Implementation E-Commerce of Salted Fish Sales Based on Supply Chain Management Using the SCRUM Framework

**Abstract.** Salted fish is one of the food preservation products found in Indonesia. In Indonesia, salted fish holds a prominent national significance., proven by almost 65% of fishery products still processed and preserved by salting. Tegal Bahari is one of the companies in Indonesia that produce salted fish. All salted fish businesses in Tegal Bahari are processed by employing the traditional method. For example, promotions are only carried out through printed media and the distribution of business cards. Besides, transactions and administration of buying and selling are also still written on a book, with receipts only written on a bill. These phenomena caused the market opportunities for selling salted fish by Tegal Bahari limited to certain areas. In addition, the sales data are also disintegrated from fish stocks in the warehouse and unintegrated with the data on demand for goods to suppliers. Therefore, fish stocks are often overcapacity, or even the fish stocks are unavailable when there is a demand for salted fish from buyers. The solution to this problem is by implementing e-commerce of salted fish sales with a scheme of Business to Consumers based on Supply Chain Management built on a website platform. The website platform was developed by applying the Scrum framework only taking 25 days to produce the e-commerce implementation.

1. **Introduction**

Salted fish is a food product made from fish preserved by adding a lot of salt. This method is carried out to make the fish meat usually quickly rotting can be stored at normal temperatures for several months, although the salted fish must be tightly closed to avoid damage to the fish [1]. This is because fishes have high enough water so that they can be harmed and decay rapidly. Only within 8 hours since the fishes are caught and landed, the fishes will easily get spoilage without special handling. Therefore, the fishes need to be preserved. One of the preservation methods is salting [2]. Salted fish is one of the food preservation products found in Indonesia. In Indonesia, salted fish holds a prominent national significance, proven by almost 65% of fishery products still processed and preserved by salting. The Indonesian government has designated salted fish as one of the nine staple foods of the public. This designation shows that salted fish is not only favored by people with lower economic levels but also preferred by those in the upper-middle class. The appeal of this salted fish mainly lies in its distinctive taste, smell, and texture [3].

Tegal Bahari is one of the salted fish producer companies in Indonesia. Every day, this company can produce +-5 tons of salted fish taken from several suppliers. Some types of salted fish produced by Tegal Bahari include *siro* fish, *banyar* fish, *kite* fish, *tanjan* fish, *japu* fish, *petek* fish, *layur* fish, and mackerel. All salted fish businesses in Tegal Bahari are processed by employing traditional method. For example, promotions are only carried out through printed media and the distribution of business cards. Besides, transactions and administration of buying and selling are also still written on a book, with receipts only written on a bill. These phenomena caused the market opportunities for selling salted fish by Tegal Bahari limited to certain areas. In addition, the sales data are also disintegrated from fish stocks in the warehouse and are not integrated with the data on demand for goods to suppliers. Therefore, fish stocks are often overcapacity, or even the fish stocks are unavailable when there is a demand for salted fish from buyers.

Based on these problems, the use of information technology is necessary to facilitate buying and selling transactions between buyers and producers, as well as integrate data to optimize data efficiency and effectiveness. In this case, salted fish can be sold by implementing e-commerce. E-commerce is a business process using electronic technology connecting companies, consumers, and the public in the form of electronic transactions and the exchange or sale of goods, services, and information electronically [4]. Principally, E-Commerce provides an infrastructure for companies to expand their internal business processes to the external environment without having to face time and space barriers often becoming the main issues [5].

To further optimize the supply chain processes in Tegal Bahari, the e-commerce development was built based on Supply Chain Management (SCM) as a series of activities needed to plan, control, and run product flows. The processes include obtaining raw materials, producing, and distributing the products to final consumers most efficiently and cost-effectively [6]. SCM is carried out to optimize supply-demand management and coordination effectively [7]. The advantage of SCM is that a company can manage the flow of goods or products in a supply chain flow by applying a network of production and distribution activities from a company so that some companies can work together to meet consumer demands [8].

1. **Related Paper**

Selfina Pare developed a website-based e-commerce application for crocodile skin craftsmen at Daniel Skin in Merauke. This development was executed since previously Daniel Skin had only promoted its products through printed media, radio, and business cards so that the scope of its promotion area was limited. Furthermore, the sales procedure was still carried out via a manual method, in which the buyer had to come to Daniel Skin to complete transactions.. Therefore, website-based e-commerce was built to expand the range of promotions. After using this application, the transaction process then varies, and the sales reports are more detailed so that Daniel Skin's productivity can be more optimal and the revenue turnover can increase [9].

A research entitled Design and Implementation of an E-Commerce Platform for Textile Destocking Problem was conducted because the popularity of the internet, e-commerce, and new business models can provide a lot of information and choices for consumers. This research was also based on issues with excess inventory in fabric firms and the destocking approach in traditional companies that was deemed less ineffective and inefficient. Therefore, E-commerce was presented as the main solution for effective destocking. The resulting e-commerce platform consisted of product information, order management, membership management, payment, distribution, advertising, and other functions. This e-commerce was developed on a website application platform [10].

The research carried out by Xie and Xiao, 2020, resulted in the design and implementation of rural e-commerce based on web technology. This study was undertaken because the agricultural e-commerce platform continued to develop, but still had the weakness of low mobility, even though the agricultural products were produced based on the regions (scope of area) and certain times (certain seasons). This research was accomplished using mobile internet technology to complete an e-commerce system implemented in rural areas. This research also analyzed the mobile application development mode and completed the cross-platform development mode, according to the Cordova development framework. This development was conducted to realize the compatibility of various mobile systems that can operate stably on the smartphone platform, and effectively solve the problem of high agricultural product storage costs [11].

A study conducted by Kumar, et al. discussed the critical success factors in implementing supply chain management in small and medium-sized companies in India and their impact on performance. The background of this research was the globalization of the economy, e-business, and information technology providing new challenges for all organizations, especially for small and medium enterprises (SMEs). It turned out that the successful implementation of supply chain management (SCM) could provide SMEs an advantage over their competitors. However, SMEs in India and other developing countries face problems regarding the implementation of SCM, due to the lack of resources and direction. Therefore, in this study, 13 success factors of SCM in SMEs and their impacts on the performance of SMEs in India have been identified. Top management commitment, long-term vision, focus on core strengths, specialized resources for the supply chain, and development of an effective SCM strategy emerged as the most relevant critical success factors. In measuring performance improvement, different measures related to customer service and satisfaction, innovation and growth, financial performance, and internal business were taken into account [12].

Yu, et al, 2017 researched e-commerce logistics in supply chain management of the furniture industry. E-Commerce logistics companies from North America, Europe, and the Asia Pacific were subjected to a comprehensive review to obtain knowledge and insight from this practice. Future technologies, such as the Internet of Things, Big Data Analytics, and Cloud Computing were adopted in improving E-Commerce logistics in terms of system-level, operational level, possible real-time, and intelligent decision-making level in the next decade. Future opportunities and perspectives are summarized from practical implementation, so that interested parties, such as e-commerce businesses, and logistics companies attain some guidance when thinking about growing their business. E-Commerce will continue to develop with new business models. As a result, the use of logistics in Supply Chain Management (LSCM) will have a significant impact on the construction of a more modern E-Commerce system. [13].

1. **Method**

The implementation of the e-commerce of salted fish sales based on SCM was built in a website platform. This website was developed using the Scrum framework. Scrum is a framework used for software development and application software development management [14]. Scrum focuses on a flexible strategy for software product development, where development teams work to achieve a common goal. In this paper, the scheme of the Scrum framework used is shown in Figure 1.

|  |
| --- |
|  |
| **Figure 1.** Scrum Framework |

1. **Result and Discussion**

4.1. Results

1. Web Design

The SCM-based e-commerce design for salted fish sales built on this website platform was created using UML (Unified Modeling Language). UML is a "language" that has become the industry standard for visualizing, designing, and documenting object-oriented software systems with a high level of complexity [15].

1. User Interface

The user interface of the SCM-based e-commerce of salted fish sales was made for six users, namely buyers, admins, cashiers, suppliers, warehouse managers, and producers. This e-commerce was developed on a website platform built using the PHP programming language, a server-side script programming language designed for web development [16] with a database in the form of My SQL, an open-source of RDBMS (Relation Database Management System) [17]. The user interface of the SCM-based e-commerce of salted fish sales is presented in Figure 2.

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| --- |
|  |
| **Figure 2.** Admin Page |

4.2. Discussion

The website platform on e-commerce created in this research applies the B2C (Business to Consumers) scheme, a process of online buying and selling transactions carried out between producers and final consumers [18]. Meanwhile, the SCM concept in this study is applied to handle raw material management, supplier management, and warehouse management, so that the prediction of raw material costs, storage costs, production costs, and transportation costs are more effective and efficient [6].

The development of the SCM-based e-commerce website for salted fish sales was carried out using the SCRUM framework explained as follows:

1. Product Backlog

Product Backlog is a list of every feature, function, requirement, improvement, and repair that needs to be applied to a product. The Product Backlog was created to determine the priority work in a sprint determined by the product development team, product owner, and scrum master [19]. The Product Backlog on the development of SCM-based e-commerce of the salted fish sales using the website platform is presented in Table 1.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1.** Product Backlog | | | |
| **ID** | **Product Backlog Item** | **Prioritization** | **Estimate (Day)** |
| 1 | Problem Identification and Analysis |  | 1 |
| 2 | Description of Solutions |  | 1 |
| 3 | Need Identification |  | 1 |
| 4 | Designing & Prototyping the Website (UML, UI/UX Design) |  | 2 |
| 8 | Software Testing (Black Box & White Box Testings) |  | 1 |
| 9 | User Testing (User Usability Testing) |  | 1 |
| 5 | Designing and Creating Database using My SQL |  | 4 |
| 7 | Integrating All Systems  (Integrating the website application with the database; integrating all user menus, features, and the existing business processes) |  | 2 |
| 6 | Building website application with PHP programming language following the resulting design and prototype. |  | 9 |
| 10 | Repairing and Refining the Software Application  (After integrating and testing the website application software, the repair, and refinement of all existing functions and features to adjust them with the owner's product needs. |  | 2 |
| 11 | Release  (After the product of the website application has been completely repaired, the next step was documenting the application system to release the website application later. |  | 1 |
| Total | | | 25 |

The Product Backlog shows the order of prioritized works in the Scrum framework.

1. Sprint Planning

This stage was formulated in a teamwork meeting on the development of e-commerce of salted fish sales based on SCM using a website platform. The teamwork included the product owner, scrum master, and development team. The Sprint planning scheme is shown in Table 2.

|  |  |  |
| --- | --- | --- |
| **Tabel 2.** Sprint Planning Meeting | | |
| **Product Owner** | **Scrum Master** | **Development Team** |
| Collecting the input from the End-User  Determining the stakeholder requirement  Updating product backlog  Prioritizing the backlog  Deleting the blocker  Facilitating the Team meetings  Assisting the prioritized backlog  Organizing the sprint retrospective meeting  Reviewing/ demonstrating the product  Updating the team on running  Planning the sprint tasks |  |  |

1. Sprint Backlog

The sprint backlog is a stage where the development team creates a real picture of the website application being worked on, under the agreed-upon by the product owner. This stage was carried out every time the sprint was done.

1. Daily Scrum

At this stage, all members of the development team shared their problems and proposed solutions to these problems. Besides, each team member also shared the progress of each work regarding design and prototype, coding/programming, database design and creation, and others. This stage was executed every day during the sprint.

1. Sprint Review

At this stage, all team members demonstrated the e-commerce development project of salted fish sales based on SCM with a website platform, and each provided a review before the project results were finally put together/integrally. This stage was carried out after one sprint was completed.

1. Sprint Retrospective

At this stage, the Scrum process was demonstrated by the development team in producing e-commerce of salted fish sales based on SCM with a website platform. At this stage, the results of the application software testing were also demonstrated. In this case, software testing was undertaken using BlackBox and Whitebox testing methods.

1. Blackbox Testing

Black Box Testing is a test to check the functionality of the software application, observe the basic aspects of the software, and check their suitability with the user needs [20].

The e-commerce of salted fish sales based on SCM has six users, namely buyers, admins, cashiers, suppliers, warehouse managers, and producers. Each user had a module, and each module was tested using Blackbox testing. One of the recapitulations of the BlackBox test resulted in one module for the cashier user is shown in table 3 below:

|  |  |  |
| --- | --- | --- |
| **Table 3.** Recapitulation of Average Blackbox Testing Results | | |
| No | Field | The Level of Success (%) |
| 1 | ID of Order | 100 |
| 2 | Type of Order | 100 |
| 3 | The Number of Order | 100 |
| 4 | Time of Order | 75 |
| 5 | Province | 100 |
| 6 | District | 75 |
| 7 | Sub-District | 100 |
| 8 | Urban Village | 100 |
| 9 | Address of Buyers | 75 |
| **Mean** | | **91.6** |

The recapitulation of Blackbox Testing results is demonstrated in Figure 3.

|  |
| --- |
|  |
| **Figure 2.** Graph of Recapitulation of Blackbox Testing Results |

1. Whitebox Testing

Whitebox Testing is a test by checking the design details, using the control structure of the program design procedurally to divide the test into several test cases [21].

Based on the results of the test on one of the user accounts, namely "cashier" with Whitebox testing using the base path technique, the path of each feature passed could be adjusted based on the results of Cyclomatic Complexity (CC) with a flowgraph made in accordance with Table 4.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 4.** Recapitulation of the Suitability of CC Results with the Flowgraph | | | |
| **No** | **Feature** | **The Passed Paths** | **The Level of Suitability** |
| 1 | Adding Order Transaction (path 1) | { 1,2,3,5 } | Suitable |
| 2 | Adding Order Transaction (path 2) | { 1,2,4,5 } | Suitable |
| 3 | Changing the Order Report (Path 1) | {1, 2, 3, 9} | Suitable |
| 4 | Changing the Order Report (Path 2) | { 1, 2, 4, 5, 6, 7, 9 } | Suitable |
| 5 | Changing the Order Report (Path 3) | { 1, 2, 4, 5, 6, 8, 9 } | Suitable |
| 6 | Adding Invoice (Path 1) | {1, 2, 3, 9} | Suitable |
| 7 | Adding Invoice (Path 2) | { 1, 2, 4, 5, 6, 7, 9 } | Suitable |
| 8 | Adding Invoice (Path 3) | { 1, 2, 4, 5, 6, 8, 9 } | Suitable |

The test results were then compared to the expected output as presented in Table 5.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 5.** Comparing Path-Based White Box Testing | | | | |
| **No** | **Feature** | **The Expected Paths** | **The Obtained Paths** | **Percentage of Success** |
| 1 | Adding Order Transaction | 2 | 2 | 100 % |
| 2 | Changing the Order Report | 3 | 3 | 100 % |
| 3 | Adding Invoice | 3 | 3 | 100 % |

In addition to testing the application software that had been produced, testing was also carried out based on a user perspective or Usability Testing to determine the extent to which the SCM-based e-commerce application software for salted fish sales was easy to learn and use. This testing also identifies user satisfaction as well as the efficiency of the application made. The results of the assessment of this usability testing method provide input for future application development to make it even better [22].

Usability testing was conducted by distributing questionnaires randomly to ten respondents consisting of producers, community, suppliers, cashiers, warehouse managers, academicians, and Software Developers. The questionnaire consisted of ten questions regarding practicality, efficiency, effectiveness, and user satisfaction. The ten questions are mentioned in Table 6.

|  |  |
| --- | --- |
| **Table 6.** List of Questions | |
| **No** | **List of Questions** |
| 1 | I think this application is easy to use |
| 2 | I find this system is not overly complicated |
| 3 | I think I can use this application easily |
| 4 | I think I do not need others' help to use this application |
| 5 | I find many functions integrated into this application |
| 6 | I think this application is consistent enough |
| 7 | I do not find any complicated things in using this application |
| 8 | I feel comfortable using this application |
| 9 | I do not need much time to learn how to use this application |
| 10 | I think the user will easily understand in using this application |

The scores suitable with those ten questions are described in Table 7.

|  |  |  |
| --- | --- | --- |
| **Table 7.** Description of Scores | | |
| **No** | **Score** | **Note** |
| 1 | 5 | Excellent |
| 2 | 4 | Good |
| 3 | 3 | Okay |
| 4 | 2 | Poor |
| 5 | 1 | Awful |

Based on the list of questions in the questionnaire, the respondents' scores are as follows:

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| --- |
|  |
| **Figure 3.** Respondents’ Scores |

The total scores in Figure 3 were calculated using SUS (System Usability Scale) with the following formulation:

*Y = Q/S*×100%

Q = The number of respondents’ scores of each question

S = The number of maximum respondents’ scores

Y = The percentage

The result of Usability Testing using SUS is:

|  |  |  |
| --- | --- | --- |
| Y = | 442 | × 100% |
| 500 |
| 88.4% |  |

The Adjective Rating based on the SUS scale is shown in Table 8.

|  |  |  |
| --- | --- | --- |
| **Table 8.** Adjective Rating | | |
| **Score** | **Grade** | **Adjective Rating** |
| >80.3 | A | Excellent |
| 68-80.2 | B | Good |
| 67 | C | Okay |
| 51-66 | D | Poor |
| <51 | E | Awful |

Based on the results of user usability testing with the SUS scale, the implementation of SCM-based e-commerce of salted fish sales with a website platform was categorized as excellent.

1. Increment

The increment is the final stage of the Scrum framework, where a finished piece of work is useable for supporting empiricism and inspectable at the end of the Sprint. In this case, every time a sprint is carried out, the result is an increment, as a step to achieve the goal/vision. This stage is the justification of the product owner, whether the project has been completed.

1. **Conclusion**

The research results concluded that the implementation of SCM-based e-commerce of salted fish sales has been completed by applying the B2C (Business to Consumers) scheme, as an online buying and selling transaction process carried out between producers and end consumers. Meanwhile, the application of SCM to e-commerce could handle the management of raw material, supplier, and warehouse management, and thus the costs of raw material, storage, production, and transportation could be streamlined. The implementation of the e-commerce was built on a website platform developed by applying the Scrum framework for 25 days.

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