Application of Web-Based in Product Distribution using Unified Modelling Language

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Abstract. Product distribution is an activity that facilitates the distribution of products from producers to consumers. The product distribution process using agents has accelerated and simplified the product to reach the consumers. The problem is how to deliver the information to the company with effective and efficient ways. The information contents like inventory stock, purchase order, delivery order and billing system. The purpose of research is to overcome the problem of the company by provides the application on web based. We used the prototype method as system development and UML (Unified Modelling Language) as a blueprint design of applications. In this study, we used four diagrams like use-case diagram, class diagram, deployment diagram, and component diagram to figure out the design of application. The software testing step has used a black box method. The results of this research is an application that allows agents to order products to companies, manage the availability of products in warehouse, facilitates warehouse delivery of products, provides accurate financial transactions, and various reports as required. Product distribution information systems can improve the company performance and expand marketing of product by facilitating interaction between companies and agents.

1. Introduction
Every company tries to ensure the product can be purchased by consumers. Through selling its products, the company can develop and maintain the stability of the business. Product distribution activities are important in determining the success or failure of a company to make a profit in their business activities. Distribution has significant meaning to achieve success in marketing. Because with the distribution, the products will reach the consumers both through direct and indirect distribution [1]. Therefore, a good product distribution is needed to improve the performance and productivity of the company. To accelerate the product distribution, some companies have many agents in the process. Effective product distribution will facilitate the flow of product from producers to agents then to consumers.

Optimal product distribution is the key to a company’s success in running its business. Therefore, companies should design the best product distribution activities. Optimal distribution activities depend on good administrative management, the availability of products in the warehouse, and accurate financial management in collecting agents and recording payment from agent. Likewise with CV 1001 (seribu satu) which is engaged in the sale of superior products nasi liwet instan. To expand the distribution of product sales currently CV 1001 has more than 200 agents.

The product distribution process using agent will accelerate and simplify the product to the consumer. This research focuses on the process of requesting products from agents to companies managed by the administration, management of availability of products in the warehouse, billing and payment from
agents to companies through the finance department. All of these activities can be implemented optimally through the implementation of management information systems. CV 1001 requires facilities that can manage the distribution management information system to facilitate the agents in order products, and administration in recording the order which will proceed to the warehouse, then the warehouse will manage incoming and outgoing products while delivering products to the agent, the finance department will record every bill to the supplier and all payment transactions from the agent to the company.

Information technology has been very useful for every company to giving the brief information of everything used in the company. Information technology makes the supply chain visible for a management which is useful for improving the performance of company. The most important role of information technology is to reduce the process of transactions between supply chain partners through cost effective data [2]. The authors explain about construction of the information system and figure out about UML diagram which has important to the research like use-case diagram, class diagram, activity diagram, and deployment diagram [3]. The implementation of a product distribution information system can help agents get the products, help the administration record and make products order reports, the effectiveness of managing inventory of products in warehouses, the accuracy of financial data payments from agents to companies.

2. Method

We use prototype method as system development in the research. We chose prototype method because the method aligned between research practical and formal. The prototype method is one of system development that constructed by object-oriented approach. Several steps in prototype have consisted of communication and requirement, quick design, early prototype including testing and accomplishing, evaluation prototype especially analysis refine by user needs, prototype improvement, and final prototype [4]. The first step in the prototype method is communication and requirements. At this step, we collected CV 1001 needs in managing products order from agents, managing products in warehouses, and payments from agents to companies. The second step is to develop software that focus in human interaction. Furthermore, this software prototype is tested by user. Prototype is improved according to test results and suggestions from users. The final step is the software that ready for use by the user.

Object-oriented approach is a way of looking at the issue of using models that are organized around the concept of the object which combines data structure and behavior of an entity [5]. UML is a part object-oriented method. UML provide system architects, software engineers, and software developers with tools for analysis, design, and implementation of software-based systems as well as for modeling business and similar processes [6]. UML explain software development of nine diagrams such as use-case diagram, class diagram, activity diagram, collaboration diagram, state diagram, component diagram, deployment diagram, sequence diagram, and package diagram [7].

In this research, we only used four diagrams like use-case diagram, class diagram, deployment diagram, and component diagram to figure out the design of application. This research used only four diagram because those diagram enough for figuring design small application.

Use Cases are a means to capture the requirements of systems, i.e., what systems are supposed to do. Class diagram is classifies a set of objects and specifies the features that characterize the structure and behavior of those objects. Deployments package specifies constructs that can be used to define the execution architecture of systems and the assignment of software artifacts to system elements [6]. Component diagram is shaped to give illustration what the component within the system, and also to give knowledge black box process [8].

At Table 1, we write the pseudocode of prototype in system development to understand of prototype development.
Table 1. Pseudocode to execute the main application in Product Distribution Information System [9]

| Pseudocode Product Distribution Information System |
|---------------------------------------------------|
| 1. Collecting requirement (list of requirements from user needs, construct master table for every actor and entity, using UML to describe the process) |
| 2. Mock-up version (built software to focus in human interaction like menu) |
| 3. Evaluate mock-up version to accomplish the application product distribution information system |
| 4. Coding application to transform series of task into programming language |
| 5. Application testing after coding complete, this phase to test application is the same with goals of application |
| 6. Application evaluation |
| 7. Operation of application |

In a study written by Susanti and Susanto, it is concluded that a product distribution management information system can help logistics managers in estimating procurement stock for the next period and helps to schedule product distribution to customers. Besides that, the product distribution management information system can also help logistics management to recommend to the product delivery department so as not to be late when delivering product to customers [10]. Differences in problems that occur at PT. Soka Niaga Cipta is the use of system approach. In that study using structured approach to design the information system that use context diagram, data flow diagram, and entity relationship diagram as tools.

Other research related to information system of produk distribution was also carried out by Reynold et. al. [11]. This study concludes that the application built can help general staff in processing products data based on the type of products, ordering products can be done computerized, users can view a list of inventory items that are in short supply to order and can print the required reports [11]. In that research using Waterfall as the system development.

These studies have in common that is building a product distribution information system that can manage the functions of ordering, recording, inventory, shipping, payment and reports.

3. Results and Discussion

Primary business process that draw about interaction between actor and case drawed by use-case diagram. The business process driven by actors or gives the report to the actors. Every actor has connected to the case [8]. Based on observation to the business process, the authors identified that the application has five cases and four actors. The cases are consisted of managing products orders, managing incoming products, managing shipping products, managing bill payments, and making reports. While the four actors involved are agents, administration, warehouse, and finance. At Figure 1, we shown about use-case diagram as a primary process in product distribution information system.
In the use case diagram above, there are several use cases. Table 2 below is the definition and description of the existing use cases.

**Table 2. Description each case in use-case diagram at Figure 1.**

| Use-case name              | Description                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Managing products order   | Activities that explain the products order from the agent to the administration. This activity carried out by administration that will check the availability of products ordered by computerized. |
| Managing incoming products| Activities that explain the recording of products entering from the production department to the warehouse. This activity carried out every time there are products coming into the warehouse. |
| Managing delivery products| This activity is carried out by warehouse after the agent orders the products to the administration, then the warehouse sends the products according to the agent's request. |
| Managing bill payments    | Activities that explains how the billing process to the agent and how the payment process from agent to the company through the financial departement. |
| Making reports            | This activity was carried out by administration, warehouse, and finance, which printed the report and submitted it to the head of company.       |

Product distribution information system is an application that built to serve agents in ordering products. Agents can order products anywhere. The warehouse must always manage incoming products so the application can provide information about the availability of products. Any products ordered can be immediately sent to the agent. Every transaction is recorded to provide financial information that must be paid by the agents to the company.

Through the product distribution information system, each actor interacts through the available menus. Menus that displayed on the web application provide comfort for its users. Each menu provides the services required of the user.

After design information system using UML, then we deployed the application by PHP programming and make the database by MySQL [12]. Figure 2 is the example part of product distribution information.
system that has executed in web technology. Figure 2 is the agent's products request form to CV 1001. The agent selects the item to be ordered and presses the save button when the request is complete.

![Figure 2. Products request form from the agent to CV 1001](image)

System testing is another important step in software engineering [13]. Software testing is a technique for testing software, has a mechanism for test data that can test software completely and has a high likelihood of finding errors in software. This software testing uses the black box testing method, with test plans to be carried out including testing the login to the system, input data, verification and validation, and output data from the system. Table 3 is the results of testing on the product distribution information system in CV.1001.
Table 3. Testing application of E-Event [13]

| Part of testing          | Testing Scenario                                                                 | Expected result                                                                 | Testing result |
|--------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------|
| Login                    | Username and password input as authority login                                   | Enter to proper webpage as authority login                                       | Passed         |
|                          | Input user data                                                                  | Submit user data success                                                          | Passed         |
|                          | Input agent data                                                                 | Submit agent data success                                                         | Passed         |
|                          | Input category data                                                              | Submit category data success                                                       | Passed         |
|                          | Input products data                                                              | Submit products data success                                                       | Passed         |
| Submit master data       | Input the name and the number of products coming into the warehouse, then click the save button | The number of products will increase                                               | Passed         |
|                          | Input the number of products ordered over stock                                   | Display “less stock” message                                                      | Passed         |
|                          | Input the number of products ordered = 0                                         | Displays the message "the minimum amount of order is 1"                         | Passed         |
| Submit incoming products | Do not input the amount of payment                                               | Displays the message "input the payment amount"                                  | Passed         |
| Submit payment           | Input with max string length                                                      | Input evaluation success                                                          | Passed         |
| Evaluation Form          | Select month and validation status, click print                                   | Print success                                                                     | Passed         |
| Print incoming products  | Select month and validation status, click print                                   | Print success                                                                     | Passed         |
| Print products order     | Select month and validation status, click print                                   | Print success                                                                     | Passed         |
| Print payment report     | Select month and validation status, click print                                   | Print success                                                                     | Passed         |

Based on the results of software testing, it can be concluded that the product distribution information system software in CV.1001 provide proper functionality. The software is suitable for the goal application.

4. Conclusion
Based on the analysis, design, system development, testing, and system implementation, we conclude that research generates a web-based application that could help agents in ordering products. The agent gets information about the availability of products to be ordered easily. The administration can manage agent data and item data based on their categories. Warehouse department records every product that enters the warehouse through a web application, so that the agent, the administration and company are informed about the availability of the products. This accelerate the warehouse department in sending products according to the agent's order. All integrated and well-recorded data makes it easy for the finance department to get billing information from agents. Product distribution information system provides accurate financial transactions, various reports as required, improve company performance and expand marketing of product by facilitating interaction between companies and agents. Product distribution information systems can save time in searching and recording data, can present information quickly, precisely, and accurately.
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