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Analysis and Design of Frozen Food Production and Sales Information Systems Using the ICONIX Process

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Abstract— Micro, Small, and Medium Enterprises (MSMEs) encourage the country's economy to develop rapidly. *Pempek Kabeja* MSMEs is one of the Frozen food businesses located in Cirebon, which is growing and has many enthusiasts because of its instant, easy, and practical nature. However, some problems exist in Kabeja MSMEs, namely the process of recording and bookkeeping in the sales and production process, which is still manual, where the recording still uses paper. This research requires business owners to improve services for the convenience of consumers and to increase competitiveness between competitors. Improvements include implementing an information system for *Pempek Kabeja* MSMEs, which can simplify the process of recording and accounting for production and sales because, with an information system, the process will be better. The development of this MSME information system uses the System Development Life Cycle method. SDLC has a framework, one of which is Use Case Driven Object Modelling with UML, commonly called the ICONIX process. The ICONIX Process is a lean, efficient method for using case-driven UML modeling that fully covers object-oriented analysis and design using a core set of UML diagrams and methodologies. Robustness analysis, a technique for bridging the gap between analysis and design, is its major activity. The ICONIX process has six stages: requirements, analysis / preliminary design, preliminary design review, detail design, critical design review, and implementation. However, this study did not conduct the critical design review stage. The result of this research has integrated information systems so that it can help the production and sales process of *Pempek Kabeja* MSMEs more effectively and efficiently.

Keywords— Analysis and Design, MSME, Information Systems, ICONIX Process, Frozen Food

I. INTRODUCTION

According to Law Number 20 of 2008, Micro, Small, and Medium Enterprises (MSMEs) are companies owned and managed by one person or owned by several people with a certain amount and wealth and income[1]. Currently, information systems are needed by many business actors because they are considered capable of helping to manage various kinds of needs. Implementing an information system is the same as increasing the efficiency and effectiveness of the MSMEs. Business actors must act quickly regarding technological advances as if they have implemented them into their businesses. MSMEs need to do this to adapt to current technological developments [2].

Pempek Kabeja MSMEs in Cirebon Regency are engaged in processing various types, which until now is growing and has many enthusiasts. However, all procedures for the activities of SMEs are carried out manually without any information technology factors. This raises several problems, such as inaccurate production and sales activity report data, causing the company's target to fail.

In conducting this research, a previous study developed a device web-based software that can be used to manage the MSME's production, operations, and marketing activities[3]. The issue of data mismatches in the business processes of MSME might be reduced to a manageable level. In this study, the method used is the waterfall method. Software development results can produce valid functions according to user needs.

In this study[4], it was revealed that the process of ordering goods was still manual, so the production party also had to wait for the data manually. The research method used is the ICONIX Process, where the research results are in the form of a software design that can then be implemented as expected. Based on several previous literature studies become the basis of reference in this study.

Based on the problems described, it is necessary to have a production and sales information system that MSME actors can use to support various production and operational activities and product marketing. Thus, it can minimize the problem of data inaccuracies related to production and sales activities. However, building an information system requires a basic concept or method known as SDLC or Software Development Life Cycle [5]–[7] is necessary.

In this study, the SDLC model used is Use case Driven Object Modelling with UML, commonly called the ICONIX process. The ICONIX Process method was selected because it offers a minimalist use of UML so that it only has a few steps needed to perform system analysis [8]–[11]. The stages required in this method are requirements, analysis/preliminary design, milestone 2: preliminary design review, detailed design, milestone 3: critical design review, and implementation. The results of this study are in the form of a production and sales information system design which can then be implemented according to expectations. Thus, it can provide convenience for MSME actors, especially *Pempek Kabeja* MSMEs in managing the production and sales processes.

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II. RESEARCH METHODOLOGY

The methodology is important in a study with the methodology to determine research results more comprehensively[12]. The methodology used in this study has several stages, as follows:

1) Literature Study: Collecting literature and references needed to support research from journals, books, and articles.

2) Collection *Data*: Collecting literature and references needed to support research from journals, books, and articles.

3) Needs Analysis Requirements: Analysis is carried out through analysis of the company's business processes, proposals, determining functional requirements, making *domain modeling*, and *requirements review*.

4) System Design: In designing a system, several steps are carried out, namely analysis/preliminary design, which produces robustness diagrams. Milestone preliminary design review results in updating the domain model and detailed design that produces sequence and class diagrams.

5) Conclusions and Suggestions: Conclude by providing solutions to the issues posed and recommendations that can be considered in the subsequent study.

Review is an activity to review scientific sources and literature that discuss a certain topic [13]. The benefit of the literature review is that it provides views of the authors to identify theories that align with the research conducted [5].

A. *Micro, Small, and Medium Enterprises (MSMEs)*

Micro, Small, and Medium Enterprises (MSMEs) According to the Central Statistics Agency (BPS), the meaning of MSMEs is based on the quantity of labor. Namely, small businesses have a workforce of 5 to 19 people. In comparison, medium businesses have a workforce of 20 to 99 people [14].

B. *Business Process*

The business process is a series of activities formed by working together in an organization or technical environment. It can also be interpreted as a collection of interrelated structured activities in solving certain problems that produce products or services with certain goals[15].

C. *Use case Driven Object Modelling with UML (ICONIX Process)*

The ICONIX process is a design or development method that refers to the use case[8]. The development process begins with identifying use cases, which then serve as the foundation for establishing the model and behavior of the constructed system [9]. In Figure 1, the ICONIX process includes several stages. At each stage, useful outputs can be produced at the next implementation stage. The documentation process in each output is useful, but the process developed can be helped. Each stage produces output used in the next stage's work.

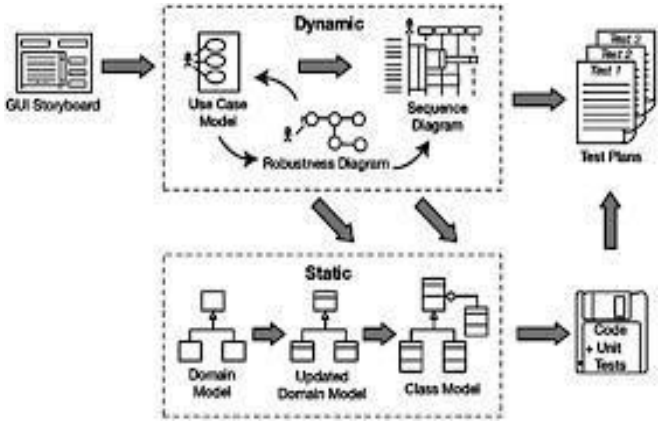

Figure 1. ICONIX Process

III. RESULT AND DISCUSSION

The results of the study should be clear and dense. The discussion should describe the significance of the research results, not repeat them. Avoid using citations and excessive discussion of published literature.

Results and discussion are the part where the data and findings in a study are described. The description presented includes an explanation of the data examined following the data analysis results. The explanation is obtained from observations or interviews and other descriptive information.

Business process analysis is defined by modeling using BPMN (Business Process Modelling Notation) to describe the current and proposed business processes in *Pempek Kabeja* MSMEs. The identified business processes include current and proposed business processes [16]. Figure 2 is an example of business process modeling.

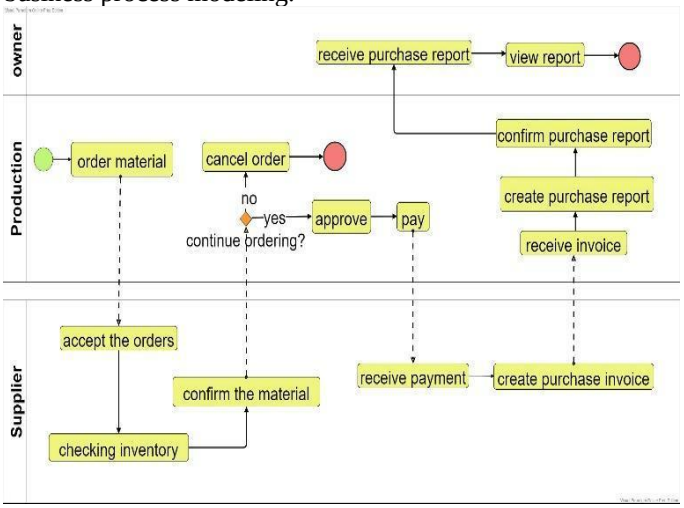

Figure 2. Current Business Process

The diagram in Figure 2 shows the current business process in which the entire process is carried out manually. Manual without any information technology. At first, the production department orders materials directly from the supplier. Then the order request will be checked to determine whether the stock of materials is sufficient. If it is sufficient, then proceed to the payment process. The supplier receives payment from

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the production department and then creates and submits an invoice to the production department. Finally, the production department makes a purchase report and submits it to the owner.

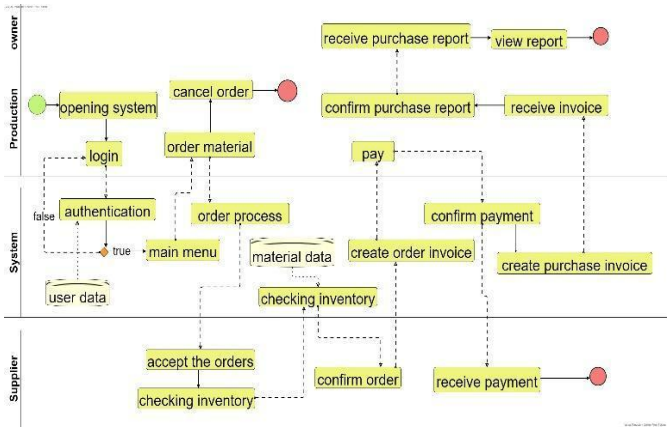

Figure 3. Business Process Suggestion

Figure 3 is a business process proposal diagram, which has been computerized. First, the production department opens the system and logs in. The system checks the username and password; if correct, they will be directed to the main menu. On the main menu, the production section can select the material purchase menu and choose the type and quantity of the desired material. The system will forward the order request to the supplier.

Furthermore, if the material stock is sufficient, the supplier will confirm the material order and create a purchase invoice, after which the production department can choose a payment method and make payment. Next, the system confirms the payment and sends proof of payment from the production department to the supplier. After the supplier confirms the payment, the system will store purchase data and make a material purchase report. Finally, the system sends a purchase report to the production department, and the production department can send the report to the owner.

A. Requirements

Requirements are stages where there is an explanation of a system or the needs and limitations of the system[17]. Requirements can also be interpreted as the definition of a function in the system.

1) Functional Requirements: Stakeholder identification, problem identification, actor identification, system requirement analysis, and specification were carried out, and obtained four actors from the identification of these actors, namely Customer, Owner, Production, and Supplier. The results of the analysis and specification of requirements are the definition of 12 system requirements. Table I has several features that must be adapted to the previously identified system requirements.

TABLE I
FUNCTIONAL REQUIREMENTS

Feature Code	Feature
FIT-1	Login
FIT-2	Production Report
FIT-3	Material Report
FIT-4	Sales Report
FIT-5	Materials and Stock Update
FIT-6	Materials Order
FIT-7	Materials Payment
FIT-8	Confirm Material Payment
FIT-9	Product and Stock Update
FIT-10	Product Order
FIT-11	Product Payment
FIT-12	Confirm Product Payment

2) *Domain Modeling:* Domain modeling identifies objects and terms contained in the functional requirements stage. After collecting the objects, filtering is carried out until they are conical into ten parts. Figure 4 describes the domain model based on actors and processes in *Pempek Kabeja* SMEs, which consists of raw material stock, production, product, supplier, user login entities, user, customer, owner, purchase, report, and sales. The processes applied are appropriate and have their respective roles for the sustainability of the MSME *Pempek Kabeja* MSMEs.

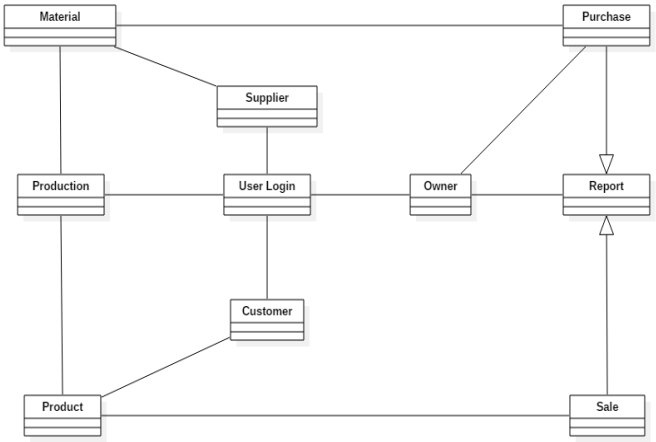

Figure 4. Domain Model

3) Behavioral Requirements: Construction of a GUI storyboard or initial display design as well as use case diagrams that describe the features and functions of the system. The GUI storyboard is built based on the features obtained from the previously written functional requirements.

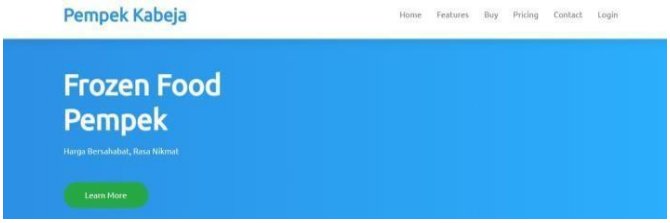

Figure 5. UI Home

Figure 5 shows the design of the home page display as a customer. The home itself is an important part of a design. On the home page itself, you can access the menus on the website. The page is created based on feature and functional requirements.

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Figure 6 is a use case diagram created and has 18 use cases. There are four actors owner, customer, production, and supplier. The Owner actor has four use cases: logging in, viewing production reports, viewing material purchase reports, and viewing sales reports. The Customer actor has four use cases: logging in, ordering products, paying for products, and viewing product stock. Production actors have five use cases: logging in, updating product stock, considering the stock of purchased materials, paying for raw materials, and buying raw materials. The Supplier actor has five use cases: logging in, checking material stock, updating material stock, sending raw materials, and confirming payment.

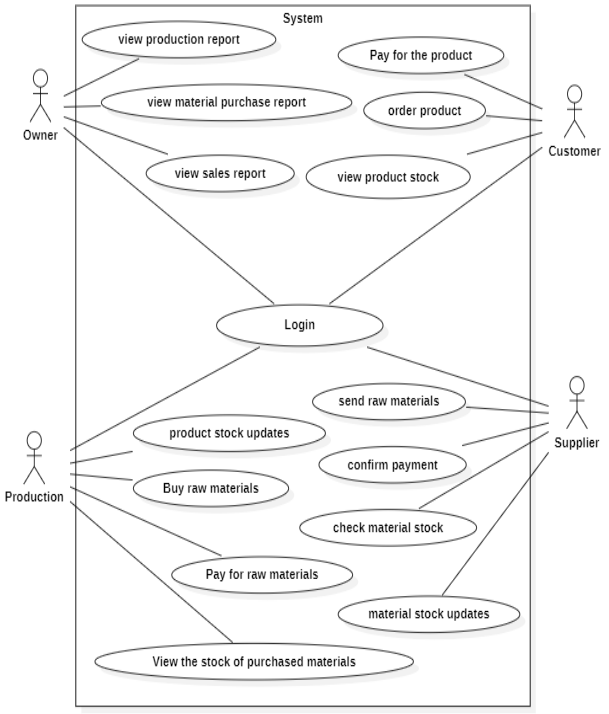

Figure 6. Use Case Diagram

4) Milestone 1: A review of the previous analysis is carried out. The review was conducted on three actors: suppliers, production, and customers. The results obtained are a few additions and updates to the *functional requirements.* That is, research on raw material payments such as validation of payment methods, then purchase and sales data is displayed neatly, and customers can cancel before paying.

B. Analysis/Preliminary Design

An initial design or an estimate of the dimensions of the material that will be used to form the structure are both functions of the preliminary design process. Which is an analysis process to measure the shape or structure of a systematic process for the first time before it is calculated using a computer application to get better results in the future. The preliminary design process is also known as preliminary analysis.

Robustness analysis in this study uses a Robustness diagram where this diagram is a description of the object of the use case that has been made. This diagram is used as a link between analysis and system design [3]. Figure 7 This robustness diagram is the production flow in Purchasing raw materials. Enter the material purchase page, select the material to be purchased, and enter purchase data such as quantity, type, and address. If you have, then all you have to do is check out your purchase and be directed to the payment menu.

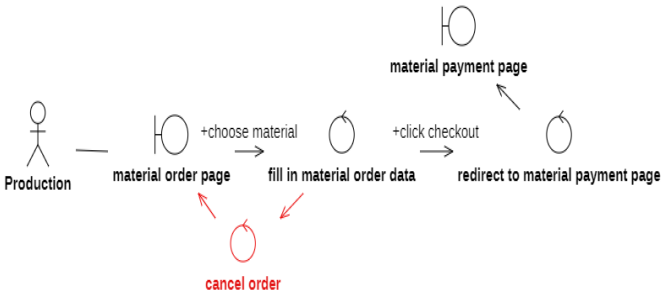

Figure 7. Robustness Diagram Buy Material

C. Detailed Design

Detailed design is a more detailed and clear design in the form of drawings or diagrams where there are specifications and information [18]. This detailed design serves to find out an overview of the design or diagram of the system in detail or in detail.

1) Sequence Diagram: Sequence diagrams are made using cases and robustness diagrams, which are 14 pieces. Naming for actor, boundary, control, and entity used is a term that is adapted to the domain model that has been created. The flow of the sequence diagram follows the robustness diagram that previously followed the use case scenario. The following is a sequence diagram that has been created:

2) Raw Materials: Figure 8 explains the production selects the menu to buy materials, requests data from the system, and the data is found to display the raw materials to be purchased. Next, select the raw materials, which will display the details of the raw materials. The process of buying raw materials is carried out on a validated system. If the purchase is successful, it will display a successful message. If the purchase fails, the message displayed is the purchase failed.

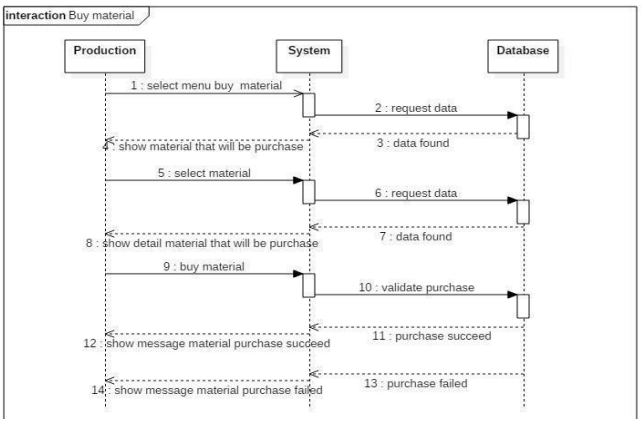

Figure 8. Sequence Diagram of Buying Materials

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3) Class Diagram: A class diagram is a type of diagram in the form of a structure in the UML model[19]. Diagram clearly describes each object's structure, attributes, classes, relationships, and methods. Class diagrams provide data as relationships between classes, not explaining what happened. *Class diagrams* in a project generally use an object-oriented concept, making them easy to use. The following is a class diagram of the *Pempek Kabeja* MSME in Figure 9.

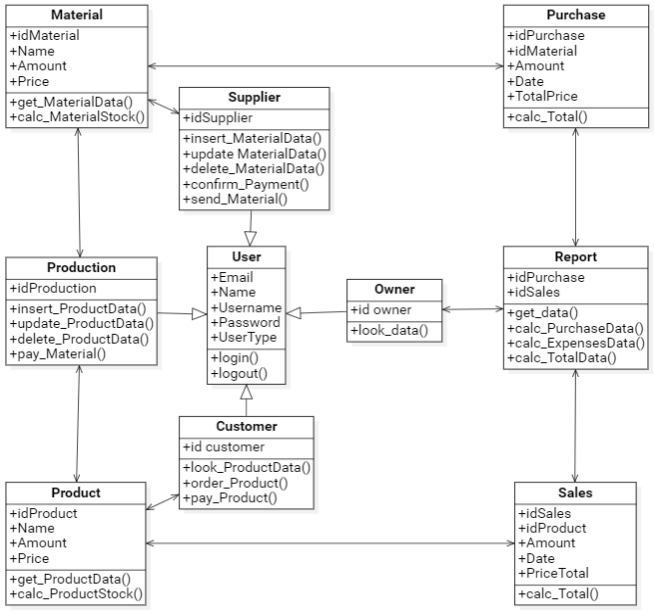

Figure 9. Class Diagram

There is Figure 9 of making a sequential class diagram based on the processes in the *Pempek Kabeja* MSMEs. Here, there are several entities, namely raw material, which has the attributes of idMaterial, Name, Amount, Price, and operations including get, calc_MaterialStock. The Production (production) entity has an idProduction attribute and then insert, update, delete_ProductData, and pay_Material operations. The Product entity (product) has attributes idProduct, Name, Amount, Price, and then the get operation, calc_ProductData. The Supplier entity has the idSupplier attribute, then insert, update, delete_MaterialData, confirm_Payment and send_Material operations. User entity (user) has attributes Email, Name, Username, Password, UserType, then login, and logout operations. The Customer entity (customer) has the idCustomer attribute, then the operations look_ProductData, order, pay_Product. The Owner entity has the id_owner attribute and then the look_data operation. The Purchase entity has the attributes idPurchase, idMaterial, Amount, Date, TotalPrice, then the calc_Total operation. The Report entity (report) has attributes idPurchase, idSales, then operations get_data, calc_PurchaseData, calc_ExpensesData, calc_TotalData. The Sales entity (sales) has attributes idSales, idProduct, Amount, Date, PriceTotal, and then the calc_Total operation.

IV. CONCLUSION

The examination and planning of the information system for production and retail sales provide the basis for the conclusions that can be formed. There are two requirements analysis stages: business process analysis and ICONIX 1 process requirements. Current and proposed business process modeling is carried out in the business process analysis process. The ICONIX 1 process has four requirements stages: functional requirements, domain modeling, behavioral modeling, and requirements review. The functional requirements stage produces 12 system feature requirements. At the domain modeling stage, the nouns and terms that appear in the functional requirements stage are filtered and modeled into domain modeling. At this stage, 35 domains were generated and further simplified into ten main domains to be used as classes.

At the behavioral modeling stage, it produces a GUI storyboard or initial display design. It uses case diagrams that describe the features and functions of the system and the requirements review stage. The review was conducted on four actors: the owner, supplier, production, and customer. The results obtained are a few additions and updates to the *functional requirements.* The ICONIX *process* itself has six stages. However, this study did not conduct the critical design review stage.

This analysis or preliminary design stage produces 15 robustness diagrams that refer to the object description of the use case that has been created. In the detail design stage, a sequence diagram is made, which refers to the use case and robustness diagram, and 15 sequence diagrams are produced. In addition to that, we will be changing the domain model to build class diagrams of entities, controllers, models, and views. The result of this research is the *Pempek Kabeja* MSMEs website which has integrated information systems that can help the production and sales process of *Pempek Kabeja* MSMEs more effectively and efficiently. The suggestions from the results of this study are that the results of the analysis and system design using the ICONIX process method can be considered for the system implementation stage.

Further implementation can add functionality and system testing to implement the system as expected. Hopefully, this research can be developed further and comprehensively. Also, hopefully, this research can guide people that want to make a production and sales information system.

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