DEVELOPMENT OF A WEB-BASED INFORMATION SYSTEM FOR MATERIAL INVENTORY CONTROL: THE CASE OF AN AUTOMOTIVE COMPANY

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Abstract—**Inventory control is controlling the materials movement to fulfill the requirements. The materials can from the direct and indirect materials. the indirect materials are the materials that cannot be calculated according to the bill of materials. Indirect materials need safety stocks, so the requirements can always be fulfilled, means it needs the control and monitoring of their levels. To control the movement of the materials, each department has roles to control and information that need to be shared. PT XYZ is an automotive assembler company, the company needs a tool to control the indirect materials inbound and outbound and control its stock. This research is to have the tool that will be a web-based program because to share the information throughout the department of planning, production, and logistics. In developing and implementing the program itself, the RUP methodology is used to guide in doing this research with having four phases and activities that support the research. The result is the program itself have been successful to fulfilled the user requirements. The program shows the real-time information for the levels of the materials and also the inbound and outbound of the materials for the user to monitor its levels.**

Keywords: **Inventory Control; Indirect Materials; Web Application; RUP Methodology**

I. INTRODUCTION

Inventory management has become the essential for any companies, and with the recent development of information technology have equipped managers to obtain and better real-time information about their products materials. This makes the information and the coordination will be better [1]. Inventory in the supply chain is a major source of cost and it has a huge impact on customer responsiveness [2]. Basically, inventory management deals with issues of how much

to keep on hand and how much and how frequently to reorder. Assembly and manufacturing companies need raw materials to process and combine with purchased items to assemble into finished goods [3–5]. Task of inventory management are varied and have many affiliations. Planning task of inventory management, for example, is the allocation and sizing of inventories. In order to determine an acceptable level of inventory, it is necessary to make decisions about order quantity and order time [6–8]. In order to categorize activities in Inventory management. It is logical to classify task with regard to function and time horizon [9–11]. With that background, activities in the inventory management have been collected and categorized in the following dimensions [1]: Planning Horizons (Strategic, Tactical, Operational) and Function (Warehousing, Transportation).

Based on that dimensions, J. Kamphues and T. Hegmanns [1] made a model of classification of tasks and related activities of inventory management. Refer to Fig. 1. While the classification regarding the planning horizon is visualized by the vertical position, the assignment to the logistic function is visualized by the horizontal peak.

From Fig. 1, the classifications or the levels divided are into three, operational level, tactical level, and strategic level. On the tactical level is all about the calculation, analysis, classification, and planning to have the best output for the company. The strategic level is where the activities that will make a good output in a long term effect.

All of the levels and tasks have the function of information management to share information from reports then monitor of that report and plan for the next task or activities and so on. This is the management of
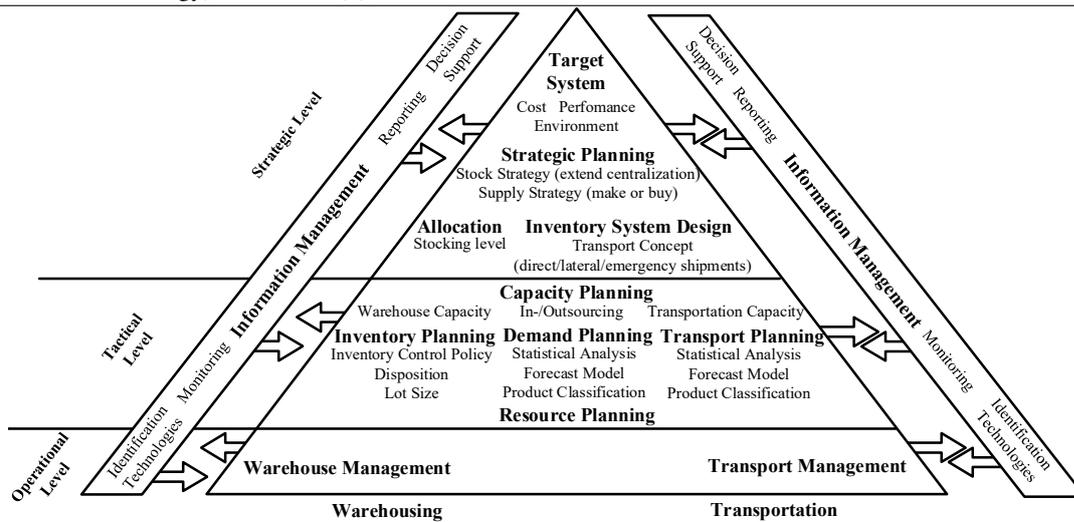
Fig. 1. The Inventory Management Framework [1].

inventory management to have and share the information and data of each department and tasks to having the performance that has been targeted and having a streamlined process [1].

The monitoring and measurement of inventory are not just checking the on hand stock but it is about knowing at all times, everything that needs to know about the inventory and to ensure the management of the warehouse and reliable feedback of the data for the management to control the inventory [12].

Stock information can be categorized in order to describe the status, properties, quantity and location, and that information can be split stock information into three main categories [12].

Fixed Information: This information describes the material itself that will not be changed at all. Variable Information: This is the information that can change frequently. Derived Information: This is the information that gathered from the analysis of the fixed and variable information.

That information needs to be gathered and also be stored in one place, so the task of gathering them can satisfy with the form of computerization. There are the number of ways, from using spreadsheet and database package, but this can cause the error and human error. Inventory control software monitored the status and the on-hand inventory in a very complex and also a better system [12]. That better system can be an information system. Information systems are usually used to automate routine activities of the management and administrative task in the management systems. To keep the business competitive, it should keep up with the rise of technologies. Information system only

helpful for decisions and the decisions themselves and it should create a competitive advantage. The information system is becoming more and more integrated with business processes. Using technology to manage and improve processes, both within a company and externally with suppliers and customers is the ultimate goal [13].

II. THEORY

Rational Unified Process is an application development process framework that provides guidance or approach to assign task or jobs for a project. It is main objective is to have a software that is high quality and meets the needs of its end user. The Rational Unified Process contain elements from business modeling, data engineering, project management, and configuration management, and also Real Time Object-Oriented Method. The formulations of Rational Unified Process include iterative development, architecture that emphasize on using the Unified Modeling Language, process model and the concept of use case [8]. As a process product, means that in RUP the development team working close with the end users, or the customers to update and improved the experience and best practices for the end users. RUP also enhance the team productivity that make sure all in creating and maintaining the models are share and focused on for one purpose. The Rational Unified Process is a configurable process, it helps to different kinds of situations and the process need for the project [9].

A. Rational Unified Process Methodology

Rational Unified Process is an application development process framework that provides guidance or approach to assign task or jobs for a project. It is the main objective to have a software that is high quality and meets the needs of its end user. The Rational Unified Process contain elements from business modeling, data engineering, project management, and configuration management, and also Real-Time Object-Oriented Method. The formulations of Rational Unified Process include iterative development, architecture that emphasize on using the Unified Modeling Language, process model and the concept of use case [14]. As a processed product means that in RUP the development team working close with the end users, or the customers to update and improved the experience and best practices for the end users. RUP also enhance the team productivity that makes sure all in creating and maintaining the models are share and focused on for one purpose. The Rational Unified Process is a configurable process, and it helps to different kinds of situations and the process need for the project [15].

The Rational Unified Process can be representing into two dimensions' phases and workflow, Refer to Fig. 2. The RUP consists of four phases; they are Inception, Elaboration, Construction, and Transition. In each of the phase, iterations are performed for each activity until the expected result or milestone is satisfied. The activities inside of the phase are varied and not all activities are describing specifically, so here makes the activity here are describing according to the developer itself but still inside of the phase and the workflow of the RUP. There are two categories of workflows: a) core technical and b) managerial supporting. The core technical disciplines are Business Modeling, Requirements, Analysis and Design, Implementation, Test, and
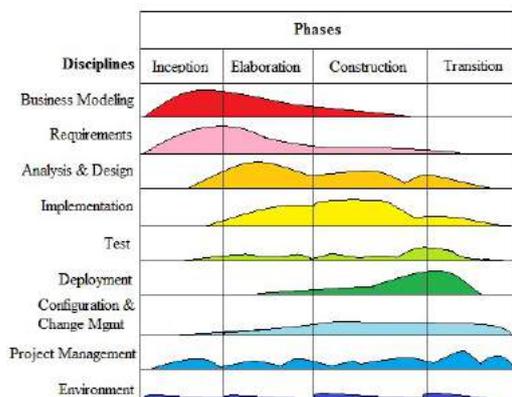

Fig. 2. RUP Methodology [16].

Deployment. The Managerial supporting workflows are Configuration and Change Management, Project Management, and Environment [15].

In the Inception phase, the primary goal is to achieve what will be needed regarding the objective of the project. First, it needed to identify the problem, plan the projects, install the work environment and tailored for the team [11]. The inception phase performed project management, business modeling, and requirements on the life cycle objectives of the project [15].

The Elaboration phase specifies the requirements in greater detail and proves the architecture for the system that detailed and understanding the scope. The goals are to analyze the problem domain, set up an architectural foundation, develop the project plan, and eliminate risk elements [15].

The subject of the Construction phase is to develop the system where it is ready for deployment. The task here is completing their specification, analyzing them, designing, coding and testing the software [6]. The Transitions phase is delivering the system into production or testing to the end user themselves. At the end of this phase, the product must be released [16].

The nine disciplines of the RUP methodology are collections of activities that are related to the topic of the project. In business modeling discipline, it is to understand the business scope and the system that are going to be developed. The requirements discipline has the goal to construct what is the requirements and information that needed for the project and specifying the scope. The analysis and design discipline, analyze requirements for the system and design the solution that will be constructed. Then the implementation discipline is where to convert the design into the program and the basic level of testing [15].

The test discipline will ensure the quality of the program itself. The deployment discipline is after the program ensures its quality, the system needs to be delivered and execute for the end users. The configuration and change management discipline is managing access to the projects work products. The project management discipline is to plan, staff, execute, monitor the project and manage the risk of the program itself. Then the last discipline is the environment discipline is to provide the software developer with the tools and support [15].

III. RESEARCH METHOD

The research methodology in this research is explained, From the first phase is the Inception phase is to initiate the planning, the tools and environment are prepared, then go to find the requirements. First, to find the requirements, the problem need to be identified then the requirements are gathered by data acquisitions
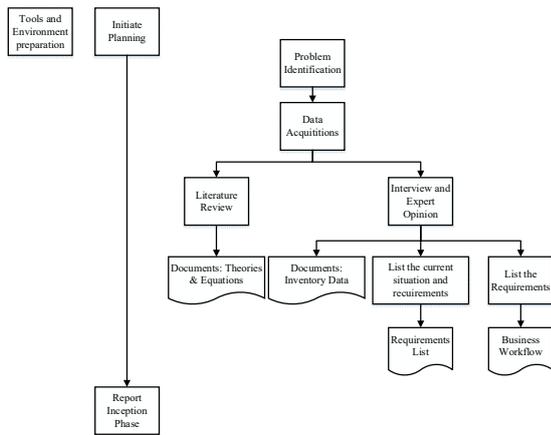
Fig. 3. The Inception Phase.

from interviewing and the expert opinions, and literature review. From those tasks the researcher will model the business workflow, list the current situation and requirements, get the inventory data of the company and get the corresponding theories and equations for the project. After the models and requirements have been made and listed, the researcher needs to report the work in the inception phase. Refer to Fig. 3.

In the elaboration phase the tools and environment are prepared, the researcher will elaborate from the requirement list by having a user requirement list that is more specified, then the it will be modeled into a use case diagram. Then the researcher will design and formulate an information flow or the data flow diagram for the application to be the base of the application. Then the elaboration phase needed to be reported. Refer to Fig. 4.

The third phase is the construction phase, the tools and environment are prepared again, then the construction begin in setting up the program, Then the researcher will compare the base program to the user requirements to show whether it need the customization or the configuration it supposed to be, then after it is been listed, the researcher will customize the program and configure them. after comparing or having the requirement list, Then the program will be tested by the researcher and check whether it is approved or not. Refer to Fig. 5.

After it is approved in the transition phase, the inventory data are implemented and the user that will use the program will test it. If the program does not approve by the user, it needed to configure and implemented it again to the program. When the user accepted the program, then if it is the program will deploy to the company and the researcher will give the tutorial
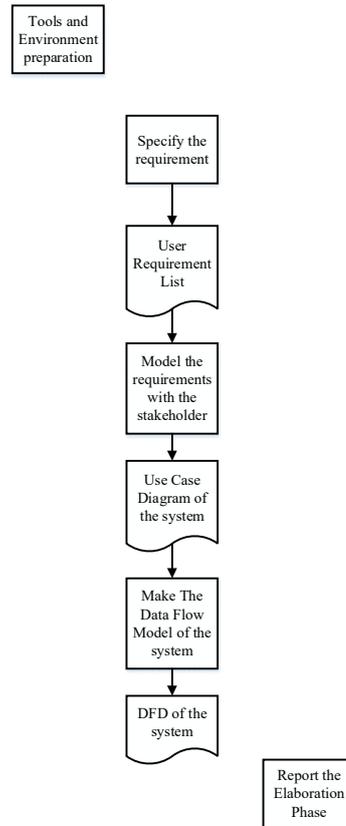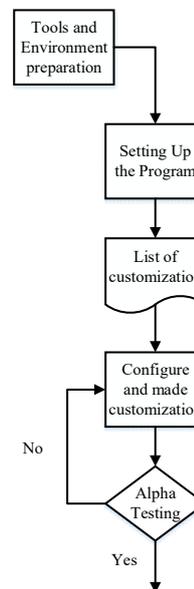

Fig. 4. The Elaboration Phase.

Fig. 5. The Construction Phase.

and the steps of the program to the corresponding department. And last the researcher need to report all
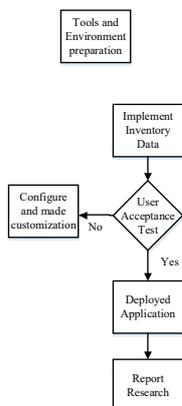
Fig. 6. The Transition Phase.

of the works and tasks that have been done in making this program. Refer to Fig. 6.

IV. RESULTS AND DISCUSSION

PT. XYZ is an automotive industry company in Indonesia that assembled complete knocked down (CKD) cars or receipts complete built up (CBU) cars from the headquarters in Germany. The product or the cars are assemblies or the quantities are forecast beforehand every year. The cars needed a lot of materials to fulfill the standard quality, from the direct and indirect materials. The direct and indirect materials are from the Germany, but the indirect materials are also from local vendors. The direct materials are already inside of the bill of materials (BOM) and included in the forecast beforehand can be directly quantified in the bill of material. The indirect materials are not included in the BOM but very consequential for the products cannot be predicted or forecast this makes it hard to handled that they needed The materials here are from oil, socket, tape and so on.

The materials are ordered and handle the activities by the Programming and Planning Control department. Those materials are stored inside the warehouse and organize by the Production Logistics department where they are following the orders from PPC whether there will be new materials comes in or release those materials to the production line by request from the Production department. That makes the PPC department as the one that control the inventory. Inventory control activities are forecasting the materials, determining requirements of the materials, setting targets, and issuing instructions for the movement of the materials [6].

The departments in PT. XYZ are needed to share the information of the materials, especially the indirect materials because it needed to be handled carefully because it cant be based on the BOM and have the right amount of stocks. This makes those departments need to share information or have real time information of the indirect materials to do suitable actions. Those data are pivotal for the ongoing business process and in this case is the inventory. The indirect materials are handled by a system before called Consumable Material System (CMS), which is specifically for the local vendors. CMS is a system where PT. XYZ is only paid the amount of materials used each year, but for the import indirect materials they inventoried all of them themselves and use the standard inventory control system with safety stock. Now, the company wants to migrate from CMS into a local system, which the system control by themselves for the local vendors and combine them with the import indirect materials system. From that, the PPC department needs to view and handled the real time information of the materials whether they are out of stock, on order, or full stock of all of them at once so they can do proper actions from that information. The problem also for the indirect materials that each of them has different lifetime lead time and also whether the materials are already on its way and that makes the information to be very detailed so if needed to be replenish they need to have a release order (RO) to orders those materials, so it maintain the stocks of the materials. Which is developing an inventory control tool as the information system it needed for each department especially the PPC to maintain the materials and simultaneously fulfill what the production needed for the product to fulfill the worthiness of the product.

A. The Current Business Workflows

The information that gathered in the interview is that PT.XYZ have two main business workflows involving the inventory: the dispatching of the materials and the purchasing of the materials. Both of this business processes are modeled using the activity diagram. The dispatching material process is shown in Fig. 7. This ordering process will be the base of how the program run when there is an order or a dispatch of materials. The activity diagram shows the ordering process from the beginning until the end. Essentially, it describes the following sequential steps: The production department requests the materials to the PPC department, the PPC department takes the request and checks the inventory, if it is approved, it will update the inside system and inform the PLG department to take that orders to the production department, the PLG department sends the materials to the production department, the production department receives the materials, and finally, the pro-
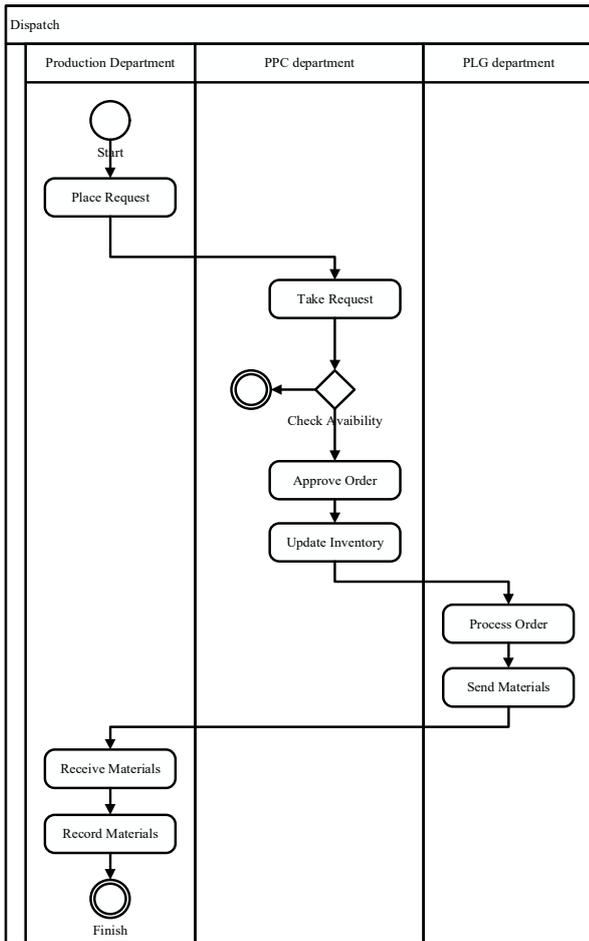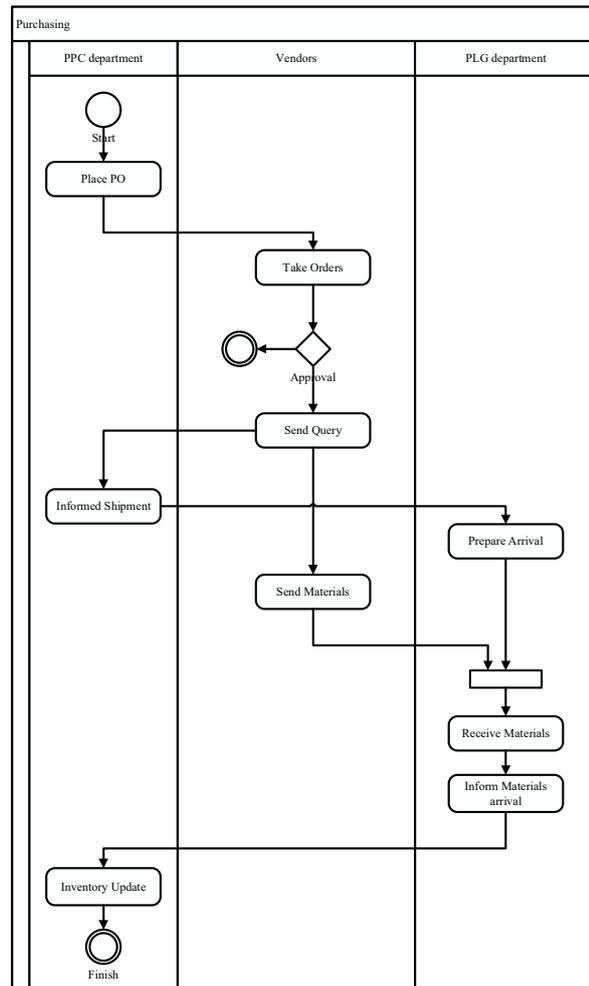
Fig. 7. The Dispatch Material Process.

Fig. 8. The Purchasing Process.

duction department records or reports that materials usage for themselves.

The purchasing activity is performed when materials are restocked or being purchased. The activity becomes important when the stock material is low or unavailable but is required for production. The purchasing activity diagram is shown in Fig. 8. The detail steps of the activity are of the following: Firstly, the PPC department place an order, the vendors receive and take the order, the vendors send query and conformation to the PPC department, the PPC department informs the PLG department that the shipment will arrive, the PLG department prepares for the shipment, the vendors send the materials, the PLG department receives the materials. the PLG department informs of the materials arrival to the PPC department, and finally, the PPC department updates the inventory data.

B. Comparison of Current and Required Inventory Control Tools

The previous information of the inventory is edited manually using a spreadsheet by the PPC department if the outbound and inbound materials are not yet automatically updated. Interviews with the relevant staffs suggest that there is a great need of a comprehensive tool to support the operation of the PPC department to control the materials. The new requirements are tabulated in Table I. With the new tools which are the application itself, it will be the new information system for the business workflow of ordering and purchasing of indirect materials. The application itself will be recording the inbound and outbound of the materials that not manually handle by the PPC department, but with more sophisticated or automatic sequence to update the data.

TABLE I
THE COMPARISON OF THE EXISTING INVENTORY CONTROL SYSTEMS AND THE NEW REQUIREMENTS.

No	Current Status	New Requirement
1	The indirect materials are not yet combined into one data file and still in spreadsheet form and the recording of the the data is still handle manually.	It needs the inventory control tools to control the materials movements.
2	The different variables of the indirect materials are all shown in spreadsheet format.	The variables are shown in a web-page and combined into one stock item.
3	Deleted information are automatically gone from the spreadsheet.	The deleted information are in a different table.
4	Information can be edited easily because in spreadsheet.	Te edited information are updated and overrided automatically.
5	The low stock materials are not separated in one table, are not shown yet in the spreadsheet, and only provide info when edited from the data directly.	The low stock materials are filtered into one table and are shown for the user to monitor.
6	Adding new materials are in the spreadsheet form.	Adding the new materials are web-based and saved into a database.
7	In dispatching the materials, the use needs to edit manually the updated quantity and may have missed input because there is no link between the dispatch data and the inventory data.	The dispatch material have its own menu and automatically update the material quantity.
8	In purchasing the materials, there is no information of the status of the materials.	The purchasing material status are shown and which and how much materials are being delivered.
9	Delivery items need to be input manually, can have missed input because there is no linke between the delivery data and the inventory data.	The delivered items are automatically update its quantity after its being accepted.
10	The data can be emailed and viewed locally.	The data can be download into a local computer and also emailed from the application itself.

C. The User Requirement Lists

From the business workflows depicted in Figs. 7 and 8, and the comparison provided in Table I, the requirements of the application are derived and shown in Table II.

D. Stakeholder of the Software

The application will be use and access with the correspond department from the PPC department, the PLG department and Production department. There will be the relationships between the function and the stakeholder of the particular function inside the application. This also is the limit of that particular user to access the page that has been assign. The diagram is shown in Fig. 9. The PPC department can access all of the features and functions because they are the department that controls the inventory itself, from the Stock Items, edit / delete data, view the low stock and no stock tables. Also for the making new purchase, and approve the purchase itself. Production department will be using only the dispatch function to take the materials that needed for production purposes and the reports function. The PLG department will use and access the deployment functions to views which items to be deployed and the orders which are the Purchase orders and use them for the delivery records.

E. Data Model

In Fig. 10 for the data relation between each entity, the user is the one controlling every function, the user and staff are each from departments inside the

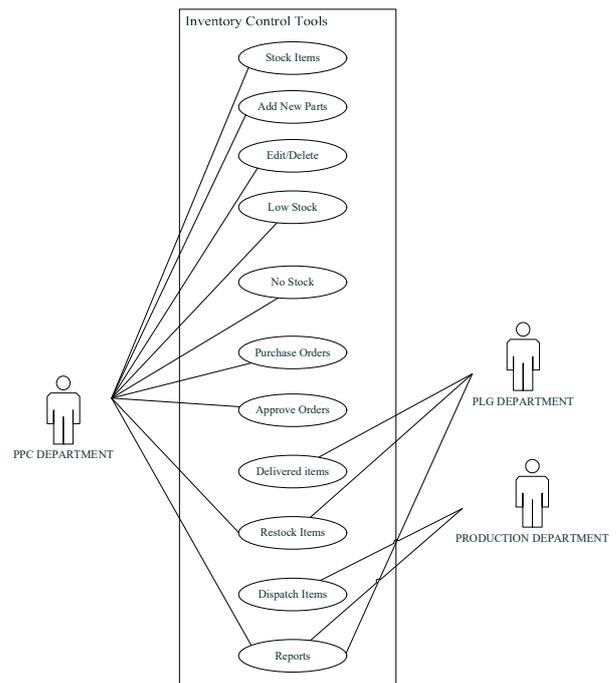
Fig. 9. The Stakeholders of the Software.

company. So this makes the department have one too many relationships. In a dispatch, because it needs the "dispatch to" is from the staff entity itself, and the list of materials are from the product. The product entity gives information throughout the system because of the stock items inside the inventory itself and the

TABLE II
THE USER REQUIREMENT LIST.

No	Description	Topic	Application Field
1	The company needs to integrate the local and imported indirect materials into a single information system that can be updated automatically.	An inventory control tool	An application
2	PT XYZ has indirect materials that have different variables and need the inventory control tool.	Indirect material variables	stock_list
3	The inventory control tools that can be removed fomr the materials and its quantity and saved into another table to be put	Delete product	deleted_products
4	The inventory control tools that can be edited from materials and its quantity.	Edit Data	edit
5	The inventory control tools need to show the materials that needed to be replenish at once or at one page.	Reorder point and main problem	Low_Stock
6	The inventory control tools can input new materials	New materials	add_Product
7	The inventory control tools need to provide information of materials that are dispatch to the department and updated automatically the inventory data.	Dispath materials	dispatch_Materials
8	The inventory control tools need to provide information of materials that are in purchase and has not been inventoried.	Purchasing	Orders
9	The inventory control tools need to provide information of materials that are already been inventoried from the purchase order and update restock items automatically.	Material Delivered	Restock
10	The user can download the data in a spreadsheet file and can also email within the system.	Download and email	email & Excel

product name and quantity that shows in every business fields. In ordering a material, the suppliers name and the name of the products itself shows in the ordering fields, they are from the suppliers and product entities. The ordering entity will affect or update the restock entity when there is a material receive, and also will affect the product entity itself to update the materials quantity.

F. Data Flow Diagram

The data flow diagram here is the new purposed business workflows that integrate the function of the software itself, this will be the new basis activities in making an order and also purchase for the workers. First, it is the DFD of making a purchase then dispatch a material.

The Purchasing information flows are shown in Fig. 11. It shows the inside processes in purchasing new materials, first the PPC department made an order to the vendors, then while wait for the confirmation, the PPC department record the purchase of that Purchased to the system, and after it gets the confirmation, the PPC department will approved the recorded PO and the approve purchase will be recorded to be shown as the PLG department, after it is being delivered, the PLG department record the deliveries and it will being restock inside the stock items. The stock items and the report will be updated and will be given to the PPC department.

Figure 12 shown the process of dispatch, the detailed processes are shown, first, the production department is the one that needs the materials, then the system itself will show the available stock, and the production department will enter the information of the dispatch. Then the dispatches are recorded and it will be the information to the PLG department to send the materials, the production department for a report, and stock items for being update. The stock items will be analyzed with the PPC department, and the output of that analyzed will be the decision to order more or not.

G. Sequence Diagram

In purchasing materials, the sequence is shown in Fig. 13. There is a material need to restock, or materials that are low stocks. The user from PPC department, will make an order to the vendors, and they will record it to the system, the user will enter the new order button and the form of the new order will show and there is information of the order that needed to be inputted.

After the information inputted and the user click enter, the purchase order will be recorded in waiting for approval table, it is stay pending until it is approved by the user in PPC department, whether it is approved or rejected, when it is approved, the purchase order information will go to the undelivered table and will shows the undelivered materials.

When the purchase order already arrives, the user from the PLG department is the one that will record the deliveries. The recorded delivered purchase order will be recorded in restocked items and update its quantity in the stock items. This will be as information again for the PPC department to monitor whether the purchase order already been restocked or not.
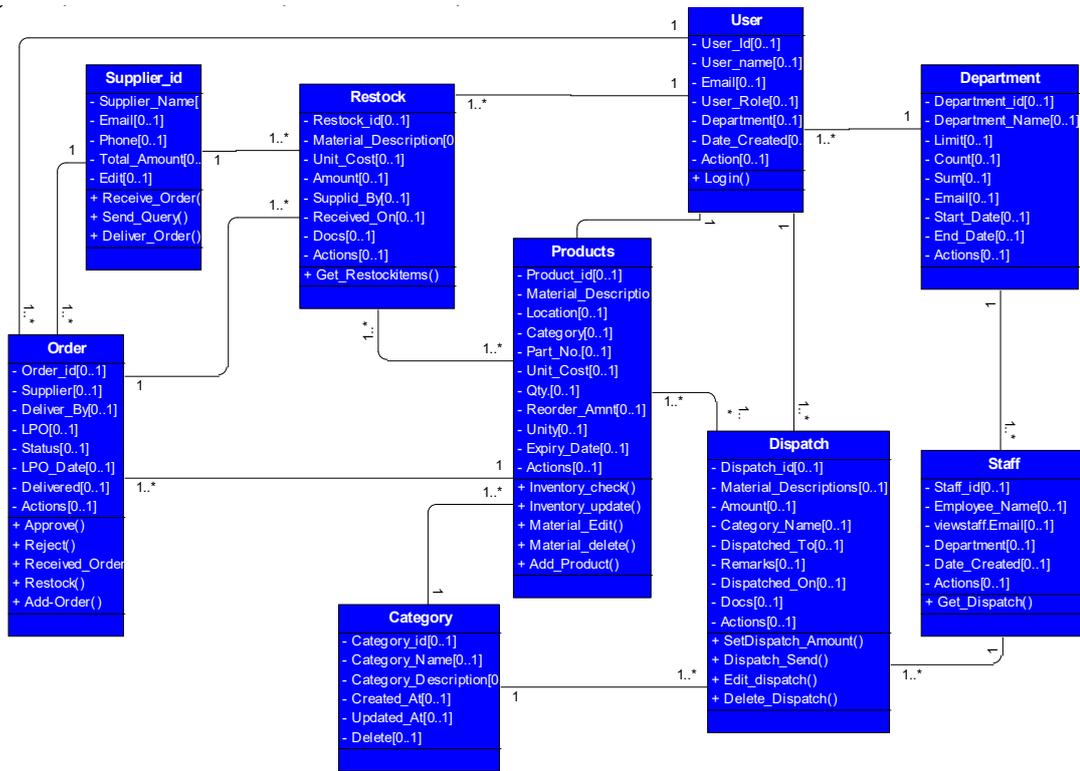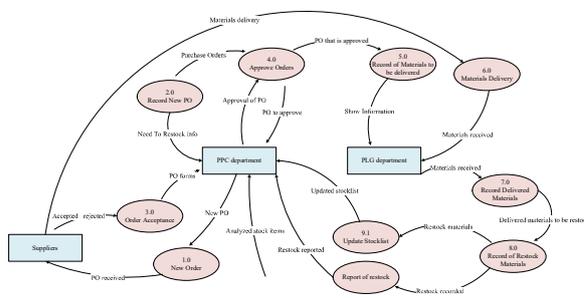
Fig. 10. Data Model.
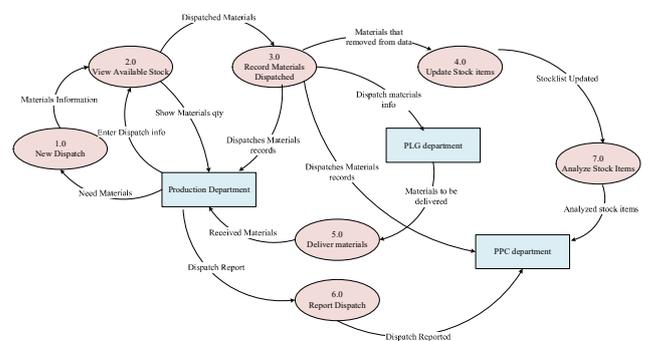

Fig. 11. DFD of making a Purchase.

Fig. 12. DFD of dispatch a material.

In dispatching materials, the user from production will click the new dispatch and then it will show the form, to enter the materials, the materials quantity is already provided, and will valid when to enter how many materials that can only be dispatch, after the dispatch has been made, the quantity of the stock items itself will be updated for that materials.

The dispatch will be shown in the view dispatch section and it is for the PLG to view for delivery purposes. The list of dispatches itself will be for the PLG. The view dispatches will be for the production and the PPC department to report and views for monitoring and

decision purposes. The sequence is shown in Fig. 14.

H. Comparison of the Software and the Requirements

The researcher then compared the properties or functions to the requirements of the user. After it is being compared the researcher list, the functions are customized or added to fulfill the requirements. Table III shows the comparison. The software should fulfill the requirements: First, there are the variables that needed to be shown on the backend side there is an additional command to show the variables; second,
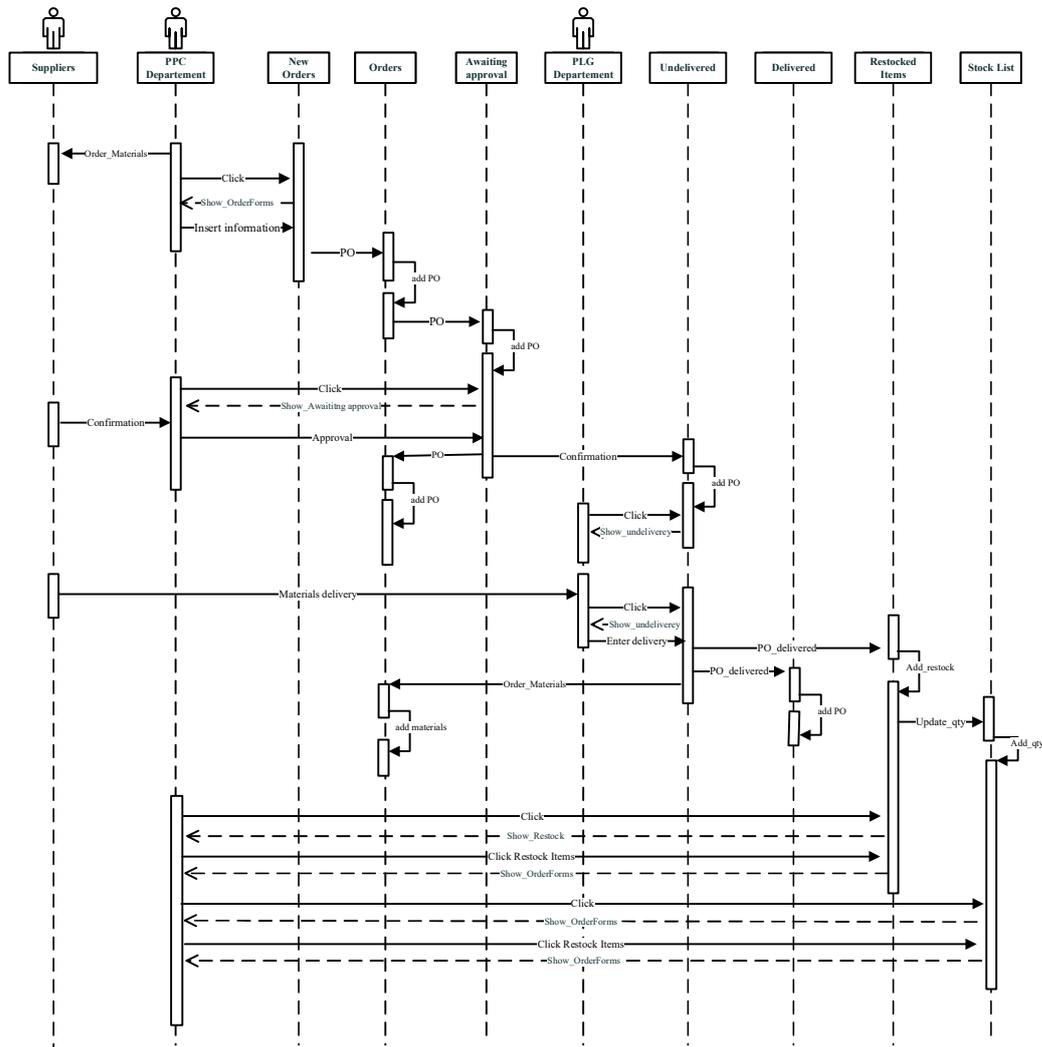
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Fig. 13. Sequence Diagram of Making a Purchase.

in showing whether there is a low stock because of the reorder point, the command is inserted, from the equation of current amount ¡= reorder amount; third , then the materials that are low stock or even no stock at all are shown in a different table, in showing the materials that are low stock and no stock can show; and Fourth, in connecting the application with the email to send report, the connection with the mail server has been set up.

I. Alpha Testing

The alpha testing here, is the researcher will test the application itself, with testing different function and business flows, from adding new materials, dispatching and have a purchase order and so on. This will show whether the application approves or not by the

researcher to have the application for the company. The Alpha testing results are shown in Table IV.

J. User Acceptance Testing

After the alpha testing had passed, the researcher prepared the data of the real-time inventory from the data collection before the application tested by the user or called user acceptance test. The data that are input is to prepare the user to test the real-time data and test whether the application is accepted or not. The user will try the program, and the test is for showing whether the user accepted the program and whether the programs work as it should be when the end user made it, the guide in testing the application itself based on the User Acceptance test shown in Table V.
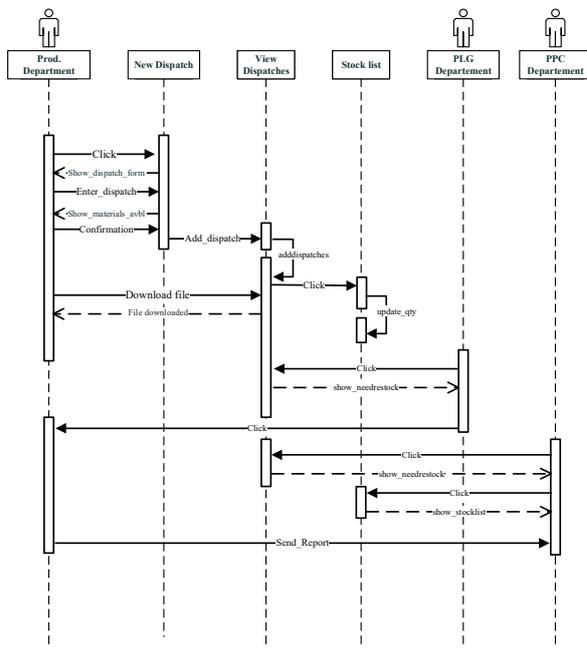
Fig. 14. . Sequence Diagram of dispatch a material.

TABLE III
THE COMPARISON OF THE SOFTWARE AND USER REQUIREMENTS.

No	The properties of the software	The Requirements	Need Customize	Remarks
	The Software and User Requirements Table			
1	The Application can update stock quantity when there is a command involve	The application provide automatic updates of the stock items so it can be real time data	No	
2	the application has a stock items fields to show all the materials all at once	The variables are shown in a web page and combine into one stock items	Yes	There are variables that need to change and shown in the viewer
3	the information can be edited	The edited information are updated and override automatically	No	
4	the information can be deleted but still in the system with different table	The deleted information are in a different tables	No	
5	The low stock table is available but not yet concurrent with the ROP methodologies	The low stock table are shown for the user to monitor	Yes	With using ROP methodologies, here is to show the materials need to restock based on the Current amount =< Reorder point
6	The application have forms to enter new materials	Adding the new materials are web based and saved into a database	No	
7	In dispatching material, the quantity updated automatically	The dispatch materials have its own menu and automatically update the materials quantity	No	
8	In purchasing orders the status of the materials are informed	The purchasing materials status are shown and which and how much materials are being delivered	No	
9	In delivery of the materials, the quantity of the materials updated from restocking	The delivered items are automatically update its quantity after its being restocking	No	
10	The Email Settings are available and not yet configured	The user need to send emails from the application itself as a report	Yes	The email setting is using an smtp that in this case have different users

K. Data Results

After the application run and accepted with the users, the real-time data will be implemented into the application. And the data that shows the system are shown. The data here is the real information from PT.XYZ, in user acceptance test and shows that it has been successful, from the login until the excel download Table VI.

TABLE IV
THE ALPHA TEST RESULTS.

Function	Scenarios	Actual Result	Status (pass/fail)
	Alpha Testing		
Add new Materials	The researcher tried to enter a new material into the system, this is a test whether the new materials will be recorded or not. First enter the new product form , the product name is test materials, the amount is 10, the reorder amount is 5, the location is at the warehouse, the expiration date is 18th of August 2016 and the unit is in Pcs.	the new material is added	pass
Delete New Materials	There are a material name test delete, here the test is to delete this material, first the user click the delete button	the material is deleted	pass
Dispatch Materials	The form is updated with lesser amount, here are the items that inputted:Items to Dispatch: Testing materials 2, (120)Dispatch to: Mr. Amir, Dispatched Amount: 50, Remarks: for Tire Assembly	the materials are dispatched	pass
Purchasing Orders	The material here is testing material, and it choose form the material list inside the form. After the materials are shown there are quantities beside them are the quantities of the difference between the reorder level, because the amount of reorder level of Test material is 5, and the current level is 4 this makes the minimum to reorder is 1.Other information that needed to be inputted in the other fields, in this order are: · Suppliers Name: Supplier 1 · Delivery By: 12th of June 2016 · LPO date: the date of the Purchase Order · Department: PPC department · Total Cost Of Order: 50 · Currency: EUR · Based On purchase request: PO1234567	the orders have been made	pass
Email and Excel Download	The tables or information that can be downloaded are, Product List, Restock List, and Dispatch List.	the data is emailed, and the data download	pass

V. CONCLUSION

From the result of Alpha testing, it shows that the software run successfully with its functions, from adding new material, delete a material, dispatch a material, purchasing material, email reports, and export spreadsheet download. The data shows that the function do what it supposed to do and then the end user test the application. From the user acceptance test the user show that after the user run it successfully, the inventory data has been implemented into the system, with its current level and reorder level, and here it shows that there are 37 materials need to be restocked. This makes the user need to order this material before they will run out. From the results, it shows the materials that needed to be ordered. Also, the real-time data of the purchase has been inputted for testing purposes, and it shows based on the current information, the user records it inside the application and shows the information of the current purchase and current ordered. This makes the PPC department will have more real-time information to monitored with its process and also can be a report to the department manager or other departments to be the backing and decision making of the next business process. The

TABLE V
THE USER ACCEPTANCE TEST RESULTS.

Step No	Test Cases	Expected Result	Actual Result	Status (pass/fail)
User Acceptance Form				
1	Users will login	Users will login		Pass
2	The Dashboard shows the need restock, dispatch, and purchases	Users will view the dashboard with need restock, dispatch, and purchases		Pass
Stock items				
3	The Users can enter new materials to the Stock items	The new materials are enter to the system		Pass
4	The Users can view the levels of the materials inside the stock items all at one page	The inventory levels is shown		Pass
5	The Low Stock materials are shown in a filetered table and have a red filled	The need to restock is shown		Pass
6	The deleted product go to the deleted products table	The deleted materials are shown		Pass
7	User can Edit the materials directly	The materials are edited		Pass
8	The Stock items can be download in excel	The data is downloaded		Pass
9	The Stock items can be email	The stock items can be emailed		Pass
Dispatching Menu				
10	The Users can enter new Dispatch	The new dispatch is entered		Pass
11	The user can see the available quantities in the new dispatch menu	The quantities of the materials are shown		Pass
12	The new dispatches are shown in view dispatches	the user can enter data		Pass
13	The user can download completed purchases in excel file	The excel is downloaded		Pass
14	The dispatches data can be email	The dispatches can be emailed		Pass
The Stock Items after a dispatch				
15	The quantities of the dispatches effect and decrease the amount in the stock items for the dispatch materials	The quantities are decreasing		Pass
16	If the stocks become the below the reorder amount, the row of that material become red	The row become red		Pass
17	The symbol of that material become red	symbol is red		Pass
18	The materials below the reorder amount are insert into the low stock materials	The Low Stock shows the data		Pass
19	The materials that there are no stock are in the no stock table	The on hand is increase		Pass
The Purchase Orders Menu				
20	The Users can enter new orders in the orders menu	The new order is entered		Pass
21	The new orders appeared on the awaiting approval table	the new orders appears at the approval table		Pass
22	The User can accepted materials at the on order	The user can change the status		Pass
23	The approve orders appears on the undelivered table	The approve orders appears		Pass
24	The User can update the status based on the materials receiving	The User can update the data		Pass
25	The materials that status is delivered are also being restock into the restock table	The delivered materials are shown in the delivered and restock table		Pass
26	The user can download restocks in excel file	The excel is downloaded		Pass
27	The user can email restocks in excel file	The data is emailed		Pass
The Stock items after a purchase				
28	The amount is increasing	The amount is updated		Pass
29	The fill is become white again if before it was red	The On hand decreased		Pass
30	The bar chart in the Amnt. fields are green again, if before it was red	The current level decreased		Pass
31	The Low stock table don't show the materials that have been delivered and restock	The restocked materials are not shown		Pass

TABLE VI
THE DATA RESULTS

Task	Result
User Login	The User can login to the application, here Mr. Sumardi Subandi can login the page, with his picture and name shown. He is the user that control the indirect materials. Also the dashboard is shown
Stock Items of PT. XYZ	The indirect materials of PT. XYZ are already implemented inside the application. The data inputted are from the excel files convert into the destination The stock items shows the materials are in safe level, and low stock level, are shows also with a red filled
Low Stock in PT. XYZ	The low stock inventory is successfully shown in the filtered table, for the user to focus only the low stock materials, as seen in Figure 5.44. it shows that there are 37 low stock items that needed to be ordered, from Rubber Adhesive to Filter white
Dispatches in PT. XYZ	The dispatches that tried from the user is based on the real data, this dispatch is tried in the user acceptance test, the dispatch is successful It shows that Mr Subandi, dispatch 6 items "BALANCING WEIGHT, 10 GR,ZINC,ADHESIVE SELF" for tire assembly.
Purchase Orders in PT XYZ	The Purchase order are successfully inserted to the system. It shows that the user order items based on PO101606001, it will be delivered by 19 August 2016 and from the supplier EX33SIFI. The user ordered of a total 420 items. Refer to Figure 5.47. this will be for the PLG department later that to prepare the arrivals, and update inside the system.
Email Report	The user successfully sent an email to fellow colleague in PT. XYZ to show the report
Excel Download	The data that can be downloaded and export as an excel as a manual backup is successfully downloaded

the materials with also for the production department to know how many materials inside the system. The application itself that already successful can be deployed inside the company from the PPC department, PLG department, and production department, but at the end of this research, the users in PPC departments that will record everything first, from the decision from the Department Manager, and in the near future, it will be deployed to the other department as this application should be. The department manager also recommends that this application can be used for the direct materials to control its delivered, undelivered, and partial items.

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