP) method. There are four phases in this method, the inception phase includes business process modeling activities both ongoing business processes (as-is) which takes longer, namely 15 minutes and proposed proposed business processes (to-be). Then the requirement analysis is carried out. The elaboration phase includes system design activities using use case diagrams, activity diagrams, configuration, use case scenarios, and salary rules. The construction phase includes implementation activities based on the system design in the previous phase. The results of the implementation will then be evaluated at the testing stage. In the final phase, namely the transition, the deployment or installation process is carried out to the user [4].

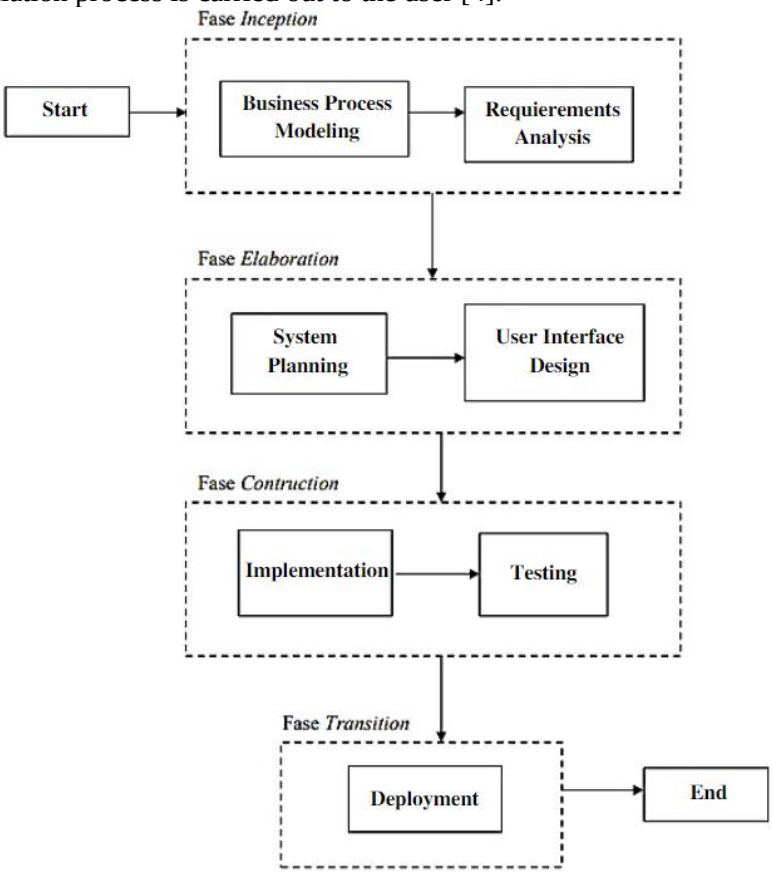

Figure 1. Block Diagram of RUP Method Implementation

II. METHODS

In this research, we implemented the Rational Unified Process (RUP) method in developing employee payroll systems. The process (Figure. 1) passes through the inception phase that includes business process modeling activities both ongoing business processes (as-is) and proposed proposed business processes (to-be). Then from the business process needs analysis is carried out. The elaboration phase includes system design activities using use case diagrams and use case scenarios. The construction phase includes implementation activities based on the system design in the previous phase. The results of the implementation will then be evaluated at the testing stage. In the final phase, namely the transition, the deployment or installation process is carried out to the user.

A. Inception Phase

In the first stage, this is done by modeling the required business processes (business modeling) and defining the requirements for the system created (requirements). Several steps were carried out, namely analyzing the system to be developed using business modeling and analyzing requirements by identifying the scope of the system project and describing user needs.

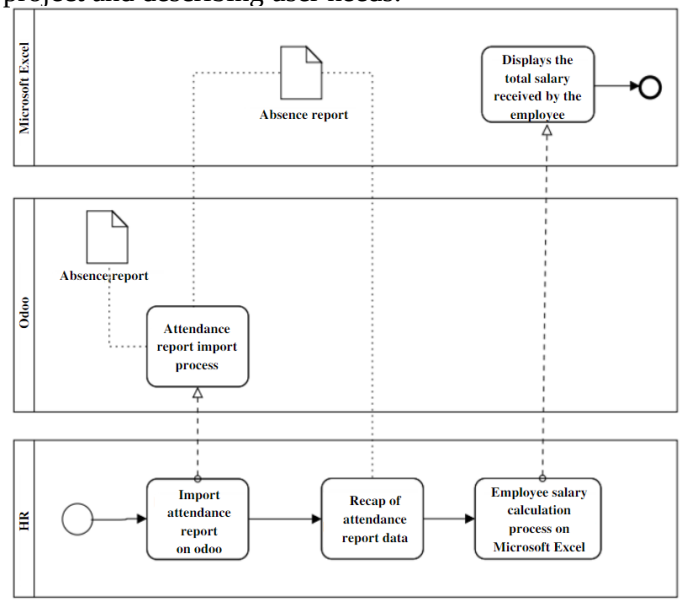

Figure 2. Business Process Modelling As-Is

The business process modeling is carried out to model a series of activities in the payroll system that are carried out to meet the needs of business users. Extracting information about the business process to be modeled in order to obtain the model as in Figure 2. This as-is business process is identified based on the state of the business process that is currently running. Analysis and modeling of as-is business processes is carried out in order to identify possible improvements or even enhancements to business processes.

In Figure 2, the business processes that are being carried out (as-is), namely the attendance report presented on the Odoo platform, is imported into a Microsoft Excel form by HRD [5]. Then a recap of employee attendance data is carried out, where HRD calculates the number of employee attendance and absence in one month which takes a long time [6]. From the data recap, the data is input into the calculation of employee salaries in Microsoft Excel. From a series of processes carried out by HRD, it takes an average of 15 minutes. so that the total average time of all employees 13 employees) takes 195 minutes [7].

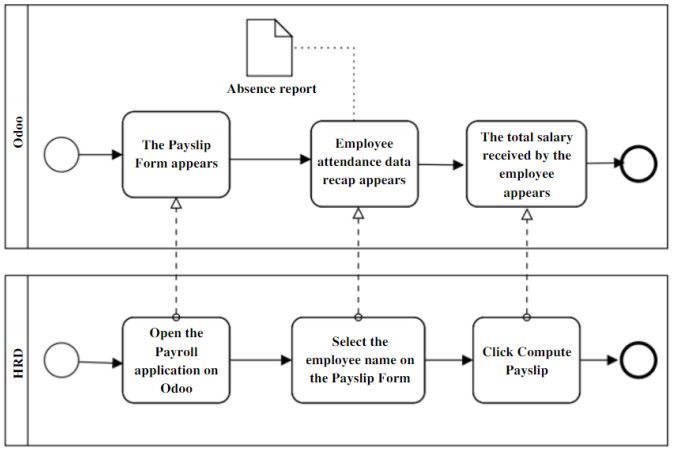

Figure 3. Business Process Modelling To-Be

The to-be business processes are identified based on the results of an analysis of the as-is business processes. To-be business process analysis is carried out by adding and deleting several activities in the payroll system. The to-be business process is modeled to reflect the proposed changes or additions.

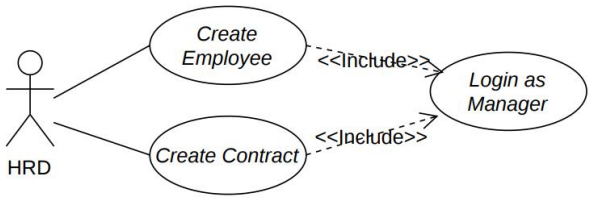

Figure 4. Use Case Diagram of Employee Data Management

The requirement analysis stage describes the analysis of the problem by identifying the types of users and stakeholders. So that it can produce system features which will later be developed into system requirements. This section describes the types of users and stakeholders associated with the system being developed as well as stakeholder representatives representing the types of stakeholders.

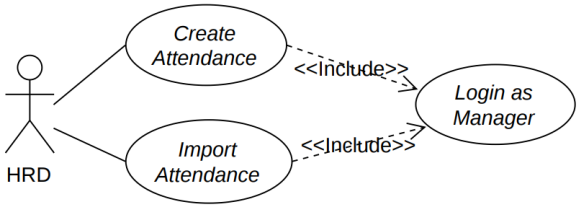

Figure 5. Use Case Diagram of Employee Attendance Data Management

Table 1 is a table of stakeholder types along with a description of the representatives of each stakeholder type. From the table, there are five stakeholder representatives for the user type, while the developer type has one stakeholder representative.

Table 1. Stakeholder Type

No.	Stakeholder type	Description	Stakeholder
1.	User	Person with direct role to use the system	HRD, CEO, *General Manager*, Employee
2.	Developer	Person with the responsibility to develop system	IT Team

At system requirement stage, every requirement of the entire system to be developed is described. The following are some of the system requirements required for the development of a payroll system :

1. The system can manage employee data.
2. The system can manage employee attendance data.
3. The system can manage employee absence data.
4. The system can manage employee payroll

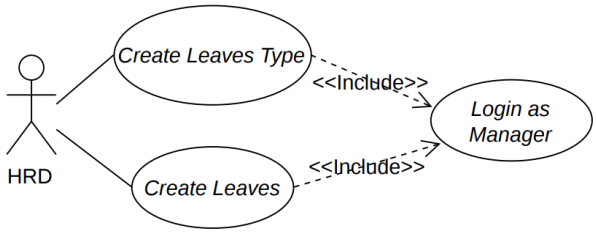

Figure 6. Use Case Diagram of Employee Absence Data

B. Elaboration Phase

In this second phase, the process of designing a system is carried out based on the results of the previous process, namely needs analysis. In addition to system design, interface design is also carried out. In system design defined use case diagrams, use case scenarios, and salary rules. Use cases are descriptions of interactions between actors and systems that are intended to meet user needs. Use cases also reflect the goals or goals of an actor when using the system [8]. Figure 4 describes HRD as an actor managing employee data while the use case in Figure 5 shows that HRD has the role to manipulate the attendance data, Figure 6 shows the role of HRD to manipulate the absence data of employee, and Figure 7 shows the action that HRD can take toward salary related data.

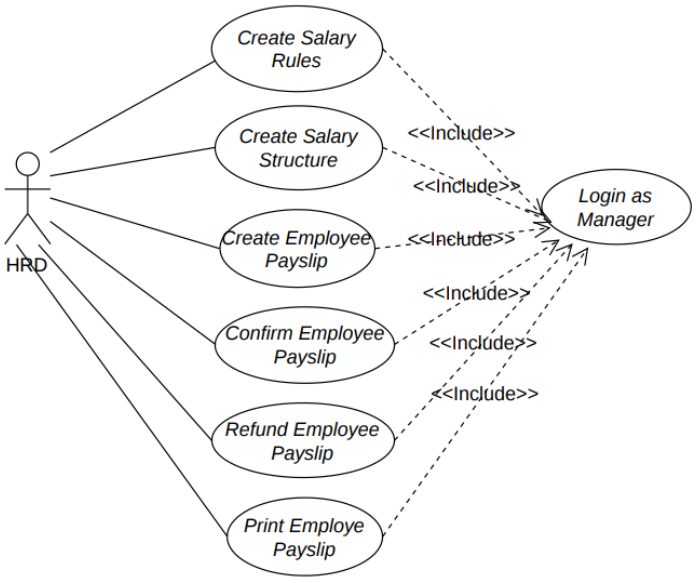

Figure 7. Use Case Diagram of Employee Payroll Data Management

C. Construction Phase

In this third process, the development of system components and features is carried out by means of implementation and testing of the system design that has been done before. Implementation is carried out based on the results of the design and suitability of the needs that have been carried out. The first

implementation is to identify the specifications of the implementation environment. The second implementation that is done is the implementation of the interface. The tests carried out are in the form of System Trials and User Acceptance Testing.

D. Transition Phase

In this last stage, the deployment or installation of the system is carried out so that it can be used and understood by users (users). The activity at this stage is the installation of the Addon module that has been created

III. RESULTS AND DISCUSSIONS

A. System Test

In this test, a simulation of the process of calculating employee salaries was carried out by comparing manual data in the form of Microsoft Excel. From the data in Microsoft Excel, the following cases were obtained: There were 13 employees at the company. Nur Ainy, is a permanent employee with a basic salary stated in the work contract of IDR 5,000,000. In April 2022 the attendance data is 22 active days, 1 day sick with a doctor's certificate, and 1 day of sickness without a doctor's certificate, so the total attendance is 20 days. So that manual calculations using Microsoft Excel are obtained as shown in Figure 8.

SALARY SLIP						Absence Records	
						Active Days	22
Employee Name	Nur Ainy					Sick (With Doctor's Note)	1
NIK	: 18120422009					Annual Leave	0
Position	: Excellence Sales Advisor					Long Sick	0
Department	: Sales & Marketing					Sick (Without Doctor's No	1
Class | Status	: 3C | PKWTT					National Holiday	0
Period	: April 2022					**Presence**	**20**
Acceptance			**Cuts**				
Basic Salary	Rp5.000.000,00		Late	24	Minutes	Rp4.046,24	
Positional Allowances	Rp1.000.000,00		Permission During Working Hours	0	Minutes	-	
Transportation Allowances	Rp390.000,00		1/2 day permission	0	Minutes	Rp4.046,24	
Meal Allowances	Rp360.000,00		Sick Without Doctor's Note	1	Days	Rp79.545,45	
Overtime			Attendance Adjust	0	Days		
Incentives			Loan	0	of 0	-	
Attendance Adjust			Income Tax				
THR	-		Other (National Holiday)	0		-	
Reception Total :	Rp6.750.000,00		Total Cuts :			Rp83.591,70	
	TAKE HOME PAY :		**Rp6.666.408,30**				
						Done by HR	

Figure 8. Salary Calculation using Microsoft Excel

After obtaining calculations using Microsoft Excel, testing was carried out on the Odoo platform with the same case. The variable of illness without a doctor's certificate (non SKD illness) affects the amount of deductions received by employees. Furthermore, the late work variable also affects the number of deductions received by employees in minutes. So the results of the Odoo calculations are as shown in Fig. 9.

SALARY SLIP

Salary Slip of Nur Ainy for April-2022

Slip Number	SLIP/002	**Employee Name**	Nur Ainy
Start Period	04/01/2022	**Position**	Excellence Sales Advisor
End Period	04/30/2022	**Department**	Sales & Marketing

ABSENCE RECORDS		ACCEPTANCE		CUTS	
Sick (Without Doctor's Note)	1 Day	Transportation Allowances	Rp. 390,000.00	Others (National Holiday)	Rp 0.00
Sick (With Doctor's Note)	1 Day	Foods Allowances	Rp. 360,000.00	Late For Work	Rp -4,046.24
Active Days	22 Days	Extra Hours of Work	Rp. 0.00	Sick (Without Doctor's Note)	Rp -79,545.45
Annual Leave	0 Day	Postion Bonus	Rp. 1,000,000.00	Attendance Adjustment	Rp 0.00
Long Illness	0 Day	Incentives	Rp. 0.00	Permission To Leave on Working Hours	Rp 0.01
National Holiday	0 Day	Attendance Adjustment	Rp. 0.00	Permission For 1/2 Days of Work	Rp 0.02
		THR	Rp. 0.00	Loans	Rp 0.03
		Total Acceptance	**Rp. 1,750,000.00**	Income Tax	Rp 0.04
				Total Cuts	**Rp -83,591.69**

TOTAL SALARY RECEIVED	
TAKE HOME PAY	Rp 6,666,408.31

Figure 9. Salary Calculation on Odoo Platform

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A time comparison analysis is carried out with the aim of knowing the comparison of the length of processing time between the ongoing business processes (as-is) and the offered business processes (to-be). In this case the test was carried out by the user manually calculating employee salaries in Microsoft Excel and using a system developed on the Odoo platform. the steps taken by the user in carrying out manual calculations by entering the number of attendance and absence of employees which had previously been recapitulated in Excel as well. Whereas on the Odoo platform users do not need to recap employee attendance and absence. The results of the two processes can be seen in Table 2.

Table 2. Time usage comparison

	Business Process *As-Is*		Business Process *To-Be*	
	Mean time per employee	Total time for all employee	Mean time per employee	Total time for all employee
Salary calculation process time	15 minutes	195 minutes	6 minutes	78 minutes

Table 2 shows that the longer time difference in the as-is business process which requires an average of 15 minutes for each employee, so that the total average time for all 13 employees takes 195 minutes. Whereas the to-be business process only takes an average of 6 minutes for each employee, so that the average time for all employees takes 78 minutes.

B. User Acceptance Test (UAT)

This test aims to find out if the developed system is in accordance with the requirements and will be identified at the analysis stage. There are several criteria on UAT testing however, the authors chose 3 criteria for testing the information system that had been developed in this study. Of the three criteria, including Performance, Usability, and Functional Correctness and Completeness because they are considered to have been able to represent whether the system is acceptable to users or not. Usability is the evaluation of a service or product through testing with representative users which aims to ensure that the system can be easily used and learned by users. Functional Correctness and Completeness is a test to find out whether the system created meets the user's requirements and has been defined in the requirements specification. Confidentiality is a rule that limits access rights to information. Availability is the assurance of reliable access to information by authorized persons. Table 3 is the result of the UAT test.

Table 3. Time usage comparison

Answer	Total Answer
Strongly Disagree	0
Disagree	0
Neutral	11
Agree	64
Strongly Agree	57

Table 3 shows the result of simulation of the payroll process which is carried out involving a limited circle of various departments at the company with totaled 11 people who gave 12 statements from 3 UAT test criteria and obtained a total of 11 neutral answers, 64 agreed answers, and 57 strongly agreed answers.

$$Total\ Score = (T_1 x Pn_1) + (T_2 x Pn_2) + (T_3 x Pn_3) + (T_4 x Pn_4) + (T_5 x Pn_5) \quad (1)$$

$$Y = highest\ score\ x\ number\ of\ respondents\ x\ number\ of\ questions \quad (2)$$

$$Percentage = \frac{Total\ Score}{Y}\ x\ 100\% \quad (3)$$

On the Likert scale calculation of the total results of the User Acceptance Testing questionnaire for system users, namely by calculating the value based on the total respondents who have been selected. The Likert scale is a psychometric scale that is commonly used in questionnaires, the most widely used in research in the form of surveys. For the purposes of quantitative analysis, the answer scale on the Likert scale can be scored for example:

1. **Strongly disagree** is scored 5
2. **Agree** is scored 4
3. **Neutral** is scored 3
4. **Disagree** is scored 2
5. **Strongly Disagree** is scored 1

All the answers' scores are calculated using equation (1), (2), and (3). From the results of the UAT test which involved six temporary respondents by giving 12 questions out of 3 UAT test criteria, the percentage value obtained is 86,97%.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the result conducted previously, we can conclude few findings. In system test, a simulation of the salary calculation process was carried out by comparing manual data on Microsoft Excel with calculations on the Odoo platform, obtaining the same results on the total salary received by employees so that the development of the payroll system was successful. In load testing, the results show that the difference in time is longer for ongoing business processes (as-is) requiring an average time of 15 minutes for each employee, so that the total average time for all employees, takes 195 minutes. Meanwhile, the business process offered (to-be) only takes an average of 6 minutes for each employee, so that the average time for all employees takes 78 minutes. In the User Acceptance Testing (UAT) test, the respondents involved were a limited circle of various departments totaled 11 people by giving 12 statements from 3 UAT test criteria and obtained a final score of 86.97%. From the final value, the respondents accepted that the system developed was in accordance with their needs.

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