Developing Manufacturing Application using Enterprise Resource Planning Concept

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ABSTRACT

Information of Technology has bound in modern life especially manufacturing company with many kinds of complexity processes, machines, tools, human resources and materials to gain profit. The company need the integrated system for handle the problem. It can increase performance and efficiency so company can reach the business goals. Enterprise Resource Planning (ERP) is a concept that can be used for handle organization complexity. ERP managing many business processes to be an integrated system that occurred in manufacturing companies such as production scheduling process. Production schedule used in the business process for efficiency time and cost. Implementation of ERP used in software Odoo 8.0 with open source system for ERP which can customize based on the user. Production schedule in Odoo working automatically different with convensional system.

Keywords

Manufacturing Company, Integrated System, Production Schedule, Enterprise Resource Planning, Odoo 8.0.

1. INTRODUCTION

Technology development was made a lot of effect, especially for the system and technology. It caused system integrated with any computer in a network but it can use based on right access for every user and their job. The manufacturing company has scheduling and production controlling that manage the production process. Production management is controlling activity that was made as decision and related to production so goods and service produced based on quantity specification, quality, and on scheduling time with minimum cost [1].

Manufacture company using scheduling for managing many customer orders. Scheduling is organization process, selection and lead time for each job [2]. There are many reasons scheduling very important in business process, because it will increasing performing otherwise make the customer satisfied with the order can be finished on time.

Enterprise Resource Planning (ERP) is the development from Manufacture Resource Planning II (MRP II) and Material Requirement Planning evolution, but MRP focus on manufacture only but ERP handle manufacturing, logistic, distribution, inventory, invoice and accounting [3].

2. RESEARCH METHODOLOGY

Applications development consist of six stages that is literature research, data collecting, data processing, implementation in Odoo, testing and implementation system also conclusion and suggestion.

Literature Research

The literature research is the stage to determine ERP concept, ERP modules and its implementation on Odoo, code for Odoo customize and things about manufacturing. Literature research based on books, journals and expert research.

Data Collecting

Interview and object observation is part from Data Collecting. Interview is technic where the researcher make a dialogue with respondent to gain information. Observation is method that work directly about how process, procedure and any problem goes to every business process [4].

Data Processing

Data processing consist of Bussiness Process Management (BPM) is about business process workflow and Bussiness Process Reenginering (BPR) is how to improvement or repair business process.

Implementation in Odoo

A new business process management or the result of redesign business process can be implementation in Odoo with doing customation using Python programming code, module adjustable or workflow business process. Programming code is about how business process working on every module, and coding is solution to make it work together.

Testing and Implementation System

Testing is the most important parameters in business process implementation if developing application work successfully or neither. Testing also be decision if system application must be repair whether continue implementation system. The most important thing that must be attention is the efficiency of application on handling every business process.

Conclusion and Suggestion

Conclusion is the result on the research, can achieve the goals and how all process works through the research. Otherwise Suggestion is about things that could be doing based on this research, like development or complement.

3. REVIEW OF LITERATURE

System is component in Information Technology. System can be explained as connection things that integrated each other. System based on Roman "Systema" and Greece "Sustema" that has definition of system is components or elements connected for facilitating information flows. Combination between human, facilities or technology, media, procedure and control was made the important communication networking, management support, intern and ekstern user and basic decision interpretation [5].

3.1. Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) is system and technology development especially computer technology development.

Flexibility, saving cost and application efficiency in business is the most wanted things because it can increasing business competition. Consequences on building a new system must understanding the evolution of ERP system and the latest company profile[6].

ERP is software package application with integrated modules for supporting various business function enable using data between different department. "Ref [7] ERP is efforts integrated system who manage by operation majority in a company. Difference ERP and conventional system is about system function. ERP integrated in a system meanwhile conventional system is separated system".

3.2. Production Scheduling

Definition of scheduling is about how time, cost, resources (tools or/and human) and jobs can working together on making a product. Scheduling can be explained as a decision on making assignment and time for working using human resources, tools, and facilities for production process [8]. The other explanation of scheduling is about instructions or indications about what must to do, with whom, and tools for finishing a job in specific time [9].

3.3. Odoo Application

Odoo is open source integrated enterprise resource planning software that formerly named OpenERP then changed by the developer. Odoo has client and server component. Server handle business logic and communication with database application while client provide information to user and enable operated with server using client application.

Odoo has integrated modules that can handle company complexity. Available modules in Odoo is manufacturing resource planning, sales management, purchase management, warehouse management, customer relationship management, social network, invoicing and payment, human resource management, project management, and google docs integration.

3.4. Bussiness Process Reengineering (BPR)

Business Process reengineering (BPR) is the redesign of business processes and the associated systems with organizational structures to achieve improvement in business performances [10].

Reengineering is redesign of business processes to achieve dramatic improvement in critical, contemporary measures of performance such as efficiency cost, service quality and speed perform[11]. Bussiness Process Reengineering is about repairing the last business process into a better business process that can using for replacing the old business process.

4. IMPLEMENTATION

4.1. Database and User Right Access Configuration

Database configuration is the first step before using the application. The function of database configuration for data saving on every input data by user.

in all and	Create a New Data	base					
0000	Fill in this form to create an Odoo database. You can create databases for different companies or for differ goals (testing, production). Once the database is created, you will be able to install your first application.						
Database Management	By default, the master password is 'admin'. This password is required to create, delete, dump or restore databases.						
Duplicate Drop Backup	Master password: Select a database name: Load demonstration data:	admin Check this box to evaluate Odoo					
Restore Password	Load demonstration data: Default language: Choose a password:	English (US)					
	Confirm password:	Croate Database					

Fig 1: Database Configuration

Another step after database configuration is user right access configuration. Every single department has user with different right access. User on the application are Sales, Invoicing Purchase, Warehouse, Manufacturing and Administrator. Administrator is the one and only can access every department on the application.

Application	Administrati	ion	· Ct Nam	e	Access Rights	En
Share Group			Port	le.	0	
Users Inherited	Menus Vi	www. Access R	lights Rules	Notes		
Object	Read Access	Write Access	Create Access	Delete Access	Name	
Models	8	90	98	90	ir_madel group_erp_manager	
ir model constraint	8	8	ж	9	ir_model_constraint group_erp_manager	
is model relation	96	90	12.	56	ir_model_relation group_erp_manager	8
ir model access	8	10	90	90	it_model_access_group_erp_manager	8
ir model data	8	8	2	90	ir_model_data.group_erp_manager	
Fields		8	8	10	ir_model_fields group_erp_manager	8
ir rule	90	10	96 1	90	ir_rule group_erp_manager	
Companies	10	96	8	96	res_company group_erp_manager	
Access Groups	90	16	96 - E	90	res_groups group_erp_manager	
Users	68	8	8	98	ros_users group_erp_manager	
Default multi company	8	9	×	8	multi_company_default Manager	
	04		(B)	100		

Fig 2: User Right Access Configuration

After the configuration step, setting module for customation. Go to "Settings" menu. The order is Settings-Users-User-Administrator-Edit. Give tick on "Technical Features" and new module could install on the application using Settings menu and choose Modules. The next step is Apply Scheduled Upgrade for using the new module.

Apply Schedule Upgrade
This module will trigger the uninstallation of below modules.
This operation will permanently erase all data currently stored by the modules!
If you wish to cancel the process, press the cancel button below
Impacted Modules
Confirm or Cancel

Fig 3: Apply Scheduled Upgrade

Confirming Apply Scheduled Upgrade could update module list on the application especially on manufacturing menu and production using production scheduling.

4.2. Display of Application

Application views is website that can be access using localhost. User can access the application everywhere without internet, but it doesn't decrease perform of the application. The main page is an opening display applications on website can be seen in Figure 4.



Fig 4: Opening Application Display

Opening Application Display is showing the name of the application, contact person and also the review of application. User login by using access right at the top right on the website like administrator that can see on opening application display.

Sales Orders must first made by the sales department, but to desired date in completing the order must be approved by Admin, Manufacturing Manager, or Warehouse Manager. Sales Orders that have been approved will used as a Manufacturing Order (MO) which is used to section for the Manufacturing production process.

Customer	Agus Adriyana		Date		02/25/2016	15:25:57	
			Referen Wareho	ce/Description use	Pemesana Your Comp	n Baja Galvali rany	8
Order Lines Other	Information						
Product	Description	Quantity	Unit of Measure	Unit Price	Taxes	Subtotal	Due Date
Baja Ringan Galva	lis Baja Ringan Galvalis	2.000	Unit(s)	90000.00	Tax 0.00%	180000.00	02/25/2016

Fig 5: Sales Order Form

SO that has been approve by the sales department will display the form that is validated by the department Invoicing, due to the form of payment-related by the customer to the company.

Invoice SAJ/2	2016/0006						
Customer	Agus Adnyana		Invoice Date	02/25/201	10		
Fiscal Pesition	formal Taxes						
Invoice Lines Cther In	0 Paymenta						
Preduct	Description	Quantity	Unit of Measure	Unit Price	Taxes	Amount	
Baja Ringan Galvalis	Baja Ringan Gatralis	2.000	ćm	90000.00	Tax 0.00%	180000.00	
				s	ubtotal : Tan i	160000.00 Pp	
					Las 1	0.00 Rp	

Fig 6: Customer Invoice Form

Invoice that contains the customer's name, amount paid, method of payment and date of payment. The amount paid is not to be paid off, but can be paid half beforehand or according with an agreement with the company's customers. After the process of making the next payment handling Manufacturing Orders regarding production orders made by Sales Orders.

Display Manufacturing Order form can be seen in Figure above. It displays the contents of Manufacturing Order form used in production process with production schedule. There are few column describe detail bill of material that using in making product.

Manufactur	ing Order MO00006			
Product	Baja Ringan Galvalis	Bill of Material	Baja Rin	gan Galvalis
Product Quantity	2.000 Unit(s)	Responsible	Administ	rator
Product UoS Quantity	2.00 · cm	Source Docum	ent S0012.V	VH Stock -> Custemers MT
scheduled Date	02/28/2016 15:25:57			
naw statemars Locatio	WYPUSTOCK			
and the tradition core	_ www.			
Consumed Products	Finished Products Scheduled Products	Extra Informatio	n	
Products to Co	nsume	Consume	d Products	
Product Quant	ity Unit of Measure	Product	Quantity	Unit of Measure
		Galvalium	2.222	fl oz
		Silkon	2.000	fl oz
		Coll	2.222	Unit(s)
		Air -	3.000	1 Review

Fig 7: Manufacturing Order Form

After the manufacture of the next MO is the Procurement Order, handles based on demand after the order of Manufacturing Order status completed.

Procurem	ent Order PC00003			
Schedule Date Description Reference MO No.	02/28/2016 15:56:57 pemesanan baja ringa galvalis Manufacture MO00005	Priority Warehouse Procurement Location	Normal Your Company WH/Stock	
Procurement Lines	Quantity Product II	nit of Measure	Status	
Procurement Lines Product Galvalium	Quantity Product U	nit of Measure	Status Exception	
Procurement Lines Product Gahalium Silikon	Owantity Product U 1.111 fl oz 1.000 fl oz	nit of Measure	Status Exception Exception	
Procurement Lines Product Galvalium Silikon Coil	Owantity Product U 1.111 floz 1.000 floz 1.111 Usit(s)	nit of Measure	Status Exception Exception Exception	

Fig 8: Procurement Order Form

Form PO that has been processed, the status will change from "Confirmed" to "Running" which means the production process in accordance with the MO request being worked. Once the process is complete, the status will change to "Done" or if the process can be completed before the scheduled time, it can be clicked the "Set to Done" so that the status can be changed to "Done".

The following menu is a vital menu in the production process that is Schedulers menu. On the menu, there are three submenus that Compute Stock Minimum Run Schedulers and



Fig 9: Production Scheduling Workflow on Application

Workflow process of scheduling production on Odoo application found in the Settings menu or setting contains various procedures for set up and configure all the modules contained within the menu along with the application. Measures scheduling can be roughly divided into two processes automatically create production scheduling and scheduling production running.

Process of production scheduling to start automatically begin with access on Module Settings-Technical-Automation Scheduled Action-Create New Scheduled-Schedulers-MRP Run Warehouse Configuration-Create Ordering Rules. Furthermore, running production processes that have been made before, where the expected output is the production demands that can be made automatically becomes MO is provided on the module Manufacturing and Reordering Rules are rules created earlier in the process of reordering performed on Warehouse module seen from the minimum stock that available in the warehouse.

Name User	Run mrp scheduler Administrator	Active Priority	5
Information Technic	al Data		
Interval Number	1	Interval Unit	Months
Next Execution Date	02/05/2017 15:54:03 💽	Number of Calls	-1
Repeat Missed	0		

Fig 10: Scheduled Action Form

Scheduled action form used in made a new schedule for production like execution date and interval unit. Every column in this form cant be empty. The other things that must be caution is the rule on making automatic production schedule. The rule in automated action form shown in Figure below.

SC					
Related Document Mode	Action Rules	• 12	Active Sequence	0	
Conditions Actions					
When to Run	On Creation & Update				٠
Filter	schedule				• 🗠
Select when the action mu In order to create a new filt Go to your "Related Leads/Opportunities In this same "Searc "Share with all user The filter must therefore be	est be run, and add filters and/or tir ler. I Document Model* page and set is: Creation Date "is equal to* 01.00 h* view, select the menu *Save Cu s* available in this page.	ning condition he filter para 1/2012) urrent Filter",	ons. meters in the *Sear , enter the name (Ea	ch" view (Example of filter based on : Create the 01/01/2012) and add the option	

Fig 11: Automated Action Form

After fill Scheduled Action form and making rule in Automated Action form, the next process is how to running the schedulers.



Fig 12: Display Menu Run Schedulers

Menu Run Schedulers when it pressed is to running the schedule that was made on application. This feature computing all the procurement that was made. Another option in production scheduling is checking stock minimum. This feature will describing on the next figure.



Fig 13: Display Menu Compute Stock Minimum

Menu Compute Stock Minimum is about checking stock minimum on warehouse and automatically making procurement order if product value out of stock. It can be as a decision if production process needed or not. This feature definitely increasing the efficiency of time and cost. So it also indicating that company can finished customer order ontime or before deadline.

Product	Baya Ringan Galvalis		Warehouse	Your Company		
Quantity	1.000 Unit(s)		Procurement Location	WH/Stock		
UoS Quantity	1.00 cm		Preferred Routes			
Scheduling						
Scheduled Date	02/10/2016 15:20.45					
Priority	Nornal	•				
Notes Extra Inform	Normal		Rule	Your Company:	Manufacture	• 6
Notes Extra Inform Bo M Manufacturing Order	Normal ation		Rule Customer Address	Your Company.	Manufacture	• 0
Notes Extra Inform Both Manufacturing Order Source Document	Normal atise M000005 S0004/WH: Stock -> Custom	• • L3 ere MTO	Rute Customer Address	Your Company	Menufactura	• 0
Notes Extra Inform Do M Manufacturing Order Source Document Purchase Order	Normal ation M000005 S0004 WH: Stock -> Custom	• • Ett ers MTO	Rute Customer Address	Your Company	Manufacture	•]0

Fig 14: Stock - Customer Make to Order

Procurement orders will automatically appear when there is a production order based Manufacturing Order does not have enough raw materials.

After the automatic production scheduling process is completed, it will make Order Planning that contains a list order request carried to the company.

€ .	> Today	Febr	uary 2016	6		Month Week 0	ag	0	00	2016		0
W	Sun	Mun	Tee 2	Wed 3	Thu	Fil	Sat (i	Sin Mor	Ser. W	est Thu	hi.	5#
						23	prosidentiti, fran In Granaliti, 1	2 3 9 10	4	5 A 12 (11)	7	10
5	2		9	10	.11	12	13	18 17 23 24 30 31	18	19 20 36 27	21	22
6	54	8	16	17	18	10	2					
7.	21	22	23	24	25	з	27					

Fig 15: Order Planning display

This menu depends on the number of MO, where at a particular time will appear on that date because the MO is the latest time of the lead time required in the process so that at the time ordered products had to be finished.

4.3. The Study and Data Analysis

The Study is step to researching the last business process and how the reengineering business process. After that process, Data Analysis for implementating reengineering business process into workflow or Standart Operating Procedure (SOP) The Study and Data Analysis is to determine the final results of the development that was conducted. Here is the study and data analysis.

4.3.1. Bussiness Process Reengineering

Business Process Reengineering was made to repair the old business process management so it can increasing time and cost efficiency. The last business process management using conventional method consist of five modules like Customer, Front Office, Warehouse, Supplier and Production.

Customer cant order product online and must go to the spot. Front Office has so many job include material checking. Every business process worked manually so it must changed into the better workflow business process. Conventional method has many risk like human error. Solution for this problem is redesign business process into better performance in business process.



Fig 16. Bussiness Process Reengineering

Bussiness Process Reengineering is redesign based on previous business process management. Step by step not using manual method anymore. Customer can make own order at home or everywhere and everytime they need. After that, each department work on application based on their job until the order completed and delivered to customer.

4.3.2. Business Process Management on Application

Implementation on application based on business process reengineering. Workflow business process on application is more structured and it works based on job from each department or module on application.



Fig 16. Bussiness Process Management of Application

Figure 3 describes workflow from business process. It has five modules consist of Sales, Invoicing, Warehouse, Manufacturing and Purchases also consist of two entities Customer and Supplier. Every process on application will have draft for validation process by each department based on their purposes before continue to the other process.

5. CONCLUSION

Developing manufacturing module application using Enterprise Resource Planning (ERP) concept consists of six stages, namely Literature Research, Data Collecting, Data Processing, Implementation in Odoo, Testing and Implementation System also Conclusion and Suggestion. Development modules using odoo 8.0 version that can customized, user friendly and can handle many business process in one integrated system. The first step is determine business process management and analyzing every single process workflow, if last business process decreasing company perform like don't have any production schedule, business process reengineering is the right choice. The result is implementation of the newest business process on application. Implementation process on Odoo application need customation on manufacturing module for making automatic production schedule that increasing cost and time efficiency.Future scope about the research is how to improvement new modules on application beside manufacturing modules so the application more suitable for every bussines process on different organization.

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