

Original Research Paper

Implementation of Incremental Models on Development of Web-Based Loan Cooperative Applications

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Abstract: Technology is an integral part of application development. Utilization of technology under the target user application becomes one assessment in the success of a software. The XYZ Savings and Loan Cooperative is a non-bank financial company engaged in savings and loans. In the employee payroll process so far it still uses the manual method, start from recording attendance, up to the salary calculation process. Web-based application development developed by researchers is used to overcome the problems of XYZ Savings and Credit Cooperatives. Development of Savings and Loan Cooperative applications developed using the incremental model. 31 respondents from the company tested the application. Application testing based on usability factor ISO 9126-3. Applications get a value of 82.66% in terms of ease of understanding, 81.50% in terms of ease of study, 81% in terms of ease of operation, 81.33% in terms of interest and 82% in terms of usage compliance. The average total rating in terms of the usefulness of the application get 82.66% so the application is very useful for companies in helping to calculate employee payroll.

Keyword: Incremental, ISO9126, Web Based, Payroll, Software Engineering.

APA:

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1. Introduction

Work is an activity everyone must do that to support their living needs [1], [2]. In carrying out the work needed a job to work [2]. The average working person is at the minimum age of 13 to a maximum of 60 years depending on their individual survival needs [3], [4]. Herizal and Muhammad Nur, in 2020, explained that humans cannot live alone and must be in society. One form of community life is work. Work used by humans or workers to fulfill three human needs, primary, secondary and tertiary needs. In human work requires work performance in the form of awards and awards is very influential on the actualization of human work. With appreciation also affects the social needs of workers or humans [5].

Every person who works will receive a wage or salary, giving salary will affect the enthusiasm of working for an employee. The impact of salaries under the ability of employees, among others employed equality, employee relations with the company and employee performance will be better [6]. In the payroll employees sometimes have many obstacles, the payroll system that is still manual, this slows the payroll process. It is necessary to improve the quality of employee payroll management through implementing Software Engineering. The developing a software project it needs a method or model of software development [7] because there are separate procedures that performed so that the software that built has a valuable quality for its users. Speaking of software development models, the incremental model is one model for developing software [8]. This model based on the merging of the linear model and prototype and in this model we repeat the process every time it makes the results of the requirements.

In this Payroll System problems also occur in the XYZ Cooperative, XYZ Cooperative is one of the nonbank financial institutions engaged in savings and loans XYZ Cooperative has a lot of employees and other financial institutions, each employee has their respective positions, the salary of each position also different. So far, XYZ Cooperatives do their employees payroll, starting from keeping records of each data including recording data of each employee, employee attendance data, salary data for each employee, and recapitulation of salary output, often for technical errors of cooperative members in recording employee payroll so often there is a mismatch of money out with the payroll file that exists because of errors payroll this can cause a long payroll process and can occur misuse of employee salary funds. Therefore, in the above problem the researcher made a web-based employee payroll system using an incremental model with this program which would facilitate the work of the employees in the XYZ Cooperative office in Surabaya, East Java, Indonesia. The name of the Savings and Loan Cooperative simulated with another name because of the company's request. From the background planned, it planned the problem formulation How to develop a web-based employee payroll system in the XYZ Cooperative using the Incremental model.

Limitation problems regarding the problems above are:

1. This system can record employee data, attendance data, payroll data including deductions and benefits and can print attendance reports, and print salary reports.
2. This system uses a MySQL database.
3. This system uses the PHP Laravel Framework
4. This system only for XYZ Cooperative employees.
5. This system can only be accessed offline.

The purpose of developing this application is to develop an employee payroll system that facilitates the work of cooperative members to record employee data, recording employee attendance, and employee payroll.

2. Literature Review

2.1. Incremental Model

The incremental model is a combination of the linear model (waterfall model) and the iterative prototype model, in the incremental stage if the first increment still does not match what the user wants, then the iterative steps performed sequentially so that the system functionality as desired by the user in this model prioritizes the system requirements that will made so it must done several iterations in its development so that the functionality is as desired by the user [9]. In the previous research, Rachman et.al., 2019, had used an incremental model in developing an educational game for fruit and vitamin introduction. Applications developed by researchers using the incremental model get a value of application usability of 82%, which means the application built can a learning medium for its users [10]. Habib A, and Andre Kartika W.H, in 2019 in their research entitled "Development of an Online Sales Information System for SMEs Using Incremental Model" explained the development of shoe

sales information system applications using the incremental model. In this study, the results show that the incremental model has helped researchers in developing shoe store sales applications [11].

In the software development process with an incremental model has several very important stages, The stages in application development with an incremental model show in Figure 1.

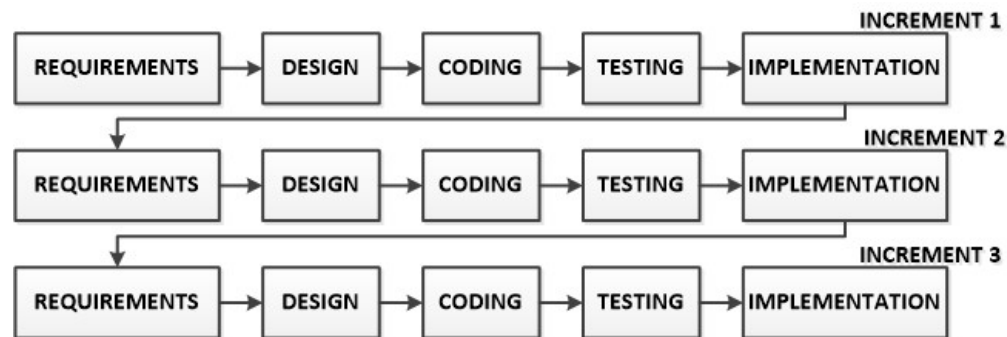


Figure 1. Incremental Model in Software Development

The Requirement Stage is the initial requirement stage that researchers used to get the functional needs of the application being developed. The Design Stage is the application system design stage. Coding Phase is the development phase based on the results of the design stage. The Testing Phase is the stage where the program module, class program tested and according to their needs or not, we use a black box testing model. The Implementation Stage is the implementation phase of the results of making the whole application.

2.2. Likert Scale

Likert scale is a scale used to measure an opinion or satisfaction on someone or a group regarding the results of research based on operational definitions that have set by researchers [12]. This scale is a scale applied in research and is most often used for research in the form of surveys, including in descriptive survey research. The creator of the Likert scale is the Likert Rensis from the United States [13]. The Likert scale is used to measure the opinions and perceptions of a person or from a particular group. Table 1 shows the assessment score on a Likert scale. Armalena in his research entitled "Management of Facilities and Infrastructure at the Muhammadiyah Elementary School in Padang City" used a Likert scale as a measurement to determine the success of the research he was doing. Researchers get the results that facilities management and infrastructure get a value of 72.42% so it does well the questionnaire management of facilities and infrastructure. But the results differ from the fact that teachers and school staff when filling out the questionnaire acted [14].

Putro SRS, in his research entitled "The Effect of Leadership, Organizational Culture, and Communication on Employee Performance (Studies in Colleges under the Bani Saleh Foundation)" uses a Likert Scale to get the results of the questionnaire because of the ease in management and ease for users in determining the answers to the questionnaire [15]. Ahmad Ab and Ridwan M, in their research entitled "Measuring Student Satisfaction Levels on Management Services Study Programs at the Makassar Tourism Polytechnic Room" using a Likert Scale in administering questionnaire scores to researchers. Researchers measure the results of the questionnaire into 5 levels, bad, sufficient, moderate, good, and very good [16]. In this study, we use five levels as in table 1 below.

Table 1. Skala Likert Score

Answer	Code	Score
Strongly Agree	SS	5
Agree	S	4
Fair	C	3
Disagree	TS	2
Strongly Disaggre	STS	1

And to calculate the average satisfaction presentation of a system that has made can use a Likert scale formula that is summing the results of the maximum score of each answer chosen, for an explanation of the formula as Equation 1.

$$\sum \text{observation_score} = (\text{numbers} \times \text{SS_score}) + (\text{numbers} \times \text{S_score}) + (\text{numbers} \times \text{C_score}) + (\text{numbers} \times \text{TS_score}) + (\text{numbers} \times \text{STS_score}).$$

Equation 1

Meanwhile, to calculate the feasibility of using the formula as Equation 2.

$$\text{Percentage of Eligibility} = (\text{observation_score} \div \text{expected_score}) \times 100\%.$$

Equation 2

2.3. ISO 9126-3

ISO stands for International Standard Organization is a world international standardization organization that functions to regulate standardization. In preparing for ISO standardization, there are special committees in each field [17]. ISO 9126 is one of the international standards for evaluating software quality [18]. During its development, ISO 9126 underwent four changes, ISO 9126-1, ISO 9126-2, ISO 9126-3, and ISO 9126-4. ISO-9126-3 has six characteristic factors, functionality, reliability, usability, efficiency, maintainability, and portability. Each characteristic has a sub-factor characteristic. Each characteristic has sub-characteristics. There are 26 total sub-characteristics found in ISO 9126-3 [19]. The characteristics and sub-characteristics of ISO 9126-3 in Figure 2.



Figure 2. Characteristics and Sub-Characteristics at ISO 9126-3

3. Method

In this study we carried out five major actions : Survey, Study Literature, Software Development, Test Demo, and System Assessment. It carried the survey process out at a Savings and Loan Cooperative (KSP) company in Surabaya. We disguised the name of the cooperative as XYZ. The reason we disguised the name of the cooperative was because the company was not pleased to name the company. During the survey we met three people who assisted with the application development process, say branch managers, cashier staff and paramedics. From this stage we found that during this time the company carried out a manual recording of payroll, accounting and employee attendance records. In this way it is very time and energy consuming because the work process can be 7 to 10 working days and requires a top level of accuracy. We did a literature study to get material about software development models that match the problems we solve. The software development model that matches our problems is the Incremental model. The next process is software creation. Developing of software using PHP programming language scripts with the Laravel framework and the MySQL database. We conducted a demo test with the respondent, Ka. Mantri, Cashier, Staff and Mantri. In this study, we divide the application into three increments. In the first increment we developed the admin

and cashier staff modules, in the second increment we developed the cashier role module for payroll data and in the third increment we developed modules for leaders and matrices. The Application implemented on KSP. To find out the usefulness of the application, we conducted a survey of the applications we developed based on the usability factor at ISO 9126-3. The survey instruments we gave to respondents shown in Table 2.

Table 2. Survey Instruments Usability of KSP Applications

NO	QUESTION
Understandability	
Q1	The flow of using a web-based employee payroll system is easy to understand.
Q2	Payroll system features and menus are easy to understand.
Q3	Information on report data is easy to understand
Learnability	
Q4	The using of employee payroll systems easy to learned.
Q5	The using of features in the payroll system is easy to learn.
Operability	
Q6	Features The features of the employee payroll system are easy to operate.
Attractiveness	
Q7	Interested in using the employee payroll system.
Q8	The flow of the use of the system easy to understand, so interested in using the system.
Q9	I can understand the features available in the payroll system until interested in using the system.
Usability Compliance	
Q10	Display Employee payroll system is appropriate.
Q11	Features Existing features in the employee payroll system are under the wishes of the user.
Q12	Information Data Reports and employee payroll calculations are under the wishes of the user.

Note:

Q = Question

4. Result and Discussion

4.1. Result

In this research, our real contribution has been to develop applications for the Web-Based Savings and Loan Cooperatives (KSP) using the Incremental Model. On this start page, information on the application information, the savings and loan cooperative logo, and the username and password section can be seen in Figure 3.

The Chief, Ka. Mantri, Cashier, Staff and Mantri tested the application with 31 respondents. It shows the results of the appraisal given by respondents in Table 3.

From Table 3 seen that the application that we developed and we surveyed using the ISO 9126-3 standard for usability factors where this assessment based on the sub-factors of understandability, learnability, operability, attractiveness, and usability compliance. amounted to 81.70% which means this application is very useful for KSP XYZ.

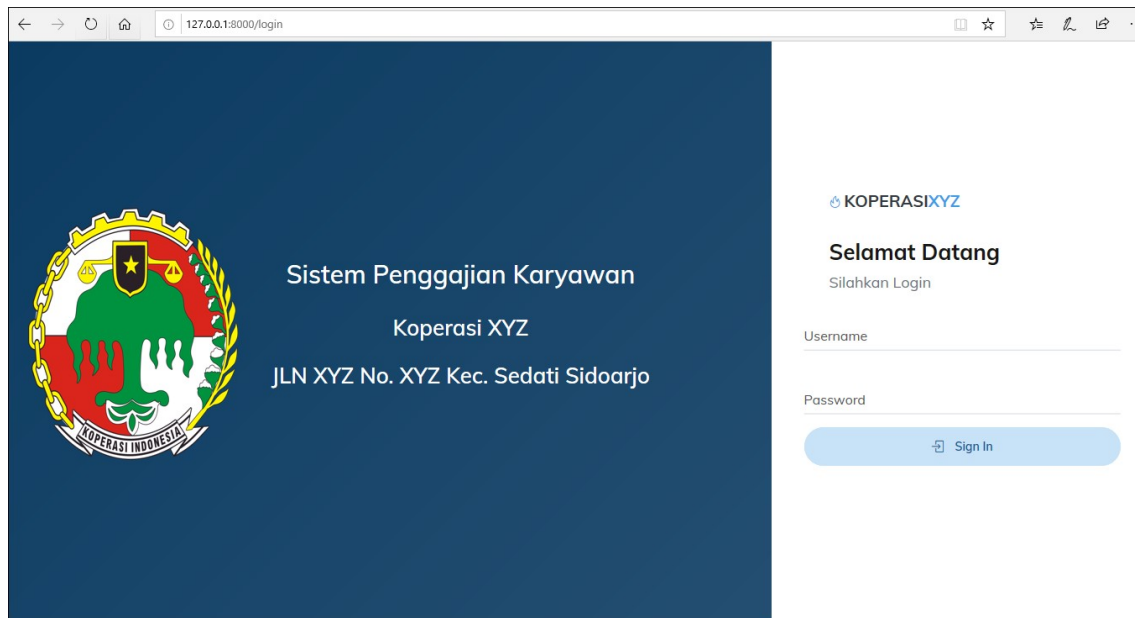


Figure 3. Main page of savings and loan applications

Table 3. Application Assessment Results Based on Usability Factors ISO 9126-3

No	Sub-Factor	Percentage	Note
1	Understandability	82,66%	Very Good
2	Learnability	81,50%	Very Good
3	Operability	81,00%	Very Good
4	Attractiveness	81,33%	Very Good
5	Usability Compliance	82,00%	Very Good

4.2. Discussion

ISO 9126 is a standard that is still workable to used to test the quality of software, even though ISO 9126 has improved and developed to ISO 25010. Based on products that exist and surveyed to the user and with honesty in filling in existing surveys, ISO 9126 can find out the quality of the software. Some researchers have also used ISO 9126 as a standard in knowing the quality of software. Rochmani M, et al., in 2015 in his research entitled "Evaluating Academic Websites Using ISO / IEC 9126" explained the use of ISO / IEC 9126 in evaluating the academic web of Telkom universities. Researchers use the functionality, reliability, usability, and efficiency factors. From its research, the results show that in terms of validity and reliability found errors or unreliable it needs retested on the academic website of the telecommunications university [20]. Laila S.N. and Kusumadiarti R.S, in 2018, in her research entitled "Measurement of SISFO_NILAI Application Software Quality in PIKSI Ganesha Polytechnic Based on ISO 9126" explained about the use of ISO 9126 to determine the quality of SISFO_NILAI software. From this activity the researchers used all the factors that existed at ISO 9126 and got an average value of 69.97%, it means SISFO_NILAI application was "GOOD" [21]. Al-Nawaisch A.J., et al., 2020 in his research entitled "A New Software Quality Model for Academic Information Systems" Case Study E-Learning System "" explained about a new model in evaluating the quality of academic information system software. Researchers use ISO 9126 as a rationale in developing alternative models to determine the quality of academic information system software. Researchers combine fuzzy and Analytical Hierarchy Process (AHP) in decision making [22].

The incremental model is one of the software development models still used because of the ease of use and the resulting product can already known at the first increment. Faisal Prasetya Pangestu, et al., in 2016, in his research using an incremental model in developing an executive information system application to monitor electrical substations in the city of Bandung. In this study, the researchers

developed an android application with Geographical Information Systems (GIS) technology features [23]. Sofida K. N and Efy Y, in 2017, in their research developed multimedia 3x3 and 4x4 matrix inverse calculation applications. Researchers use incremental models in developing applications. The researcher focuses on the learning material available in the Linear Algebra course, where while learning to exist applications cannot run on other computer devices, only certain computer devices. They built the application using Visual Studio 2010 [24]. Gowtham V, et al., 2020, in his research discussed software development models that always develop as needed. The researcher discusses three software development models used by application developers, waterfall, incremental, and spiral models. Of these three models, incremental and spiral models are software development models that always develop because of their nature [25].

Suhari Janti, et al., in 2020, in his research developed a campaign application called Indonesia Generous as a rapid response using the prototype model. In this study, researchers have been able to develop web-based applications and campaign media. Here visitors can also make donations when visiting the Generous Indonesia website [26]. Irfan M and Deny T.E. Y, in 2018, in their research developed the application for credit applications at BRI bank Colonel Sugiono's unit. Researchers use the agile (scrum) model in application development. Agile model (fast) is a software development model that emphasizes the nature or speed features in software development [27]. Jatinderkumar R.S. and Vikas S.C., in 2020 in their research, trying to calculate the efforts of students in developing software projects. Here the researchers used COCOMO II to determine the efforts of students in developing software projects. Researchers find that there are still many students who have failed in developing software under the time limit given [28]. Bayu Dwi J, et al., in 2020, in his research developing an e-commerce application booking event organizer services using extreme programming models. The researcher uses ISO 9126 functionality factor to find out if the application function is running well and usability factor to determine the usefulness of the application. From the functionality side the application gets a value of 100% and the usability side gets 85.98% [29].

5. Conclusions

From previous studies i found it that in the development of a software model it is necessary to develop software as a framework for developing software so that researchers do not get out of the realm and desired research path. Using ISO-9126 or other measuring instruments that can determine the success of a software, both in terms of usability, function, efficiency or from other parts is very necessary and considered. Technology that supports a software that relates also to the condition of the user and the intended community will determine the success and success of a software.

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