Implementation of material requirement planning (MRP) on raw material order planning system for garment industry

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Implementation of Material Requirement Planning (MRP) on Raw Material Order Planning System for Garment Industry

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Abstract. The increasingly competitive business environment has encouraged many actors to use information and communication technology as a competitive advantage, including the garment industry. So far, difficulties in controlling raw material inventories which causes problems for the production process. If there is a shortage of raw materials, the production process cannot be carried out, on the contrary if the raw material ordered is too excessive it will cause excess and the high cost of raw material inventory. This research develops an information system that can plan the needs of raw materials needed for production. This system is web-based, applying the MRP (Material Requirement Planning) method to develop raw material ordering planning systems, case studies at garment companies, using PHP programming and FIREBIRD databases. This system gets input from the production schedule resulting from production scheduling information system, then provides output in the form of recommendations for scheduling raw material orders. This output can later be used as a reference for the company's operational decisions in planning raw material requirements.
Keywords: information system, raw materials, order planning system, MRP, material requirement planning

1. Introduction

The development of the current global era influences the way companies do business. To be able to survive, an organization or company innovates to beat competitors, and strives to advance in utilizing Information Technology (IT). One of the keys to success, companies must have the right mission and strategy in their business activities and improve their performance.

As a case study, XYZ company is engaged in Moslem fashion industry in Indonesia, which provides various models of Moslem clothing for sale (make to stock). During this time, XYZ companies have difficulty in planning and controlling the supply of raw materials that will lead to obstacles in the production process. There are many suppliers as business partners who supply raw materials in the production process, but on the other hand consumer demand cannot be met. If the raw materials ordered are lacking, the production process cannot be carried out, so that some consumer requests cannot be met. However, if the raw material is ordered too much, it will cause excess and accumulate raw materials, as well as the high cost of raw material inventory. If this continues to happen, it will result in a waste of working capital and could be a loss for the company.

Therefore, to enhance the existing business strategy, needed an information system that can do the planning needs of the raw materials needed for production. This system refers to the production schedule resulting from demand forecasting, then output the form of a recommendation of scheduling reservations raw materials [1].

This paper discusses how to analyze, design, and develop a computer based and web based application system, for raw material order planning system, using Material Requirement Planning (MRP) method. Input of this system is in the form of Master Production Schedule (MPS) resulting from Production Scheduling Information System [2]. MPS are generated from the demand forecasting results of sales transaction history data in Online Transaction Processing (OLTP) [3]. The system will produce output in the form of raw materials on the booking schedule, using Material Requirement Planning (MRP) per week (period), and not using safety stock with the assumption that goods arrive on time.

Materials Requirement Planning (MRP) is a technique for determining the quantity and the time to purchase dependent demand items necessary to meet the needs of the Master Production Schedule (MPS) [3]. Materials Requirement Planning (MRP) as a technique that uses a list of bill of material, inventory, receipts were estimated, and the master production schedule to determine material requirements [4]. The implementation of MRP would create competition and efficiency, which would lead to a better quality of life for customers at lower costs [5].

This system plays an important role for maintaining the stability of the amount of raw material inventory that is no less and no exaggeration, according to production requirements. In other words, this system will control the supply of raw materials effectively, reducing the risk of a less amount of raw materials or excessive, so that the production activity of company XYZ can run optimally.

2. METHODS

2.1 Data collection

The data collection is the procedure for obtaining the necessary data in this study. After knowing the main problem faced by company, then collecting the data needed in order to find solutions to these problems. Literature studies are also conducted and appropriate reference about MRP are looked to support and obtain information that is true and accurate.

The technique used by the author collection data for raw materials is a subsystem of data analysis results of Muhammad Aulia Taqwa [6] of raw material inventory control which is currently running at company XZY. The data includes the number of raw materials needed to produce certain products, as well as data lead Time or length of time to send raw materials from its suppliers respectively.

Bill of Material (BOM) contains information on all materials, components or sub-assembly that is used in making a product [7]. The data amount of the raw material needs as well as bill of material from other models can be seen recapitulation bill of material collected from five products.

Table 1. Summary of Bill Of Material 5 Model

Model	Type Material	Total Reuirements (m^2)
X-101	Kaos Broken White	9.21
	Shirt Dark Brown	0.21
	Shirt Brown Young	0.65
	Label	2
	Rubber	0.3
	Tape	0.3
X-68	Pink Kaos Kids	8.44
	White shirt	0.42
	Pink Shirt Young	0.38

Model	Type Material	Total Reuirements (m^2)
	Label	2
	Metal studs	3
X-95	Kaos Mosaline	9.06
	Shirt Magenta strit	3.664
	Label	2
	Rubber	0.4
X-100	Shirt Brown Young	7.926
	Shirt Dark Brown	0.945
	Label	2
	Rubber	0.2
	Metal studs	2
X-102	Kaos Batik	7.64
	Shirt Dark Brown	0.8
	Label	2
	Rubber	0.2
	Tape	0.8

Table 2 describes the results of the calculation data forecasting demand for each model is in April and May 2013[4]. The results of forecasting (pieces) explains the forecast amount of clothing that must be produced or forecasts of the number of requests by the prediction clothes.

Table 2. Summary of Demand Forecasting for 5 Moslem Clothes Models

Model	Year	Month	Results Forecasting (Pieces)
X 68	2013	April	571.00
		May	579.00
X 95	2013	April	377.43
		May	374.93
X 100	2013	April	88.49
		May	1.11
X 101	2013	April	467.84
		May	451.58
X 102	2013	April	1,025.38
		May	1,038.01

2.2 Data Analysis

Improper scheduling of production activities, resulting in PT. XYZ also has difficulty in determining the time and number of orders for raw materials that must be ordered to suppliers. For example, the delivery time can reach 4 weeks to arrive at the raw material warehouse. This will certainly slow down the production process of finished goods if the raw material delivery time does not match the initial

estimate. While the number of orders for excessive raw materials can make a buildup in a limited warehouse of raw materials.

3. RESULT AND DISCUSSION

3.1 Analysis and Design

Workflow system procedures that would apply to the proposed system Booking Raw Materials Planning System in this scenario:

1. Historical data from polling stations processed into forecast demand.
2. Information System Demand Forecasting make forecasting to produce a model with a certain amount to be produced at a certain time.
3. From the results it will bring demand forecasting production or MPS (Master Production schedules) which will be input Booking Planning Information System Raw Materials.
4. Planning system for ordering raw materials will process production demand data by looking at the BOM (Bill of Material) of each model to be produced; estimate the amount of raw material ordered and when it will arrive at the warehouse at the specified production time (lead time).
5. Output from the planning system in the form of Scheduling of Raw Materials / Materials based on suppliers and the date to be ordered.

The focus of the planning system ordering raw materials are at No. 4 and 5.

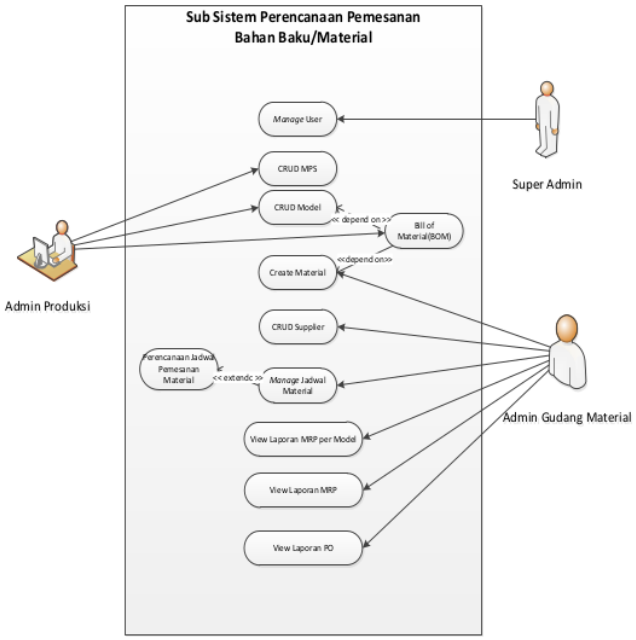

Figure 1. Usecase Diagram of Raw Materials Order Planning System

Figure 2. Algorithm for Ordering Raw Materials (for each Material)

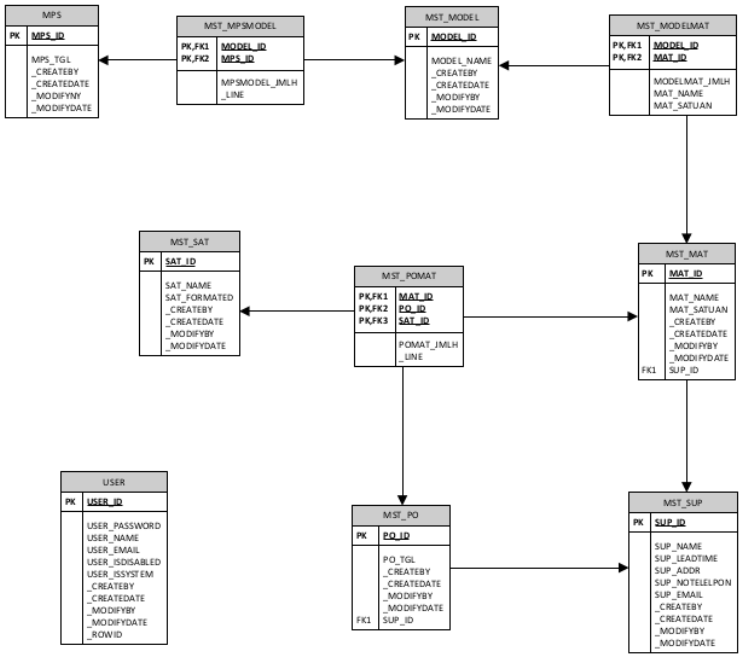

Figure 3. Databases of Raw Materials Order Planning System

3.2 Algorithm

Here is an overview of the activities that occur in the system . Figure 2 is the algorithm of ordering each raw materials calculated based on a request from the production form of MPS. MPS consists of MPS_ID and MPS_TGL. MPS has MPSMODEL detail consisting MPS_ID, MODEL_ID and MPSMODEL_JMLH. Then the request by the specified date of production will produce a model with a certain amount.

For admin of raw materials can know what materials will be ordered system will calculate it automatically. MAT_REQ is the material to be booked calculated by MODELMAT_JMLH multiplied by MPSMODEL_JMLH to obtain the required material for each model, after it was totalled by SUM (MAT_REQ), after getting the material needed to determine the time of booking material supplier. MPS_TGL decreased by SUP_LEADTIME it will get on how to be ordered material for each supplier.

The menu structure is designed based login to allow a user to use this system. The system is simple not too many designs that create confusion.

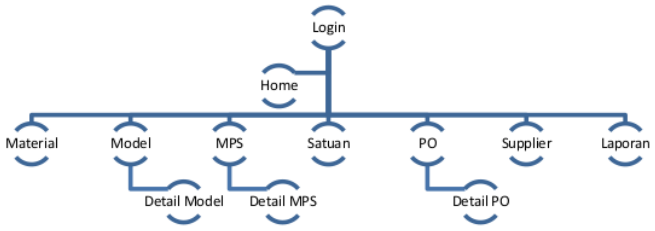

Figure 4. Structure Menu System

3.3 Implementation of User Interface

User Interface the design of the raw materials order scheduling system for company XYZ will be indicated by these figure:

1. Pages Management Bill of Material (BOM)

Bill of Materials is located in the Model menu. Due to indicate the model requires the name of the raw material and how much material.

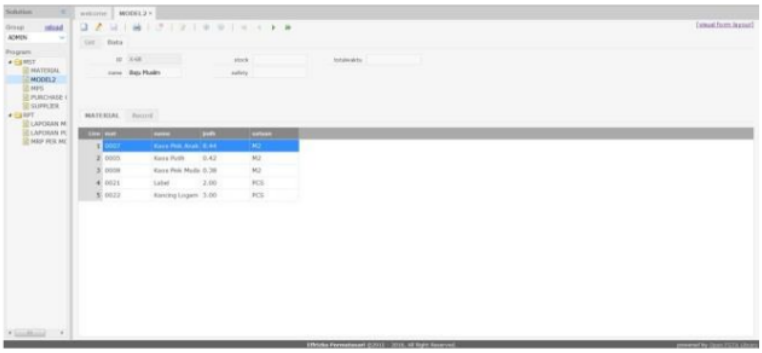

Figure 5. Page Management Bill of Material (BOM)

2. Page MPS

This page is a request from the production department to ask for the necessary raw materials warehouse section. Which will be the input of a reservation system Raw Materials

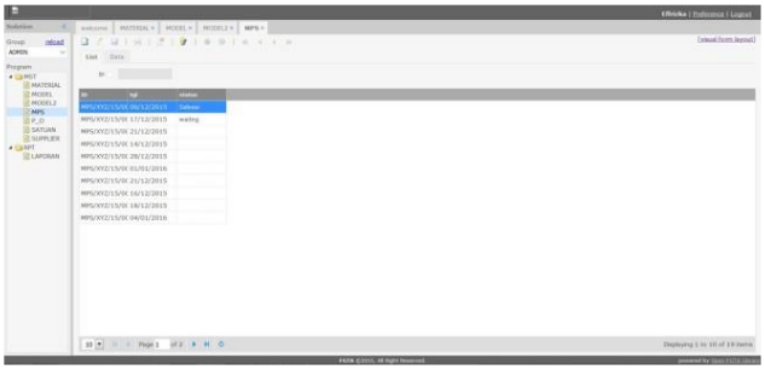

Figure 6. Page MPS

3. Reports MRP for each Model

Weather is the output of the planning system in the form of raw material ordering schedule. It is a calculation of raw materials in a dress model.

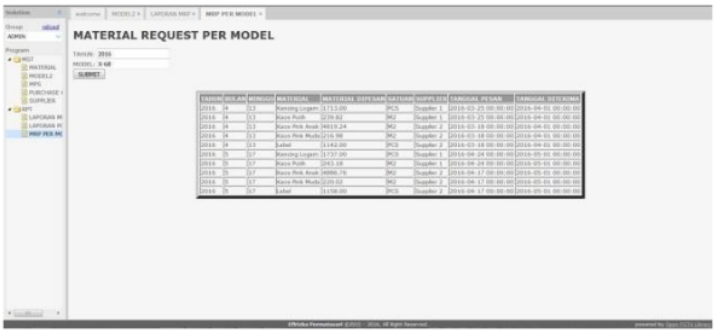

Figure 7. Report of MRP per Model

4. Planning Reports for Booking Raw Material (MRP)

This is a scheduling page that can be done on the date calculated by the system. The calculation of all MPS that have been prepared by the production department which generates the whole or recapitulation of the required raw materials and their order schedule.

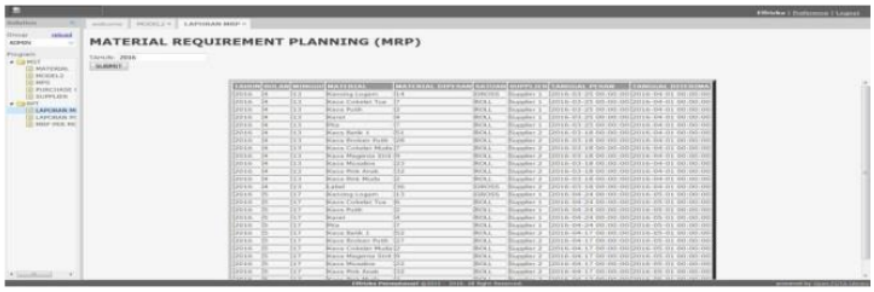

Figure 8. Report of Raw Materials Planning Order

5. The Reports page PO

This is the PO to supplier page report that will be made by the warehouse to order raw materials. Laporan shown on this page is based on a PO to a single supplier.

Figure 9. Report of Purchased Order (PO)

4. CONCLUSION

4.1 Conclusions

Raw Materials Planning Order System can be used in Garment Industry and has services and benefits:

1. This system provides solutions and convenience for users to order raw materials. The system produce output in the form of raw materials booking schedule, using Material Requirement Planning (MRP) method with the assumption that goods arrive on time.
2. Master Production Schedule (MPS) is a requirement to be entered into this system. MPS are resulted from Production Scheduling Information System and generated from the demand forecasting results of sales transaction history data in Online Transaction Processing (OLTP).
3. With the construction of this system, it can reduce errors in ordering raw materials up to 80%, which includes the number of orders and order time. Errors can occur if there is a change in market demand from what has been predicted or there are supplier time constraints in sending goods outside of previous planning.
4. The development of this system results in the planning of ordering raw materials in the form of a schedule for ordering raw materials according to the previously estimated, so that the risk of delays in the delivery of raw materials from suppliers can be handled properly.
5. Based on the results of research conducted by the company, the suggestion of acquisition of raw materials must be 3 days to anticipate things that are not desirable. This can actually be done by this system.

4.2 Recommendations

Suggestions for further research authors who want to develop or continue research of this system can be integrated with the sub-systems of production, marketing and storage of raw goods so that data can be integrated and usefulness of this system can be stronger.

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