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MATERIAL REQUIREMENT PLANNING ANALYSIS IN MICRO, SMALL AND MEDIUM ENTERPRISE
CASE STUDY: GROOVELINE - AN APPAREL OUTSOURCING COMPANY FINAL PROJECT

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Abstract- *Micro, Small, and Medium Enterprise (MSME) is the largest business executor to the Indonesia's national Product Domestic Bruto (PDB). It contribute 59.8% to the total of PDB, according to the government data related to MSME period 2011-2012. Due to the size of the company, it is inevitable that MSME required to have an efficient workflow and material purchasing in order to minimize the costs and create a better margin in profit. MSME in fashion industry is one of the most promising business ventures, an apparel outsourcing called Grooveline is one of those. Grooveline is a company which offer the service of T-shirt manufacturing that can be ordered according to customer's wishes in term of design, color, image to be printed, fabrics, and size. Based on the interview with the company's owner and manager, it was obtained that it is important for Grooveline apparel outsourcing company to be able to fulfil their customer's demand. These objective, however, inhibited by the problem of the company's inability to determine what materials should be purchased and how much the need is, and the problem of the company's inability to make a production planning in order to fulfill the customer demand in the right amount and on the right time.Thus, a calculation of Material Requirement Planning (MRP) of each product produced is crucial to the business in order to design an effective purchasing order. The implementation of the aforementioned plan shall prevent the company from wasting materials and to conduct a more effective production and lead a more profitable business. The requirement that need to be met in order to make a calculation of MRP, are the availability of product structure, Master Production Schedule, Bills of Material, purchasing and production lead time, a time phased structure, Gross Material Requirement, a lot sizing and net material requirement. The final calculation of MRP requirement are being totaled and being compared to the actual purchasing data that the company has performed to satisfy the previous demand. This action is conducted in order to show how much efficiency the company can create when performing MRP from the beginning of period. Result of the total calculation has shown that if company has implemented MRP from the beginning, company can save the amount of Rp 4,459,500,- in price and make saving of 11%.*

Keywords: *Cost Efficiency, Apparel Outsourcing, Material Requirement Planning, Micro, Small and Medium Enterprises (MSME)*

Introduction

Fashion is a major business which deserves serious attention. It has always become so important that this field of business will presumably never run out of demand. The phenomenon of huge fashion demand has created consumptive behavior and the thirst of ready-to-wear apparel. It is translated by garment producers into producing the large scale of fashion products which then created a similarity of fashion on most people. This similarity of fashion encourages some people to stand out distinguish themselves from the others, especially the younger generations, on the basis of their courage and interest in innovations (Law, Zhang, & Chung-Sun, 2004). Furthermore, the fashion business is particularly volatile because the customer's taste change rapidly. To anticipate both of the aforementioned challenges, several stores exist to offer the service of customizable

fashion products from top to toe. An example of this kind of company is apparel outsourcing company. The apparel outsourcing company in Bandung is usually performed by MSME business performer. In spite of its relatively small size, MSME have a huge impact on Indonesia's economic growth (Narasi Statistik UMKM, 2012). MSME proves to be resistant to the fluctuation of Indonesia's economic situation. It has a relatively stable demand and income. These advantages attract a lot of business actor in this model of business, proven by the fact that the number of business performers that kept increasing each year.

One example of a MSME business performer which runs in the field of apparel outsourcing company is "Grooveline". Grooveline apparel outsourcing company provides the manufacturing services of T-shirt that can be customized according to customer's wishes. Grooveline is a MSME that has been running for 10 months since its establishment on February 2014. Grooveline is a MSME that has been running for 10 months since its establishment on February 2014. It has a simple financial management, the operation of the company has an intensive interaction with the owner due to its limitation of employee number, and has only 6 employees in total, with 4 permanent employees and 2 temporary employees. The annual sales of the company is yet to be known because the data is not available yet. However, from the available data of the company's income it can be seen that the company's income will not exceed Rp 300 million a year. Thus, Grooveline apparel outsourcing company can be categorized as a MSME, in micro level enterprise.

Problem Statement

There are several problems that are ensued in Grooveline apparel outsourcing in Bandung. These problems are still occurring and will hamper the development of this company. Problems are collected through direct and indirect interviews with company's owner and manager. Based on the interview, it was obtained that it is important for Grooveline apparel outsourcing company to be able to fulfil their customer's demand. This company had faced the problem of the inability to determine what materials should be purchased and how much the need is. The skills to determine the material requirements is important because small apparel outsourcing companies need to adjust their production result to customers demand and expectation, without spending too much cost on raw material purchasing. . If the company purchased too many raw materials, there will be a waste of cloths because their products are specialized in customization. However, the company cannot buy too little of raw materials either because there's also a chance that the need for required fabric would not be available in the second purchasing. There is a common situation in which the fabrics have a different color when purchased at the different time. Another problem that occured in Grooveline is the company's inability to make a production planning in order to fulfill the customer demand in the right amount and on the right time. Grooveline is often unable to meet the deadline of the customer demand which make the company failed to satisfy their customer. The delay in the company's fulfillment date can cause the customer dissatisfactions and there is a possibility that this unsatisfied customer will not be going to order in the same store in the future. Above problems shall becoming the concern of this study. Therefore, it becomes the objective of this study.

Literature Review

Micro, Small and Medium Enterprise

A MSME has a relatively small capital with simple financial management and in its operation the company has an intense interaction with the owner due to its limitation of employee number (Narasi Statistik UMKM 2010-2011, 2012). MSME has three business categories which are Micro Enterprise, Small Enterprise, and Medium Enterprise which categorized based on its employees number, its net worth excluding land and building, and its annual sales. According to Narasi Statistik UMKM 2010-2011, a micro enterprise has less than 10 employees with net worth at most of Rp 50 million and annual sales of at most Rp 300 million. A small enterprise has 10-100 employees with net worth of more than Rp 50 million up to at most of Rp 500 million and annual sales of more than Rp 300 million

up to most Rp 2.5 billion. Meanwhile a medium enterprise has 100-300 employees with net worth more than Rp 500 million up to at most of Rp 10 billion and annual sales of more than Rp 2.5 billion up to most Rp 50 billion. (2012)

Business Process

Business Process is a series of structured activities or tasks that are related to each other and performed to solve a specific problem or to accomplish a specific goal and results. It is a set of logically related tasks performed to achieve a defined business outcome (Davenport & Short, 1990). A business process diagram can be split into several sub processes which have their own attributes that contribute to achieving its objectives. Analysis of business process is often visualized with a Flowchart as a concatenation of activities with interleaving decision points. It is used to show the sequence of business process activities.

Material Requirement Planning (MRP)

Material Requirement Planning (MRP) is a time phased-priority planning technique that calculates material requirement and schedule supply to meet demand of a product (Moustakis, 2000).This technique has so many benefits include better response to customer orders as the result of improved adherence to schedules, faster response to market change, improved utilization of facilities and labor, and educed inventory levels (Heizer & Render, 2011).

By implementing this technique on their system, a company can have a better response to customers demand, have more efficiency in controlling their production, avoid excess inventory, and have a less waste. In accomplishing an effective use of dependent inventory models it, requires the operations manager to know; (1) Master production schedule, to know when products need to be finish and on how much quantities, (2) Bill of materials (BOM), to know what are the components that is needed to fulfil the product demand, (3) Inventory availability / status record, to know the material availability in stock and to figure how much material that need to be ordered from the supplier, (4) Purchase orders outstanding, to know the purchases order that has yet to deliver from supplier, and (5) Lead times, to know how much times it take for the suppliers to deliver material ordered to the company (Heizer and Render, 2011). However, since the company is prefer to have no inventory availability and zero purchase order outstanding, step 3 and 4 are not applied in this study. After aforementioned requirements are completed, a (6) Time phased product structure, (7) Gross material requirement, (8) Lot sizing, and (9) Net material requirement can be created to complete the MRP structure on this study. A time phased product structure is made based on BOM and Lead Times information. Gross material requirement is made based on MPS and time phased product structure. Lot sizing is made based on the information on gross material requirement. Net material requirement is made based on lot sizing. After the structure is completed, (10) Cost comparison can be perform to discover how significant the improvement that the company can perform if the company is applicate the theory on their material purchasing system. The cost comparison is created based on the information on net material requirement.

- **Master Production Schedule (MPS)**

  When an order received, the manufacturer will create a timetable schedule known as Master Production Schedule (MPS) which specify what product is to be made and when (Heizer and Render, 2011). It is a schedule that is used to note the company when the demand must be fulfilled. A MPS can have months, weeks, or days as its time unit measurement. Below is the example of MPS.

- **Bill of Material (BOM)**

  Bill of Material (BOM) contains lists of information about quantities of components, ingredients, and materials required to make a product. Every product will have a different bill of material depend on its specification and needs and BOM can tell what a product were made of. It functioned to provide a better understanding of product's structure. Kumar & Suresh define Bill of

Materials as "*A listing of all components (subassemblies and material) that go into an assembled item. It frequently includes the part numbers and quantity required per assembly"* (2009). There are levels that are usually used to identify the steps on building those products. It may be called level 0, 1, 2, and after. This level completed until every component is included.

- **Lead Time**
  Lead time is the time required to acquire (purchase, produce, and assemble) a finished product (Heizer and Render, 2011). Lead time usually divided into two, which are purchasing item lead time and production lead time. Lead time for purchasing items is the time between the recognition of the need for an item and the time that those item is available for production. Production lead time is the time that company required to make any necessary components as the materials of a product.

- **Time Phased Product Structure**
  A time-phased product structure construction is performed to figure out how much time a product or component needs to be build. This structure made based on the combination of information regarding product's BOM and lead time. The importance of this structure is that this structure created to provide a better understand about what product that need to process, how much to produce and when to start and finish the production of every product's component.

- **Gross Requirement Material**
  The gross material requirement plan is a schedule that shows when an item must be ordered from suppliers and when the production of an item must be started to satisfy the demand of finished goods by a particular date (Heizer and Render, 2011). According to Kumar and Suresh, gross material requirements is the projected needs of for a raw materials, components, subassemblies, or finished goods by the end of the period shown (2009).

- **Lot Sizing**
  Lot sizing is techniques used to make a decision of how much material needed to be ordered once net requirement is obtained (Heizer and Render, 2011). Lot for lot is a lot sizing technique that generates exactly what is required to meet the plan. It was build based on the information from the net requirement plan and will not consider the next period requirement in the making. This study is adopt the assumption on zero inventory.

- **Net Material Requirement**
  Net material requirement is made with the consideration of inventory on hand and is the result of adjusting gross requirement for inventory on hand and scheduled receipts (Heizer and Render, 2011). Net material requirement are calculated by adjusting the existing inventory and items already on order as recorded in the data of inventory on hand and purchase order outstanding and are the net amount of materials needed in the period (Kumar & Suresh 2009).

- **Cost Comparison**
  In order to obtain how significant the improvement that company can perform if company applies the theory on their material purchasing system, a cost comparison was made. This comparison will compare the existing cost of material purchasing with the new cost of material purchasing that are obtained by applying MRP. Cost comparison will figure out how much money can company saved by applying MRP and its efficiency percentage.

Methodology

Research method explains about the method that are used into accomplishing the study and why this method is selected. Method that is used into accomplishing this study is Material Requirement Planning (MRP) method. This method is considered to be the most appropriate method to answer the research question because it is a technique that can be used to calculate the material requirement and to schedule supply to meet demand across all products and parts in a plant (Moustakis, 2000). Other than that, the implementation of the method will help the company to anticipate the occurrence of waste, brings more effective production and make the business more profitable.

MRP has the benefit of better response to customer orders, faster response to market changes, and inventory level's reduction. It consists of several the steps from master production schedule to net material requirements construction, as described on above literature review related to MRP steps. An application of MRP can actually cover the function of both methods. The application of the project scheduling on task and task duration actually have a similar information with the information contained in product's Bill of Material, which is one aspect of the MRP requirement. The scheduling function of forecasting method can be covered by creating a master production schedule, which is also less risky compare to the application of forecasting to such a newborn company such as Grooveline apparel outsourcing company. It is safer for the company to apply the system of material purchasing only when there is certain demand from the customer, considering the company's production situation which has a lot of variable and product request which vary from one customer to another.

Research Steps

There are steps that writer takes to complete this study and shown in below table;

Store Visit and Interview	•Process of collecting the data related to construct the study
Problem Identification	•The recognition of problem and to set the objective of the study
Literature Review	•The theoretical foundations of the data analysis
Data Analysis	•The analysis of the problem using the theory on literature review
Conclusion and Recommendation	•Brief summary of study's result and recommendation to company and further research

Figure 1 Methodology

Data Analysis

Business Process

Business process of Grooveline apparel outsourcing company for T-shirt product is actually pretty simple. Even so, these processes were assessed as very effective and efficient according to the company's employee. Below is the business process of T-shirt product.

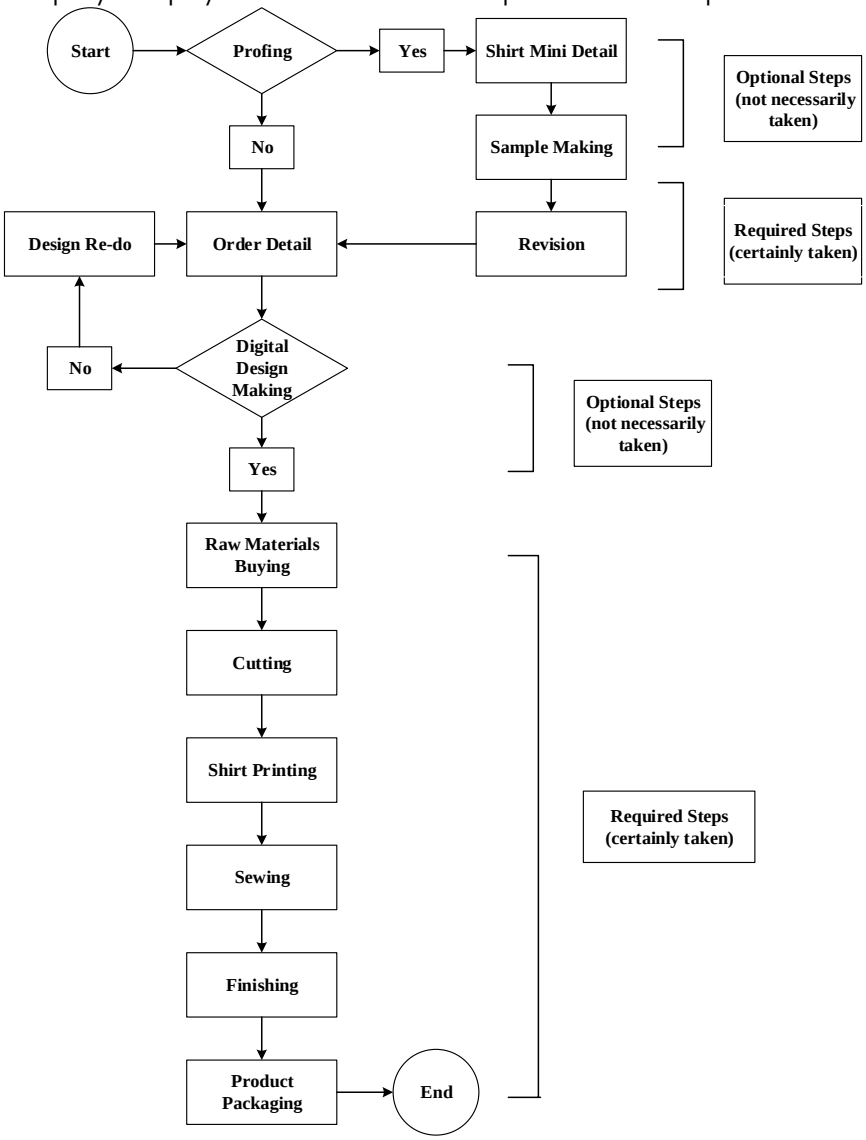

Figure 2 Business Process

T-shirt that is made by Grooveline apparel outsourcing company is basically a basic T-shirt with short sleeve and varied color. What makes it difference is that in every production there are printed images that being placed in either front or behind on the shirt as requested. Structure product of T-shirt is shown in below figure,

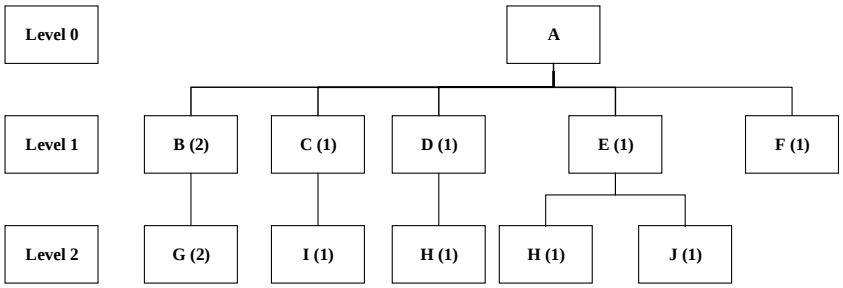

Figure 3 Product Structure

Notes:

A: T-shirt	D: Plain body	G: 20 x 50 cm cotton	J: 10 ml ink
B: Sleeves	E: Printed body	H: 55 x 80 cm cotton	
C: Collar	F: Small roll of yarn	I: 4 x 60cm rib cloth	

Master Production Schedule

Main materials that are needed to build this product are cloths and yarn. Since the company was just established on February 2014, the company can only provide data of demand of the T-shirt product from Mach 2014 to September 2014. The table above provides the number of product request for T-shirt in a 7 months period.

Table 1 Master Production Table

Months	Requested Item (pc.)	Months	Requested Item (pc.)
March	150	July	250
April	200	August	300
May	90	September	200
June	160		

Bill of Material

T-shirt was made out of 4 main components, there are 2 pieces of T-shirt's sleeves, one piece of the collar, one piece of plain shirt body and one piece of printed shirt body. Bill of material for T-shirt production has three levels which are level 0, level 1 and level 2. Bill of Material of product T-shirts can be seen on table below,

Table 2 Bill of Material

Component Code	Component Level	Item	Number of Item
A	0	T-shirt	
B	1	Sleeves	2
C		Collar	1
D		Plain Body	1
E		Printed Body	1
F		Yarn	1
G	2	20 x 50 cm cotton	2
H		55 x 80 cm cotton	2
I		4 x 60cm rib cloth	1
J		10 ml ink	1

Lead Time

There are two lead items: purchased items lead time and production lead time. All purchased items had no lead time because the store where the company buys the component has always had their inventory. There are 6 days of production lead time which consist of raw materials buying lead time, cutting lead time, shirt printing lead time and product finishing and packaging lead, and sewing activities lead times.

Time Phased Product Structure

The figure below is the time phased structure of the T-shirt product. A T-shirt require 6 days in total to be processed, from a completely raw materials to become a finished product.

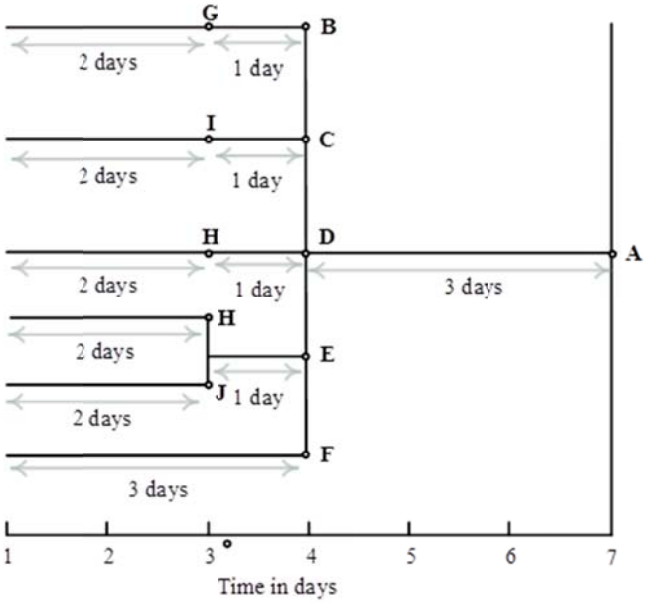

Figure 4 Time Phased Product Structure

Gross Material Requirement Plan

Based on the above information about previous demand, a gross material requirement plan can be built. The demand that is used to make an example of the gross material requirement plan is the demand in August 2014 because it has more quantity ordered than another month's demand.

Table 3 Gross Material Requirement Plan

		Days																										Lead Time
		Week 1							Week 2							Week 3							Week 4						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
A	Required Date							45						200												55					3
	Order Release Data				45						200											55								
B	Required Date				90						400											110								1
	Order Release Data			90					400												110									
C	Required Date				45						200											55								1
	Order Release Data			45					200												55									
D	Required Date				45						200											55								1
	Order Release Data			45					200												55									
E	Required Date				45						200											55								1
	Order Release Data			45					200												55									
F	Required Date				45						200											55								3
	Order Release Data	45						200											55											
G	Required Date			90					400												110									2
	Order Release Data	90						400											110											
H	Required Date			90					400												110									2
	Order Release Data	90						400											110											
I	Required Date			45					200												55									2
	Order Release Data	45						200											55											
J	Required Date			45					200												55									2
	Order Release Data	45						200											55											

Lot Sizing: Lot for Lot

Lot sizing subsector is calculated with Lot for Lot technique. This lot sizing technique is also suitable to the condition of Grooveline apparel outsourcing case.

Table 4 Lot for Lot

Lot Size	Lead Time (Days)	On Hand	Safety Stock	Allo-Cated	Low-Level Code	Item Identification		Days																									
								Week 1							Week 2							Week 3							Week 4						
								1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Lot for Lot	3	0	-	-	0	A	GR							45					200												55				
							SR																												
							POH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
							NR							45					200												55				
							PORc							45					200												55				
							PORI				45							200											55						
Lot Size	Lead Time (Days)	On Hand	Safety Stock	Allo-Cated	Low-Level Code	Item Identification		Days																									
								Week 1							Week 2							Week 3							Week 4						
								1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Lot for Lot	1	0	-	-	1	B	GR				90						400											110						
							SR																												
							POH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
							NR				90						400											110						
							PORc				90						400											110						
							PORI			90						400											110								
Lot Size	Lead Time (Days)	On Hand	Safety Stock	Allo-Cated	Low-Level Code	Item Identification		Days																									
								Week 1							Week 2							Week 3							Week 4						
								1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Lot for Lot	1	0	-	-	1	C	GR				45						200											55						
							SR																												
							POH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
							NR				45						200											55						
							PORc				45						200											55						
							PORI			45						200											55								

Lot Size	Lead Time (Days)	On Hand	Safety Stock	Allo-Cated	Low-Level Code	Item Identification		Days: Week 1 (1 2 3 4 5 6 7)	Week 2 (1 2 3 4 5 6 7)	Week 3 (1 2 3 4 5 6 7)	Week 4 (1 2 3 4 5 6 7)
Lot for Lot	1	0	-	-	1	D	GR	45	200	55	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	45	200	55	
							PORc	45	200	55	
							PORl	45	200	55	
Lot for Lot	1	0	-	-	1	E	GR	45	200	55	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	45	200	55	
							PORc	45	200	55	
							PORl	45	200	55	
Lot for Lot	3	0	-	-	1	F	GR	45	200	55	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	45	200	55	
							PORc	45	200	55	
							PORl	45	200	55	
Lot for Lot	2	0	-	-	2	G	GR	90	400	110	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	90	400	110	
							PORc	90	400	110	
							PORl	90	400	110	

Table 5 Lot for Lot cont.

Lot Size	Lead Time (Days)	On Hand	Safety Stock	Allo-Cated	Low-Level Code	Item Identification		Days: Week 1 (1 2 3 4 5 6 7)	Week 2 (1 2 3 4 5 6 7)	Week 3 (1 2 3 4 5 6 7)	Week 4 (1 2 3 4 5 6 7)
Lot for Lot	2	0	-	-	-	H	GR	90	400	110	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	90	400	110	
							PORc	90	400	110	
							PORl	90	400	110	
Lot for Lot	2	0	-	-	-	I	GR	45	200	55	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	45	200	55	
							PORc	45	200	55	
							PORl	45	200	55	
Lot for Lot	2	0	-	-	-	J	GR	45	200	55	
							SR				
							POH	0 0 0 0 0 0 0	0 0 0 0 0 0 0	0 0 0 0 0 0 0	
							NR	45	200	55	
							PORc	45	200	55	
							PORl	45	200	55	

Net Requirement Plan

Based on actual procurement data that company performs above, it was found that there is an excess of raw materials compare to the total component requirement which has obtained with the application MRP to calculation. There is excess in yarn which overage by 10 rolls, excess in cotton which overage by 3 kg, excess in rib cloth which overage by 1 kg, and excess in shirt-printing ink which overage by 15 bottles.

Table 6 MRP August Requirement vs. Actual Raw material Procurement

	Actual Raw Material Procurement	MRP August Requirement
Demand	300 Pieces	300 Pieces
Yarn (F)	310 Rolls	300 Rolls
Cotton (G)	65 Kg	62 Kg
Cotton (H)		
Rib Cloth (I)	8 Kg	7 Kg
Shirt-Printing Ink (J)	75 Bottles	60 Bottles

Cost Comparison

Cost comparison contains the comparison between the original costs of actual material purchasing on every months demand with the costs that is calculated using MRP. Comparisons of cost are made by combine each month's total price in a table and compare their value in price and in percentage. The also be the efficiency column which contain information regarding the difference between the original cost before MRP and cost that obtained after MRP implementation. Efficiency column is provided in the rupiah or value in price and value in percentage.

Table 7 Cost Comparison of Actual Procurement and MRP

Month	Actual Procurement Cost	MRP Cost	Efficiency	
			In Price	In Percentage
March	Rp 4,700,000,-	Rp 4,004,000,-	Rp 696.000,-	14.81%
April	Rp 5,662,500,-	Rp 5,224,000,-	Rp 418,500,-	7.39%
May	Rp 3,015,000,-	Rp 2,440,000,-	Rp 575,000,-	19.07%
June	Rp 4,814,000,-	Rp 4,183,000,-	Rp 631,000,-	13.11%
July	Rp 7,437,500,-	Rp 6,484,000,-	Rp 953,500,-	12.82%
August	Rp 8,560,000,-	Rp 7,863,000,-	Rp 697.000,-	8.14%
September	Rp 5,762,500,-	Rp 5,294,000,-	Rp 486,500,-	8.13%

All information from tables above then being totaled to ease the data observation. Table below contain the information of above table's summary.

Table 8 Total Cost Comparison of Actual Procurement and MRP

Total Actual Procurement Cost	MRP Total Cost	Efficiency	
		In Price	In Percentage
Rp 39,951,500,-	Rp 35,492,000,-	Rp 4,459,500,-	11%

Based on above comparison it is found that cost calculation using MRP can save company's spending up to Rp 4.459.500,- or 11% more cost efficient from its total original cost which valued Rp 39.951.500,- for 7 months. If this method is being applied since the beginning of production then company is able to save Rp 637.071,- per month.

Conclusion and Recommendation

Conclusion

Grooveline apparel outsourcing company is a Micro, Small, and Medium Enterprises (MSME) apparel outsourcing company which has the problem of company's inability to determine what materials should be purchased and how much the need and company's inability to make a production planning in order to fulfill the customer demand in the right amount and on the right time. This problem results the company to experience a shortage and excess in the purchase of raw materials such as cotton, rib cloths, yarns, and shirt-printing inks.

To answer this problem, an implementation of Material Requirement Planning is performed in the calculation of raw materials purchasing plan. This method was chosen because it was considered appropriate to answer the problems that were faced by Grooveline apparel outsourcing company. Its objective to perform a better response to customer demand, more efficiency in production controlling, and to avoid excess in inventory (Heizer & Render, 2011) is also beneficial for this company because it has vary customers demand.

In comparison data it can be figured that in August demand, company can save costs by 8.14% and make savings of an average of 11%, if the company has applied the MRP on their planning. The company also makes savings of Rp 4,459,500,- if the MRP method has been applied from March to September. Results generated from calculation of cost savings are relatively small in percentage. However on its capacity as UKM/SME, the application of MRP method in the purchasing planning of raw materials resulted company to save a lot of costs. Judging from the size of this small company, these saving figures have considerably big impact.

In addition to the terms of cost reduction, the application of this method also resulted to make companies to be able to fulfill the customer demand schedule on time. Other than that, this method implementation helps company to perform savings in the transportation cost of material purchasing, eliminate the possibility of color difference in fabrics that are occur when company perforce to perform the second purchasing trip, reduce the possibility of waste due to the excess of raw materials purchases, minimize the possibility of not meeting the production schedule, and an easiness in analyze how much materials to be purchased to meet demand.

Recommendation

- Recommendation for Company
  It is recommended to Grooveline apparel outsourcing company to applying MRP on their material purchasing system because it can reduce the company's material purchasing costs and helps the company to perform a more efficient material purchasing activity. It is also recommended for the company to implement the calculation of MRP method to not only on T-shirt product but also to the other three products. In the real condition there will be demand of other three products and an efficient material purchasing can helps company to perform a better production process.
- Recommendation for Further Research
  It is recommended for further research of this study to input a more detailed analysis with the consideration of another costs regarding company's production costs such as the availability of inventory on hand and the transportation cost. The consideration of these costs will helps further research to build a more precise MRP implementation in the company.

References

Davenport, T.H. & Short, J. E.m 1990. The New Industrial Engineering: Information Technology and Business Process Redesign. *Sloan Management Review, Summer 1990, vol 31.*

Fashion Inc, 2006, Fashion House Launches Private Label Division to Open New Revenue Channels with High-Margin Potential; Private Label Businesses To Target Major Department Stores and Other Leading Retail Footwear Outlets, *Business Wire*, 1.

Jay, H. & Render, B., 2011, in Material Requirement Planning (MRP) and ERP. In S. Yagan (Ed.) *Operations Management*: 578-589, Global Edition: Pearson.

Kementrian Koperasi dan Usaha Kecil dan Menengah, 2012, Narasi Statistik UMKM 2010-2011, 9: 1-2, 7.

Kumar, S.A. & Suresh, N., *2009, in Material and capacity Requirements Planning (MRP and CRP). Operations Management*: 217-227, International Edition: New Age International (p) Limited

Law, K.M. Zhang, Z.M. & Chung, S.L., 2004, Fashion Change and Fashion Consumption, *Journal of Fashion Marketing and Management,* 8.4.