Design of logistics information system in the finished product warehouse with the waterfall method: review literature

Friska Heriyanti* and Aulia Ishak

Magister of Industrial Engineering, Universitas Sumatera Utara, Almamater Street, Medan USU Campus 20155.

*Email: Friskaheri1@gmail.com

Abstract. The process of sending and loading finished goods is very important. According to some experts, transportation activities spend 44% of the total cost. Even in Indonesia transportation costs can reach more than 60%. In practice, one way of saving on transportation costs can be done by minimizing the waiting time for loading finished products in the warehouse. The slow delivery of information from the logistics department to the warehouse can cause high load times for finished products. This can lead to delays in product delivery to consumers. The method used in this paper is the Waterfall method. The Waterfall method provides a software flow approach in sequence or sequentially starting from analysis, design, implementation, verification, and maintenance phase.

1. Introduction
Logistics information systems in a company are needed to coordinate the flow of materials, raw materials, and finished products. Also, information is needed to reduce the costs of production, supply and distribution activities to increase efficiency. Thus, the introduction of information systems integrated into industrial company management provides certain advantages such as the speed of exchange of information between larger units, reducing the number of miscalculations, decreasing volumes of unproductive work, and separate information block collaboration. In the end, all of that enables the implementation of a more effective logistics approach for the management of industrial companies and leads to cost optimization [1].

The logistics information system carried out using manual processes takes a lot of time, a high risk for human error and involves a lot of paper [2]. This can affect the process of shipping goods to consumers. The longer the process shipping and loading of finished goods, it is feared that the goods sent cannot arrive on time in the hands of consumers.

This paper aims to make information systems computerized so that the flow of information from the logistics department to the warehouse can be delivered quickly, precisely and efficiently.
2. Methodology

2.1. System design method

Lately, the most popular approach to developing software for computer-based information systems is the waterfall method [3]. Waterfall method is one method in the System Development Life Cycle (SDLC) that has the characteristics of working on each phase in the waterfall that must be completed before proceeding to the next phase. This means that the focus on each phase can be maximized because there is no parallel workmanship. According to [4], the waterfall model defines several sequential phases that must be completed one by one and moves to the next phase only when the previous phase has been fully carried out. For this reason, the waterfall model is recursive because each phase can be repeated endlessly until it is perfected. Figure 1 illustrates the various phases of the SDLC model waterfall.

![Figure 1. Process of the waterfall model.](image)

The Water fall method consists of five phases [4]:

a. Requirement Analysis Phase: Often known as software requirements specification is a complete and comprehensive description of the behaviour of software to be developed. This involves systems and business analysts to define functional requirements describe user interactions with software and non-functional requirements. This includes properties such as reliability, scalability, test capability, availability, maintenance, performance, and quality standards.

b. Design Phase: This is a planning and problem-solving process for software solutions. This involves developers and software designers to determine solution plans that include algorithm design, software architecture design, database conceptual schemes, and logical diagram designs, concept designs, graphical user interface designs, and data structure definitions.

c. Implementation Phase: This phase is where the original code was written and compiled an operational application in which the database and text file is created.

d. Testing Phase: This is also known as verification and validation which is a process of checking whether a software solution meets the original requirements and specifications and that it reaches the intended purpose.

e. Maintenance Phase: This is the last phase in the waterfall model. Maintenance includes fixing errors not found in the previous step.

2.2. Program tool

In designing a program cannot be separated from supporting equipment (program tools). Supporting equipment in program design can add convenience in obtaining the procedures that will be used in the program [5].

2.2.1. Use case diagram.
Use case or use case diagram is modelling for a behaviour information system that will be made. The use case describes an interaction between one or more actors with the information system that will be created. Roughly speaking, a use case is used to find out what functions are in an information system and anyone who has the right to use these functions [6].

2.2.2. Activity diagram.
Activity diagrams or activity diagrams describe workflows (workflows) or activities of a system or business process or menu that is in software. It should be noted here that the activity diagram describes system activities not what actors do, so the activities can be carried out by the system [6].

2.2.3. Sequence diagram.
Sequence diagrams describe the behaviour of objects in the use case by describing the lifetime of objects with messages sent and received between objects. Therefore, to describe a sequence diagram, it must be known that the objects involved in a use case along with the methods that the instantiated class has become that object. Making a sequence diagram is also needed to see the scenario in the use case. Many diagrams sequences that should be drawn is minimal as defining use case that has its processes or essentially any use case that has defined the interaction of the way messages are already included in the diagram sequence so that each use case defined the diagram sequences that must be made are also increasingly tire yak [6].

2.3. Programming
In this study, the author designed an information system using PHP (Hypertext Pre-processor Page). PHP is a programming language for creating web-server-side scripting. PHP allows us to create dynamic web pages. PHP can be run on a variety of Operating Systems (OS), such as Windows, Linux, and Mac OS. Besides Apache, PHP also supports several other web servers, for example, Microsoft IIS, Caudium, PWS and others.

3. Literature review

3.1. System information
Understanding information systems can be seen in terms of physical and function. From a physical point of view, it can be interpreted as an arrangement consisting of hardware, software and implementing personnel which together support each other to produce a product. While in terms of function information is a sequential process starting from data collection and ending with communication/dissemination. Furthermore, the information system is said to be effective if it can produce good information, high accuracy, timely, complete and concise contents. Accuracy is a measure in the form of a ratio between the amount of correct and incorrect information. A system is said to have high accuracy if its accuracy is 95%. However, high accuracy will not be useful if the arrival is late and irregular. Therefore, information systems are required to be complete, concise and orderly so as not to confuse users of the information.

The Logistics information system is a broader communication network within an organization or company that must be prepared to make or send and be able to receive information conveyed by the organization or company. Also besides, there are efforts made to collect, strengthen and utilize company or organization data as a basis for the company's strategy in making decisions that can be useful for the company or organization itself [7].
3.2. Waterfall method

Some studies related to problems in the stem of information that can be solved using the waterfall method can be seen in Table 1.

| No. | Year | Title                                                                 | Problem                                                                                                                                                                                                 |
|-----|------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 2018 | Inventory Control System Using Waterfall Development Model [2]        | The manual process takes a lot of time, a high risk of human error and involves many papers and files because the shop owner will verify the availability of goods in the store. |
| 2   | 2017 | The Application of the Waterfall Method to the Inventory Information System of Pangan Sehat Sejahtera Company [5] | In the previous system, the center office cannot access inventory data from each branch office quickly.                                                                                                  |
| 3   | 2017 | Mobile Augmented Reality Media Design with Waterfall Model for Learning Geometry in College [3] | Some students still consider geometric images as 2D objects, and still have difficulty determining the differences between intersecting lines and intersecting lines, and cannot use acquisition geometry to solve spatial geometry problems at the secondary school level |
| 4   | 2017 | The Application of the Waterfall Model in the Online Student Value Processing Application Program at the Islamic High School Abaabyl Tangerang [6] | Academic services at the school are still carried out manually so the level of problems posed by this system is very large. Among them are missing student grades, wet report cards due to negligence of some students and other natural factors that cause damaged report cards. |
| 5   | 2014 | Design and Build a Web-based Surabaya Hospital Records Management Information System [6] | RSBS archives are often damaged, lost and the archive distribution is late.                                                                                                                                   |
| 6   | 2012 | A Simulation Model for the Waterfall Software Development Life Cycle [4] | The project director did not wisely determine the number of workers and resources needed in various SDLC activities. As a result, some SDLC phases with inadequate resources may be delayed. In the meantime, other people with excess resources may be unemployed. |

4. Conclusion

The main objective of this paper is the design of a computerized information system that is able to accelerate the flow of information systems, which can increase warehouse efficiency. To be able to design the desired information system, the waterfall method is used. Waterfall method suited for systems or software is generic, meaning that the system can be identified all the needs of beginning with a public specification and
according to the research that has the objective to build a system from scratch that gathers system needs to be built according to the topic the research chosen until the product was tested.

References

[1] Voronkova O, Kurochkina A, Firova I and Bikezina T 2017 Implementation of an information management system for industrial enterprise resource planning Espacios 38(49) 23
[2] Amron M T, Hassan A, Shukri M, Hudin S and Janom N 2018 Inventory Control System Using Waterfall Development Model 7 138–141
[3] Adetokunbo A and Basirat A 2014 Software Engineering Methodologies: A Review of The Waterfall Model and Object-Oriented Approach Int. Journal of Scientific & Engineering Research 4(7) 427–434
[4] Bassil Y 2012 A Simulation Model for the Waterfall Software Development Life Cycle 2(5)
[5] Tabrani M and Eni P 2017 Penerapan Metode Waterfall Pada Sistem Informasi Inventori Pt. Pangan Sehat Sejahtera Jurnal Inkofar 1(2) 30–40
[6] A S R, and Salahuddin M 2014 Rekayasa Perangkat Lunak Terstruktur Dan Berorientasi Objek 19(3) 72–81
[7] Imaniyati N 2010 Sistem informasi logistik dalam pengambilan keputusan ekspor impor pada rekanan pt twins logistik Manajerial 8(16) 78–88