

## Use Case Framework of Computerized Production Monitoring Processes in Textile Industry

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### ABSTRACT

Use cases are a description of system functions resulting from needs analysis and obtained from interviews and observations. In standard practices, this stage is also known as the most time-consuming stage. Although every use case produced in software development is unique, there is always a similarity in its function to systems made previously in other organizations. These similarities are studied to reduce time in the process during the requirements analysis stage. Many studies have built and used a Use Case Framework (UCF) to be used together by software developers. So far, UCF has been owned by the banking industry in mapping use case standards in ATMs, health in standardizing use cases in electronic medical records, libraries in standardizing information retrieval, and mapping processes in crowdfunding. This research adds to the list of the latest UCFs produced, namely in the related textile industry, in standardizing the functions that exist in computer-based production monitoring systems. It is based on the fact that there are many textile companies globally, with more than 1.000 of them are established in Indonesia. This study investigated eight Indonesian textile companies to obtain information data to determine what functions are required. The data collection techniques used were interviews and observation. More stages were carried out in this study afterward, namely defining Actor Analysis and Functional Methods, Combining Analysis, Classification of Use Cases, Describing Use Case Scenarios, and Visualizing Frameworks. The data analysis results obtained from each company, we managed to define 10 main use cases, 4 supporting use cases, and four specific use cases. This study's products can help provide a reference in using case design to create a computer-based textile company monitoring system.



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### I. INTRODUCTION

Monitoring is monitoring, which can be explained as awareness of what you want to know, to be able to make measurements through time that shows the movement towards the goal, Monitoring will provide information about the status and the tendency that the completed measurements and evaluations are repeated over time, to check the following process object to evaluate the progress toward the current condition [1]. In the series of manufacturing a product, one of the main functions of monitoring is to ensure that a plan that

has been carried out can be carried out correctly in the production process and produces results in the form of products with the desired quantity and quality. [2]. To carry out the production process, the company needs raw materials to be processed into products with added value [3], may be related to resources and work [4], and product quality also dramatically affects the level of success in competition in the business world [5], all of which require a robust monitoring mechanism. In other words, monitoring is a critical process in organizational activities that can determine the implementation or failure of a corporate goal. The purpose of

monitoring is to ensure that the organization's main tasks can run according to a predetermined plan [6]. Especially in monitoring a company or factory, a lot has been done to support activities and maximize the available resources [7].

Technology encourages the monitoring process to be carried out with the help of computers. Monitoring systems have been used in various fields, one of which is in manufacturing [8], clothing [9], shoes [10], finance [11], and health [12], and can provide an evaluation of the final product results, where the evaluation process can carry out from data retrieval from monitoring that has been done [13]. One of the industries that have utilized information technology in regulating its production monitoring process is the textile industry, starting from upstream activities (yarn manufacturing) [14] [15] to downstream activities (making apparel) [16]. Typical problems in companies engaged in textiles are gaps in communication and cooperation between divisions in companies responsible for providing information related to the company's production [17]. This is where the monitoring system plays a role, ensuring that communication and cooperation can run smoothly with information technology.

In terms of informatics, the construction of a production monitoring system in the textile industry is carried out using a software engineering process starting from the needs analysis stage. The process then produces a software design that will be built until the final product is complete. Several studies state that this stage is the most important in a series of software development activities [18]. The more accurate the needs analysis process is, the higher the success rate of making and implementing the software [19]. But unfortunately, this stage is also known as the most time-consuming stage because this stage is very dependent on the availability of time from stakeholders in the organization related to the production monitoring system to be built, especially in terms of telling business processes that occur and what are the expected functions of the production monitoring system to be made. In the business reference book entitled "Indonesian Textile and Textile Product Directory, 2017," in the index based on companies (Index by Company), especially in West Java province, there are approximately 437 textile companies. The book also informs that about 1,047 textile and garment companies in Indonesia range from small to medium and large scale. Seeing the fact that needs analysis is a long process and also the fact that the textile industry has a very large number of companies in Indonesia, it is deemed necessary to have a general framework that can be used jointly by software developers, significantly to speed up the process of analyzing their needs. A framework explicitly made for requirements analysis and system design is often known as the Use Case Framework (UCF).

UCF development is based on the following essential matters: type of industry, industry process standards, and the number of actors in the industry [20]. For example, a labor-intensive industry, with standard operating standards / tight, and a large enough number of industry players in a particular

area will undoubtedly have a high chance of having its own UCF. So far, UCF has been owned by the banking industry in mapping use case standards in ATMs [21], health in standardizing use cases in electronic medical records [22], libraries in standardizing information retrieval [23], and mapping processes- crowdfunding process [24]. Many researches on the development and design of monitoring information systems for textile companies have been carried out, but each previous research only analyzed 1 textile company. Therefore, this research creates a use case framework as a result of interviews, observations and literature studies at several textile companies. This research will add a list of the latest framework use cases produced in the related textile industry, to standardize the computer-based production monitoring system's functions.

## II. METHODS

The activity of designing a use case is at the stage of analysis and system design, so the center of the activities carried out in this study is there. The research started by collecting data from the textile companies that had been determined. This research was taken from 8 (eight) textile companies both upstream and downstream. In facilitating communication and interaction with resource persons, all selected companies' locations are those domiciled in Bandung Raya. Data collection is one of the critical elements of the analysis and planning process [25] and consists of interviews and observations. The interview process took place in their respective companies, with the possibility of meeting outside the office if deemed necessary. At each meeting, we highlight various topics such as business processes; organization profile with their structure, vision, and mission; problems or needs in the process that need to be addressed; and actors, their roles in the process, and specifically defines the flow of information between each actor throughout the process. Apart from interviews, we also conducted observations that took place in the same place. This activity highlighted more findings that previous interviewees did not mention. Next, we recorded and summarized our findings and validated them to the interviewees before deciding to place them as research facts.

Data collection to fulfill research needs was carried out using several methods to determine the running business processes, the actors involved, related documents, and some of the 8 related textile companies' current work. The data collection process includes interviews, observations, and literature studies. The data collection process was carried out for eight months, each month at one textile company. Interviews were conducted with several actors involved in the production process, each actor giving 60 minutes - 90 minutes. Actors involved in the interview have different discussions, such as discussing business processes, discussing sales, and discussing problems. Collecting data using observation is given a maximum time of 120 minutes to see what activities are in the textile company, producing data for research. To increase knowledge about similar research, a

literature study was also conducted by reading relevant previous research journals.

**III. RESULT AND DISCUSSION**

After conducting a series of interviews, observations and literature studies, we have obtained some information related to textile companies, namely business processes, actors involved, and available documents.

*A. Defining Actor Analysis and Functional Methods*

We collected data by conducting interviews with four workers in each company. Each of these workers has their position and position. We divide it into positions, as in table 1.

TABLE 1  
THE WORKERS WERE INTERVIEWED IN EACH COMPANY

Division	Position	Gender	Last Education
Production	Head of Division	Women	High Scholl Equivalent
QA/QC	Staff	Man	High Scholl Equivalent
Planning Production	Head of Division	Women	High Scholl Equivalent
HRD	Staff	Man	Bachelor
Warehouse	Head of Division	Man	High Scholl Equivalent
Marketing	Staff	Man	High Scholl Equivalent

Data collection results in interview scripts and minutes of observations in each company were divided and classified into two parts: actor analysis and functional methods. The results of the actor analysis and functional methods were again shown to the resource persons for verification, and then the report was made.

1) *Actor Analysis*: Analysis of ongoing system users explains who the actors are involved in the running system and is one of the steps that must be taken in analyzing use cases [26]. Analysis of running system users is an explanation of who are the actors involved in the running system. Based on the interviews and observations in textile companies, it can be concluded which actors are involved in the work process with their respective duties. The definition of actors can be seen in table 2.

TABLE 2  
RESULTS OF THE ANALYSIS OF ACTORS MONITORING INFORMATION SYSTEMS OF TEXTILE INDUSTRIES

Actor	Description
Production Manager	Carry out the ongoing production monitoring process for orders to be produced and receive production results
Marketing	Carry out the process of receiving orders from customers

Planning Production Division	Carry out the production planning process for orders that the production department will produce by making a production plan to match the specified time
Production Section (Fabric)	Carry out the production process according to the planning that has been made previously
Production Parts (Accessories)	Make a selection of accessories used in an order
Production Section (Laminating)	Receive PO, schedule production, carry out the laminating process and report production results
Production (cutting)	Carry out the process of making patterns, composing, binding patterns, and cutting patterns
Production Section (Sewing)	Perform product sewing
Production Department (QA / QC)	Check the finished product and carry out the finishing process and then create a production report
Export section	make deliveries on schedule
Raw Material Supplier Section	provide raw materials to order
Pelanggan	Customer
Warehouse Section	Taking care of all the raw material needs

2) *Functional Analysis*: Software Requirements Analysis is one of the steps for software development. This stage will produce conditions owned by the software, which will be developed, taking into account all stakeholders' needs. The software to be built must follow user needs. The analysis of functional requirements is based on the processes involved in the textile company's production process. Based on the ongoing process analysis results, it can be concluded that the functions found in table 3.

TABLE 3  
RESULTS OF FUNCTIONAL ANALYSIS OF INDUSTRIES TEXTILE MONITORING INFORMATION SYSTEM

Functional	Description
PO receipt from the Marketing department	The manager of the marketing bag carries out the process of receiving POs
Confirm PO	The manager carries out the PO confirmation process from the marketing department
PO receipt that the manager has confirmed	PO acceptance from the manager, which the production planning department carries out

Production planning	The process of making production planning carried out by production planning based on PO
Production Planning Changes	The process of changing production planning at certain times
Schedule creation	Making production schedule results from production planning based on PO
Schedule changes	The process of changing the production schedule at certain times
PO receipts from production planning	PO receipts that have entered into the production schedule from the production planning section to the production bags
Fabric management	Management of the production process at the fabric stage
Accessories management	Management of the production process at the accessories stage
Laminating management	Management of the production process at the laminating stage
Cutting management	Management of the production process at the cutting stage
Sewing management	Management of the production process at the sewing stage
QA / QC management	Management of the production process at the QA / QC stage
Order Process	To place a customer order a product
Planning Process	To make production planning based on orders
Production process	For production management to be made by order
Production Report Making	To report the production results that have been completed
Catalog	Customers can see a catalog of examples of bag shapes and materials to be produced

3) *Document Analysis*: Document analysis is an explanation of the documents used during the ongoing production process in a textile company. Document names and descriptions can be seen in table 4.

TABLE 4  
RESULT OF DOCUMENT ANALYSIS OF TEXTILE MONITORING INFORMATION SYSTEM

Actor	Description
PO documents	Contains data on orders that must be made and a

	description of the production time
Packing List Documents	Filled with product data that has been produced and will be given to the packing section
Worksheet document	Contains documents used by each part of the production to see the tasks that must be done
Production Report Document	Contains data reports on production results following standards, defects, and delays
Export Schedule Documents	Contains the schedule for the order to be sent
Arrival Schedule Documents	Filled with the schedule for the arrival of goods from the raw material provider
Order Form	Filled with fields filled with information on goods and order as a condition for the order
Production Schedule	As a reference for the implementation of production
QC report	Contains a report on the results of the product checking
Raw Material Documents	Contains raw material data
Production Planning Documents	contains documents used by each production section to view production plans

### B. Combining Analysis

The next stage is to combine analysis, both actors and functional methods. The process of combining the two uses the most frequent occurrence method. Previously, both existing actors and functions were codified one by one by the analyst data. Several similar definitions or terms appear even though with different words, for example, actor "warehouse head" with "warehouse manager" or the function "input production schedule" with "schedule management." This stage's final result is a table of actors and functions in order of the most frequent appearances.

The amalgamation was carried out on actor analysis and functional analysis. The combination produces a table containing the module name and who will use or carry out its functions. The results of the combined analysis can be seen in table 5.

TABLE 5  
RESULT OF MERGING ANALYSIS OF TEXTILE MONITORING INFORMATION SYSTEM

Module	Actor
Manage User	Admin
Manage Order	Admin
Manage Planning	Planning and warehouse bag

Manage Raw Materials	The warehouse section, the planning section, and the production section
Manage Production	Production department, and warehouse
Manage Cutting	Production (Cutting)
Manage Sewing	Production Section (Sewing)
Manage Accessories	Production parts (accessories)
Manage QA / QC	QA / QC Production Department
Manage Reports	Production manager
Manage Styles	Warehouse Bag
Manage Cloth	Production Bag (Cloth)
Manage Laminating	Production Bag (Laminating)
Manage Role	Admin
Manage PO	Production Manager, Bag Marketing, Production Planning Bag
History	Admin, production manager

C. Use Case Scenario Description

Based on the functional analysis, it can be concluded that several functions need to be used in carrying out the production process. These functions are divided into several modules. The functional analysis result modules are shown in Table 6.

TABLE 6  
LIST AND DESCRIPTION OF THE USE CASE RESULTS OF THE COMBINED ANALYSIS

Module	Description	Source
Manage User	The module used to manage monitoring system users	Results of several studies on monitoring systems
Manage Order	The module used to manage orders that come from customers	Results of interviews with the product section
Manage Planning	This module is used to manage planning in textile production	The results of interviews with and observations in the production planning section and the QA section
Manage Raw Materials	This module is used to manage raw materials stored in the warehouse	The results of interviews with the production planning division and the warehouse section
Manage Production	This module is used to manage the entry	Results of interviews with

	and exit of manufactured goods	the production department
Manage Cutting	This module is used to manage raw materials/fabrics that enter the cutting section	Results of interviews with the QA and production department
Manage Sewing	This module is used to manage raw materials/fabrics that enter the sewing section	Results of interviews with the production and QA departments
Manage Accessories	This module is used to manage raw materials/fabrics that enter the accessories installation section	Results of interviews with the QA and production department
Manage QA / QC	This module is used to process the test results and check the final results of the production	The results of observations and literature with the title Design and Design of Web-Based Quality Control and Defective Application Monitoring Reports on Shoe Production
Manage Reports	This module is used to manage reports in the production process from start to finish	Results of interviews with the production and QA
Manage Styles	This module is used to manage the style of the material being processed	Results of interviews with the production department
Manage Cloth	This module is used to manage products that have entered the fabric stage	Results of interviews with the QA section
Manage Laminating	This module is used to manage products that have entered the laminating stage	Results of interviews with the QA section
Manage Role	This module is used to manage user roles using a monitoring system	Results of interviews with the HRD department
Manage PO	This module is used to process orders	The results of interviews with the production planning division, the marketing section, and the QA section

History	This module is used to display some history of the production process and orders	Results of interviews with the HRD department
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Each module above has several functions. These functions are used to meet the needs of a textile company monitoring information system. These functions can be seen in table 7.

TABLE 7  
ANALISIS FUNGSIONAL SISTEM INFORMASI MONITORING PERUHAAN  
TEKSTIL

Module	Function
Manage User	a. Add User b. View User c. Edit user d. Delete user
Manage Order	a. Add orders b. Edit orders c. View orders
Manage Planning	a. Add Planning b. Edit Planning c. View Planning d. Create Schedule
Manage Raw Materials	a. Add raw material b. Edit raw material c. Raw material Verification
Manage Production	a. View status b. Edit Production
Manage Cutting	a. View history b. Cutting Verification
Manage Sewing	a. View history b. Verifkasi sewing
Manage Accessories	a. View history b. Accessories verification
Manage QA / QC	a. View history b. QA/QC verification
Manage Reports	a. Print Report b. View Report
Manage Styles	a. Add style b. View style c. Update style
Manage Cloth	a. View Fabric b. Update Fabric Status c. View Fabric Detail
Manage Laminating	a. View Laminating b. Update Laminating c. View Laminating Detail
Manage Role	a. Add Role b. Edit Role c. View Role
Manage PO	a. Create PO b. View PO c. View PO Detail

	d. Send PO e. Apporve PO
History	a. View History

The next stage is to describe the entire use case with the use case scenario. This tool is used to explain the activities between the user (actor) and the system being built. Each use case that is formed in the system description must define its use to be understood. The attributes contained in a Use Case Scenario include a name (name of the use case created, ID (ID of the use case), description (a brief description of the use case), actors (actors involved in the use case), organizational benefits (benefits obtained by the organization when using the use case function), triggers (actions taken by the actor in triggering the use case), pre-conditions (conditions before the use case is executed), post-conditions (conditions after the use case is completed), main course (interaction between actor and system), alternate approach (alternative interaction between actor and system), and exception (conditions that are run if they are not following the main and alternative conditions).

The use case scenario describes each use case. There are actors associated with the use case, the purpose of the use case, a description of the use case, before the conditions must be met, and the expected conditions after the functional use case runs. Also, a review is provided relating to the system's response to an action given by the actor, either as a process or mainstream that the system or alternative flow must carry out. Use case scenarios used in the development of a production monitoring system can be seen in table 8.

TABLE 8  
USE CASE SCENARIOS MANAGE PRODUCTION PLANNING

Name	:	Manage Production Planning (Create Production schedule)
ID	:	SK-13
Description	:	A function used to add a production schedule in the system
Actors	:	Planning Production
Organization Benefit	:	Users can create new production schedules that are stored in the database
Triggers	:	When the actor clicks the "Save" button
Pre-conditions	:	Production schedule data is not stored in the database
Post-conditions	:	Production schedule data has been stored in the database
Main Scenario		
Actor		System
1. Click the production planning menu		

	2. Displays the production planning data page
3. Click the detail icon	
	4. Displays a detailed page of production planning data
5. Click the button for schedule	
	6. Displays the message "are you sure you made a schedule?"
7. Click the button yes	
	8. Checking the completeness of the data entered
	9. Save data into the database
	10. Displays a message "data saved successfully."

*D. Use Case Classification*

Furthermore, the use case classification process is carried out for existing actors and functions by classifying them into three categories: main use cases, supporting use cases, and specific use cases. The main use case is a use case that occurs very often or even always appears in each existing case's observation process. This use case is categorized and recommended as a use case that must be present in every production monitoring information system that is built. Furthermore, supporting use cases are use cases that have appeared in some of the cases studied. This use case cannot yet be categorized as a mandatory use case to be created. Still, in certain business models (more than 1 business model), it is likely to be used in production monitoring information systems.

Meanwhile, a specific use case is a use case that appears only in 1 or a maximum of 2 cases studied. This use case is not a general use case in every production monitoring information system. Still, it will be an important note, especially if the production monitoring information system to be built has the same characteristics as the use case.

After performing the combined analysis, the use case classification is continued. From a total of 16 use cases, there are 10 main use cases, 3 supporting use cases, and three specific use cases.

1) *Main Use Case:* The main use case is a use case whose frequency often appears in every company. There are ten main use cases, which can be seen in table 9.

TABLE 9  
MAIN USE CASE CLASSIFICATION RESULTS

Use Case Name
Manage User
Manage Order

Manage Planning
Manage Raw Materials
Manage Production
Manage Cutting
Manage Sewing
Manage Accessories
Manage QA / QC
Manage Reports

2) *Support Use Case:* Supporting use cases are use cases whose frequencies appear under the main use case in each company. There are 3 supporting use cases, which can be seen in table 10.

TABLE 10  
RESULTS OF CLASSIFICATION OF SUPPORTING USE CASES

Use Case Name
Manage Styles
Manage Cloth
Manage Laminating

3) *Specific Use Case:* The specific use case is the use case that appears, but not every company has this module. There are 3 supporting use cases, which can be seen in table 11.

TABLE 11  
RESULT OF THE SPECIFIC USE CASE

Use Case Name
Manage Role
Manage PO
History

The results of the process that has been passed from the definition to classification stage are then compiled and visualized into a use case framework for the development of a monitoring information system in a textile company, as illustrated in Figure 1.

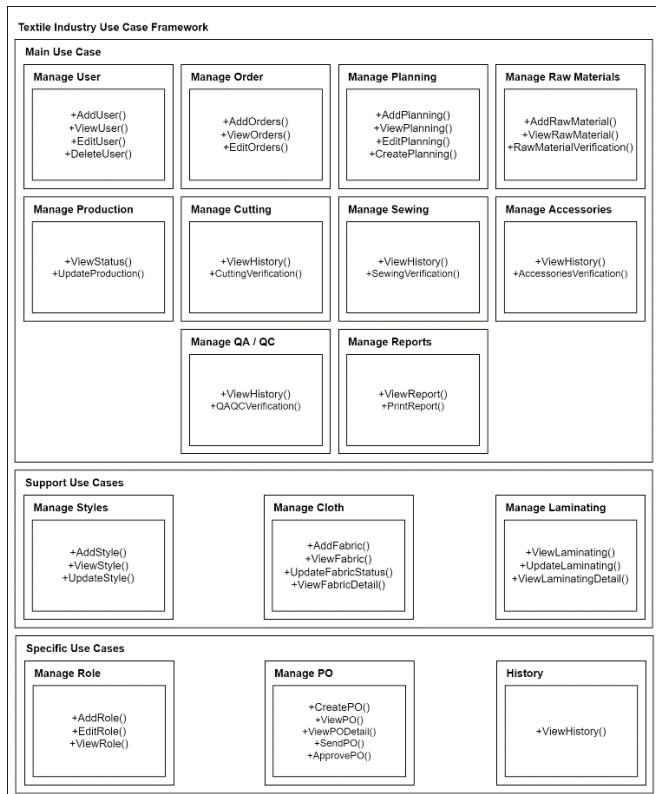


Figure 1. UseCase Framework for Monitoring Information Systems in Textile Companies

We visualize it using a rectangle inside the business capabilities rectangle. Each rectangle has several more specific functions to describe the contents of the use case.

#### IV. CONCLUSION

We have completed the use case framework on the textile company monitoring information system. We found 16 use cases that are usually used in building monitoring information systems in textile companies. This use case is divided into three parts: ten main use cases, three supporting use cases, and three specific use cases. In the main use case, there are several use cases: managing users, managing orders, managing planning, managing raw materials, managing, producing, managing cutting, managing sewing, managing accessories, managing QA / QC, and managing reports. Each use case in the main use case is the most needed and most used in monitoring information systems in textile companies, and this can also be seen from previous research [27] [28]. This study shows similarities in several use case, as used in this study. In the supporting use case, there are three use cases. This supporting use case is a use case whose frequency of occurrence is below the main use case in each company. After that, specific use cases are additional use cases that are not the same for all companies and that support the needs of each company. This research can be used as an initial basis in designing a monitoring information system for textile companies. The main and supporting use cases in the textile company's information system have been defined, the rest can

be adjusted to the needs of the information system to be built. With this use case framework, software developers can more quickly determine what functions will be made.

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