Comparison Study about Inventory Control System from Some Papers in Indonesian Case Study

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Abstract. Inventory is one of the most important parts in production management, because by controlling the inventory of raw materials it's trully optimizing the quantity order of raw material for producton process. This case must be considered so that there is no slow moving in inventory. Because this is one component of production cost, which has been complaining that the cost in this sector are quite high. The right method according to the problem can be used to find out the optimum amount in ordering so it can improve the efectiveness of total company inventory cost that will spent. The aim of this paper will determine the gap among some research and studies about Inventory Control, Optimizing the Quantity Order and the Total of Inventory Cost. This paper will be described by comparison study of several inventory control method, so in the future research could give new contribution.

Keywords: Inventory Control, Optimizing the Quantity Order, Total Inventory Cost

1. Introduction

By the time, competition of business is getting tougher. In this case, firm and company must be taking an action for survive and exist. One of the actions that the company can take is to determine the decision at the best optimization, in order this is intended to reduce production cost so as to be able to utilize resources optimally. Achieving this level of optimization, a company must needs to plan a system of planning and controlling the inventory control of raw materials as well as possible so that there is a balance between material stock and production in accordance with material demand, which can reduce cost such as the time cost of storing raw materials in warehouse also known as slow moving of materials. For this reason, it's necessary to propose a design and planning system of raw material inventory control, so that production costs can be reduced. With this research, it is expected to improve all aspects of management in the company, thereby increasing the effectiveness and efficiency.

2. Literature Study

2.1. Inventory Control

Inventory is defined as goods that are store for use or sale in future periods [1]. Inventory is the most important factor for all manufacture company. Because it can show much the company will be earned. Inventory control is for reach the balanced of quality and the raw material required with minimum cost for company. In general inventory divided into three, which is direct Material, work In Process, and the finished goods [2]. There are several function of

inventory control, such as [3]: keeping the company from running out of inventory, and then that production or sales activities do not cease; keeping inventory not too large so that, the cost is not too much; ensure that purchases are not repeated when production, so that ordering cost not become high.

2.2. Optimizing the Number of Orders

optimizing the number of orders by finding the smallest value with analysis of forecasting production in the future, so it can have planning of the order numbers that must be fulfilled.

Table 1. Example of Forecasting Formulas

Method	Formula	Description
Linier Trend	$Y't = a+bx_t$	Y't = Trend (Forecast) a = Constanta b = Slope xt = Period (Year)
Quadratic Trend	$Y't = a+bx_t+ cx_t^2$	Y't = Trend (Forecast) a,b,c = Constanta (Coefficient Value) x_t = Period (Year)
Exponential Trend	$Y't = a \times b^{xt}$	Y't = Trend (Forecast) a,b = Constanta (Coefficient Value) xt = Period (Year)

For accuracy of forecasting, error value can calculated by using MSE [4]. The small error value in trend will be chosen as the forecast method for the research. After that using the moving average to control the forecast. Moving average chart is designed to compare the observed value with the demand forecast value [5].

2.3. Production Planning.

Production planning is the process of producing goods within a certain period as predicted and scheduled through the organization of resources such as labor, raw materials, machinery and other things, therefore forecasting is an integral part of production planning [6]. Forecast sales and the number of production results are not always be same. This case happened because of various things such as damage of production line, employees can't work good, poor quality of raw materials, and the procurement of raw materials that are not in accordance with the marketing planned [5].

2.4. The Included Cost for The Procurement of Inventory.

a. Ordering costs (Cr)

Ordering costs are the costs related to clerical cost of preparing purchase orders, some spent finding suppliers and expediting orders, transportation costs, and receiving costs such as unloading and inspection

b. Holding Costs (Cc)

Holding Costs are the costs related to storage space (E.g. warehouse depreciation), security, insurance, taxes, handling, forgone interest on working capital tied up in inventory, and deterioration, theft, spoilage, or obsolescence.

c. Shortage Costs (K)

Shortage Costs are the cost related to disrupted production when raw materials are unavailable (idle workers, extra machinery setups), lost sales resulting in dissatisfied customers, and loss of quantity discounts on purchases [7].

2.5. Inventory Model

Inventory has two models, namely Static Inventory that ordering just only once, which means the amount of inventory is limited within a certain period. and the other one is dynamic inventory model, this model that ordering several times and continuous [8].

Table 2. Description of Inventory Model

Inventory Model	Inventory Type	Description
Static Inventory Model	Static Inventory Under Risk	Needs distribution model is known
	Static Inventory Under Uncertainty	Needs distribution model is unknown
Dynamic Inventory Model	Dynamic Inventory Under Certain Needs	The level of materials requirements in a certain period.
	Dynamic Inventory Under Uncertainty	Needs distribution model is unknown
	Dynamic Inventory Under Risk	Needs distribution model is known

2.6. Inventory Control System

The Inventory control system has two type, that is P- System and Q-System [9]. The Description of Inventory Control System can be seen in the table below.

Table 3. Description of the Type of Inventory Control System.

No.	The type	Description
1.	*P-System* (Periodic Review System)	The overview period is constant. The order quantity would vary during each order and is determined by state of stock level during the Review. The maximum inventory level is fixed.
2.	*Q-System* (Continuous Review System)	The order quantity is fixed, and orders are triggered whenever stock level reaches the reorder point. The level of safety stock depends upon the variations during the lead time and service levels fixed by the policy. Safety stock depends on accuracy, reliability, lead time variable and rate of demand.

2.7 Safety Stock and Re-order Point

Safety stock is a level of extra stock that is maintained to avoided running out of stock, in other words safety stock is defined as inventory that is carried to prevent stock out and back order situation [10]. Re-order point is the time (point) of inventory at which action needs to be taken to fill the shortage of inventory on the goods [11]. Fangruo Chen (1998) conclude that ROP quantity reflects the level of inventory that triggers the placement of an order for additional units. The quantity associated with safety stock protects the company from stock outs or backorders [12].

3. Comparison Study and Research Gap

3.1 Research Inventory Control of Raw Material with Continuous Review System

Research by Sukanta (2017), *Inventory Control of Raw Material with Continuous Review System in Moga Toys Home Industry*. This research is discussing about application of Moga Toys raw material inventory control using the "approximately" method. Under these conditions, the researcher will determine the inventory with the Continuous Review System (CRS) Method with the Q model because it approaches how much amount and time is required in ordering raw materials. In addition, how much money must be spent to be more efficient [13].

Research by Panggabean (2009), The model of inventory control for Crude Palm oil with Q Method. This research aims to optimizing the ordering cost. First step of this research is analyzing data use Lilliefors test, and it's known that the data is normally distributed. From the data the models in used to inventory problem under risk. So, with this method the optimal result can be obtained [14].

3.2 Research Analysis of Material Inventory Control Using the EOQ and Kanban method.

This research by Apriyani and Muhsin (2017) are discusses about EOQ technique for carrying out inventory raw materials in company that determines how many orders are economical for each time an order with predetermined frequency and when to place an order back. This method aims to minimize total inventory cost, furthermore this method can also reduce inventory cost so that inventory efficiency runs well, and the optimal number of booking units can be reached by minimizing cost [15].

3.3 Research of Inventory Control Analysis Using Probabilistic Methods with Backorder and Lost Sales.

Research by Fatma and Pulungan (2018) is the research that's aims to determine the exact inventory control for the company to minimizes the inventory cost. This study analyzes the various related aspects of system and inventory cost used by the company, this research will use probabilistic inventory methods, namely P models and Q models [16].

3.4 Research about Inventory with Lagrange Method.

Setiawan and Hayati (2012) research title is Inventory control of multi item goods with Lagrange multiplier method *for ice cream shop company in Magelang*. This research aims to set off the unit of ice cream., because the company's inventory often to overstock and stockout. The overstock and stockout happened because the levels of sale each product are different. This company has 13 variant of ice cream and the other problems are caused by storage and the spent of inventory cost [17].

Nainggolan and Sunarni (2019) research title is tea inventory control by considering constraints of warehouse and cost capacity. This research focused on controlling tea products in the warehouse. The aim of this research is to control the inventory, so the supply can reach the target and can reduce the spent of total inventory cost [18].

3.5 Research about Inventory Control Using Just In Time Method.

The research of Sholehudin (2017), Analysis of time inventory method (Just in time) as a basic of indirect raw material inventory control. The focus of study is to determine the indirect raw material inventory control by PG. Lestari Nganjuk using Just In Time with qualitative approach.

With this method, company could save cost since the company is not necessary to bear storage cost of the indirect raw materials [19].

3.6 Research about Optimizing the Inventory Control using Activity Based Costing as determination of warehouse capacity allocation.
Putri (2015) research title is Inventory Optimization with Activity Based Costing (ABC) as Determination of Material Warehouse Capacity Allocation Non-Polycellonium Pack at PT.Zanith Pharmacy Factory. This research aims to determine the priority of non-pollycellonium packaging material, the number of bookings optimal packaging materials, the amount of safety stock, re-order point, and the total inventory cost [20].

Table 4. Research Gap

Description	Authors							
	Sukanta	Panggabean	Apriyani	Fatma E	Setiawan, A	Olaviane A.	Sholehudin	Putri Indah
Improvement	√	√	√	√	√	√	√	√
Method	Continuous Review System with Q Model	Q System, Inven-Tory control under the risk	EOQ and Kamb-an	Back order and Lost Sales	Lag range Multiplier	EOQ Multi Item, Lagrange Total cost	Just in Time	ABC, EOQ
Industry type	Production of doll	Food Industry	Stam-ping Indus-try	Manu-factur	Food Industry (ice cream)	Food Industry (Tea)	Food Industri (sugar)	Pharmacy Industrry
Saving Levels	Rp. 1.840.868,67/year	Rp 7.981.042.884,4	Rp. 2.463.315	Rp 4,926.339	19,58% Rp 34.275	33,2% Rp 127.981.619	Rp 1.807.584,213	Rp 5.485.775.391
Total Inven-tory Cost (Rp.)	Rp 42.146.098,33	Rp 12.861.251.797,32	Rp 1.377.668.782	Rp 856.499.099	Rp 140.743	Rp 257.524.800	Rp. 2.681.664,874	Rp 92.736.857.056
Univer-sity	Universitas Singaperbangsa Karawang	Universitas Sumatra Utara	Universitas Pembangunan Nasional	Politeknik APP Jakarta	Universitas USISBANK	Universitas Katolik Musi Caritas	Universitas Negri Surabaya	Universitas Dian Nuswantoro Semarang

4. Research and Discussion

After studying all papers. It can be concluded that are many methods can be used to make improvement and effectiveness of inventory control. From this statement above, we have a conclusion that every method has it own advantage. For the best inventory result, method that being used must suitable with the problem companied by reliable data. We can use some of method such as EOQ, Lagrange, ABC, and the other methods.

References

[1] Kusuma, H. (2009). Manajemen Produksi: Perencanaan dan Pengendalian Produksi. *Yogyakarta: Andi.*
[2] Sumayang, L. (2003). Dasar-Dasar Manajemen Produksi dan Operasi. *Jakarta: Salemba Empat.*
[3] Sofyan, A. (2004). Manajemen Produksi dan Operasi. *Jakarta: FEUI.*
[4] Neter, J., Wasserman, W., & Kutner, M. H. (1989). Applied linear regression models.
[5] Biegel, J. E. (1992). Pengendalian produksi suatu pendekatan kuantitatif. *Jakarta: Akademika Pressindo*.
[6] Buffa, E. S., & Sarin, R. K. (1996). Manajemen operasi dan produksi modern. *Edisi Kedelapan, Jilid Satu, Jakarta: Binarupa Aksara*.
[7] Hilton, R. W., & Platt, D. E. (2013). *Managerial accounting: creating value in a dynamic business environment*. McGraw-Hill Education.
[8] Taha, H. A. (2013). *Operations research: an introduction*. Pearson Education India.
[9] Singh, S. (2011). *Hand Book of Mechanical Engineering*. S. Chand Publishing.
[10] Radasanu, A. C. (2016). Inventory management, service level and safety stock. *Journal of Public Administration, Finance and Law*, (09), 145-153.
[11] Heizer, J., & Render, B. (2011). Operations Management, Buku 1 edisi ke sembilan. *Salemba empat: Jakarta*.
[12] Kontuš, E. (2014). Management of inventory in a company. *Ekonomski vjesnik: Review of Contemporary Entrepreneurship, Business, and Economic Issues*, *27*(2), 245-256.
[13] Sukanta, S. (2017). Pengendalian Persediaan Bahan Baku Menggunakan Metode Continous Review System Di Moga Toys Home Industry. *Journal of Industrial Engineering Management*, *2*(1), 25-31.
[14] Panggabean, M. Model Pengendalian Persediaan Minyak Sawit Mentah (CPO) Dengan Menggunakan Metode Q (Studi Kasus: PT. Perkebunan Nusantara III Medan).
[15] Apriyani, N., & Muhsin, A. (2017). ANALISIS PENGENDALIAN PERSEDIAAN BAHAN BAKU DENGAN METODE ECONOMIC ORDER QUANTITY DAN KANBAN PADA PT ADYAWINSA STAMPING INDUSTRIES. *opsi*, *10*(2), 128-142.
[16] Fatma, E., & Pulungan, D. S. (2018). Analisis Pengendalian Persediaan Menggunakan Metode Probabilistik dengan Kebijakan Backorder dan Lost sales. *Jurnal Teknik Industri*, *19*(1), 38-48.
[17] Setiawan, A., & Hayati, E. N. (2012). PENGENDALIAN PERSEDIAAN BARANG JADI MULTI ITEM DENGAN METODE LAGRANGE MULTIPLIER (STUDI KASUS PADA DEPO ES KRIM PERUSAHAAN "X" DI MAGELANG). *Prosiding SNST Fakultas Teknik*, *1*(1).
[18] Nainggolan, O. A. O., & Sunarni, T. (2019). PENGENDALIAN PERSEDIAAN TEH DENGAN MEMPERTIMBANGKAN KENDALA BIAYA PERSEDIAAN DAN KAPASITAS GUDANG. *Jurnal Tekno*, *16*(1), 47-57.
[19] Sholehudin, M. (2017). ANALISIS METODE PERSEDIAAN TEPAT WAKTU (JUST IN TIME) SEBAGAI DASAR PENGENDALIAN PERSEDIAAN BAHAN BAKU PEMBANTU (Studi pada PG. Lestari Nganjuk). *JURNAL AKUNTANSI UNESA*, *5*(2).
[20] Putri, Sari Indah. (2015). Optimalisasi Persediaan dengan Pendekatan Activity Based Costing (ABC) sebagai Penentual Alokasi Kapasitas Gudang Bahan Kemas Non-Polycellonium di PT.Pharmasi Zenith.