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Comparison Study Among Production Planning Research in Some Papers and Industries in Indonesia

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Comparison Study Among Production Planning Research in Some Papers and Industries in Indonesia

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Abstract. Keeping company exist means the company must have good policies related to sales activity. The solution is by implementing production planning which include forecasting, aggregate planning, disaggregate planning, making master production schedule, making rough cut capacity planning, material requirement planning, and capacity requirement planning. Every companies have their own unique situation which make the best method for each company is different. The aim of this paper is to determine the gap among sore researches and studies about production planning ind Indonesia. For methodology, this paper will be described by comparison literature study, so in the future research could give contribution to the blank area of study.

1. Introduction

Sales is the main key to make a company exist. To keep a company exist, company must be able to make good policies related to sales activity. The solution is by implementing production planning[1]. Production planning is the planning of production and manufacturing modules in company or industry which utilizes the activities of employees, materials, and production capacity resources allocation in order to meet customers' needs[2]. Production planning methods and tools have been developed since 19th century and nowdays the methods and tools are still being developed to find a better methods and tool with very small errors which can be suitable to be implemented. Implementing production planning is crucial for industries for maximizing profits and minimizing production costs and inventory costs. The aim of this paper is to determine the gap among some papers and researches about production planning in Indonesia's industries.

2. Literature Review

Production is a main function of every organization, which include responsible activities to add the product's value[3]. The characteristics of production system are having component or element which related to each other and make a one whole unit, having the same goal, having transformation adding input value activity process is effective and efficient way, having mechanism of controlling the operation process[3]. Based on the goal, the production system can be classified into engineering to order (ETO),

assembly to order (ATO), make to order (MTO), and make to stock (MTS). Each kind of production system has a difference with another one and with another company, so every company need production planning in case of increasing income and decreasing cost. Production planning started from making forecast, aggregate planning, disaggregate planning, master production schedule, rough cut capacity planning, material requirement planning, and capacity requirement planning.

Forecasting is activity to forecast demand for the upcoming period which include the size of quantity, quality, time and location needed to fulfill the demand of product or service[4]. Having upcoming demand forecast can help company to decide which strategy is the most suitable for the next period planning[5]. Forecast can be in qualitative form and quantitative form[6]. There are lots of forecasting method can be chose depends on each company situation. Cenderawasih Nabire Coffee Factory uses trend linear and trend exponential for their forecasting method caused by the past data patterns tend to trend pattern[7] while PT. XYZ Banyuwangi are using artificial neural network by using MATLAB software caused by the method has the smallest error[8].

Aggregate planning is planning process and setting output time in a certain time by adjusting the variables that can be managed[9]. Aggregate planning is the first step of production planning activity that will be used for the next step. In aggregate planning, facility is considered to be permanent and can not be expand[10]. The aggregate planning in Cenderawasih Nabire Coffee conducted for the next 12 months from May 2018 to April 2019. Based on aggregate planning calculation the total production time is 10940.837 hours, total work day is 292 days, regular time is 8 hours/day/person, over time is 2 hours/day/person, effective work time is 2289.28 hours, and total workforce needed is 4.78 people and rounded up to 5 people caused by the total cost of 5 people is less than 4 people[7].

Disaggregate planning is break down the aggregate units in aggregate planning into each product item as well as knowing a product item will be produced. The result of aggregate planning calculation will be used to make the production calculation by using disaggregate planning method. By making disaggregate planning, master production schedule can be made.

Master production schedule is a detailed plan about what and when the company plan to produce each finished product item in each certain upcoming period of time[11]. Master production schedule must be made based on reality and considering the production capacity and workforce whether it is permanent workforce or subcontract. PT.X as one of the toys manufacturing industry which produce train shaped toy make their Master production schedule by using transportation method to see the least unit cost[12].

Rough cut capacity planning will decide whether the planned resources enough to implement the master production schedule[13]. There are four policies which will be taken by the company to increase the production capacity. The four polices are overtime, subcontract, changing route, and adding personnel[14]. RCCP in PT. AP Aluminium proved that the capacity of grinding, lathe, and polish workstation is not enough and the problem solved by implementing overtime[15].

Material requirement planning is a dependent technique which use a list of material requirements, inventory, estimated acceptance, and master production schedule to determine the material needed [16]. Implementing material requirement planning can reduce inventory, reduce lead time, and make a realistic shipping commitment for potential customers [17]. Material requirement planning which will suit PT. XWZ, a textile industry, the best is using part period balance, least total cost, least unit cost, silver meal, and wagner within. There are lots of choice to be chose for PT. XWZ because all of those methods give the same least optimum inventory cost[5] while PT.X, a packaging manufacturing industry is suggested to implement wagner within for their inventory management because the cost needed by using wagner within is lower than the existing method the company uses[18].

Capacity requirement will show how many people, machines, and resources needed to fulfill the production[19]. The main purpose of making capacity requirement planning is to know which workstation is overloaded and which workstation is underloaded. The research at PT. X, toys manufacturing industry state that the capacity of under body assembly workstation and dynamo assembly are lack of capacity and this can be a consideration for the company in planning the strategy to solve this problem whether it is overtime or subcontract[12].

3. Comparison study and research gap

Complete production planning is a whole planning started from forecasting until the capacity requirement planning. But due to every unique company's condition, researches are have been done just to solve their own main problem, this will make a research gap between one and other research.

3.1 Research about Forecasting in Indonesia Studies

Lina Gozali et al. (2013) research title is proposed determination of the best lot sizing technique with minimal cost in planning and controlling the needs of canvas EP 200. This research do the forecast in lots of technique and compare it to get the best method to be implemented. The result shows that the best forecasting method for this company is using linear regression because it has the smallest error proved by MAD, MSE, and MAPE calculation[5].

Sendy Parlinsa Elvani et al. (2016) research title is forecasting total palm production using ARIMA method (Autoregressive Integrated Moving Average)/. This research uses AIC and SIC score comparison because it's a must to do a residual diagnose test to know the model eligibility when using ARIMA as a forecasting method[20].

Wawan K Risal et al. (2017) research title is capacity requirement planning for SP Aluminium production[15].

Muhammad Arief et al. (2017) research title is material requirement planning analysis for coal by using material requirement planning. This research tells that the best forecasting method for this company is single exponential smoothing method proved by tracking signal control chart[21].

Hendra Pasu (2017) research title is implementing aggregate method in order to arrange master production schedule in Cenderawasih Nabire Coffee Factory. This research uses trend linear and trend exponential for their forecasting method caused by the past data patterns tend to trend pattern. Forecastion results are used to make the aggregate planning[7].

Dina and Ahmad (2013) research title research is optimizing raw rubber (latex) inventory system by using lot sizing method (case study: PT. ABAISIAT RAYA). This research tells that the best forecasting method for this company is cyclic forecasting method proved by tracking signal control chart[22].

Iid Mufidah et al. (2017) research title is forecasting PND frozen shrimp demand by using artificial neural network (backpropagation). This research uses artificial neural network (backpropagation) as their forecast method because it has small error which is almost 0[8].

Lina Gozali et al. (2019) research title is office furniture production planning forecasting in order to increase E-Class product selling strategy (caste study: PT. Modera Furintraco Industry). This research shows that the best forecasting method for this company is cyclic forecasting method because it has the smallest error among the another method that has been calculated in this research[1].

3.2 Research about Aggregate Planning in Indonesia Studies

Hendra Pasu (2017) research title is implementing aggregate method in order to arrange master production schedule in Cenderawasih Nabire Coffee Factory. This research shows that aggregate planning in Cenderawasih Nabire Coffee conducted for the next 12 months from May 2018 to April 2019. Based on aggregate planning calculation the total production time is 10940.837 hours, total work day is 292 days, regular time is 8 hours/day/person, over time is 2 hours/day/person, effective work time is 2289.28 hours, and total workforce needed is 4.78 people and rounded up to 5 people caused by the total cost of 5 people is less than 4 people[7].

3.3 Research about Disaggregate Planning in Indonesia Studies

Hendra Pasu (2017) research title is implementing aggregate method in order to arrange master production schedule in Cenderawasih Nabire Coffee Factory. This research tells that the disaggregate planning uses the data from aggregate planning. The result of disaggregate planning will be used to make master production schedule[7].

3.4 Research about Master Production Schedule in Indonesia Studies
Hendra Pasu (2017) research title is implementing aggregate method in order to arrange master production schedule in Cenderawasih Nabire Coffee Factory. This research tells master production schedule can be used to calculate the loss cost caused by over production and shortage of production. This research also says that by implementing master production schedule, company can do the cost saving for 98.08% from the total loss than before implementing the production scheduling[7].

Nita and Tiara (2019) research title is capacity requirement planning for train shaped toys product in PT. X. This research tells that master production schedule can be calculated by using the least cost of transportation method[12].

Wawan K Risal et al. (2017) research title is capacity requirement planning for SP Aluminium production. This research says that master production schedule can be verified by RCCP to know whether the available production capacity of production plant able to implement the schedule arrange by master production schedule[15].

3.5 Research about Rough Cut Capacity in Indonesia Studies
Nita and Tiara (2019) research title is capacity requirement planning for train shaped toys product in PT. X. This research shows that the result of master production schedule calculation can be verified by using RCCP[12].

Wawan K Risal et al. (2017) research title is capacity requirement planning for SP Aluminium production. This research says in arranging RCCP, calculation of capacity requirement can be the total needs to do the all kinds item[15].

3.6 Research about Lot Sizing in Indonesia Studies
Lina Gozali et al. (2013) research title is proposed determination of the best lot sizing technique with minimal cost in planning and controlling the needs of canvas EP 200. Based on the calculation results the best lot sizing method for this company are PPB, LTC, LUC, silver meal and wagner within methods because those methods have the same most optimum inventory cost of $ 1,116,146.20[5].

Puspandam and Achmad (2018) reseach title is wagner within algorithm implementation in PT.X inventory management. This research shows that wagner within algorithm can minimize raw material inventory cost than the existing method in the company[18].

Muhammad Arief et al. (2017) a research title is material requirement planning analysis for coal by using material requirement planning. This research tells that fixed period requirement method is the best method for this company planning material requirements, it can be seen from the minimum total cost incurred. Calculation of lot sizing by the FPR method find that the efficient period order is 4 times in a year with a span time of 2 months between each orders[21].

3.7 Research about Safety Stock in Indonesia Studies
Lina Gozali et al. (2013) research title is proposed determination of the best lot sizing technique with minimal cost in planning and controlling the needs of canvas EP 200. This research tells that based on the calculation, the optimum safety stock for using P method is 25 rolls, while using the other lot sizing method will make the safety stock is 20 rolls[5].

Dina and Ahmad (2013) research title research is optimizing raw rubber (latex) inventory system by using lot sizing method (case study: PT. ABAISIAT RAYA). This research tells that the quantity of latex safety stock to minimize stock out is 114,282.2 kg[22].

3.8 Research about Capacity Requirement Planning in Indonesia Studies
Nita and Tiara (2019) research title is capacity requirement planning for train shaped toys product in PT. X. This research states that state that the capacity of under body assembly workstation and dynamo assembly are lack of capacity and this can be a consideration for the company in planning the strategy to solve this problem whether it is overtime or subcontract[12].
Research gap table from 10 production planning researches in Indonesia can be seen in table 1 bellow.

Table 1 Research gap of production planning studies in Indonesia

Description	Author										
	Lina Gozali, Andres, Rhio Handika (2013)	Iid Mufaidah, Sony Suwasono, Yuli Wibowo, Deddy Wirawan Soedibyo (2017)	Hendra Pasu Parningotan Simanjuntak (2017)	Puspandam Katias, Achmad Affandi (2018)	Nita Marikena, Tiara Rahmania (2013)	Lina Gozali, Kevin Oktavian, Tira Natscha, Nita Sari, Claudia Jessica Atmadja (2019)	Dina Rahmayanti, Ahmad Fauzan (2013)	Sendy Parlina Elvani, Anis Rachma Utary, Risky Yudaruddin (2017)	Wawan K Riosl, Puryani, Eko Nursubiyanto (2017)	Muhammad Arief, Supriyadi, dan Dadi Cahayadiro (2017)	Fransiska Lefta, Lina Gozali, Iveline Anne Marie (2019)
33	DMA, DES, Linear Regression	Backpropagation ANN	Linear Regression, exponential	-	-	SMA, WMA, DMA, SES, DES, Quadratic, Linear, Cyclic	Exponential, Linear, Quadratic, Cyclic, Cyclic Trend	Correlogram Unit Root Test, ARIMA	WMA, SES	SMA, SES	WMA, SES, DES, Linear, Cyclic, Quadratic, ANN
Aggregate Planning	-	-	Yes	-	-	-	-	-	-	-	Yes
Disaggregate Planning	-	-	Yes	-	-	-	-	-	-	-	Yes
MPS	-	-	Yes	-	Yes	-	-	-	Yes	-	Yes
RCCP	-	-	-	-	Yes	-	-	-	Yes	-	Yes
Lot Sizing	FOQ, PPB, FLF, LTC, Silver Meal, LUC, Wagner Within	-	-	Wagner Within	-	-	-	-	-	FOQ, EOQ, LFL, FPQ	LUC, EOQ, LFL, POQ, Silver Meal, AWW
Safety Stock	Yes	-	-	-	-	-	Yes	-	-	-	-
Capacity Requirement Pla	-	-	-	-	Yes	-	-	-	-	-	Yes
Industrial Type	Make to	Make to	Make to	Make to	Make to	Make to	Make to	Make to	Make to	Make to	Make to
Industry	Textile Industry	Food Industry	Food Industry	Packaging Manufacturing Industry Woven Bag	Toys Manufacturing Industry	Furniture Industry	Latex Manufacturing Industry	Agricultural Industry	Aluminium Manufacturing Industry	Steel Manufacturing Industry	Talc Powder Manufacturing Industry
Product	Textile	PND Frozen Shrimp	Coffee	Woven Bag and Jumbo	Train Shaped Toy	Office Furniture	Latex	Palm	Aluminium	Steel	Talc Powder
Sales/year	10,627.575 m	16,535 MC	4600 Kg	-	18,000 unit	5,635 unit	3,080,833 Kg	17,668.54 ton	-	-	1,093,631.667 ton

4. Research and Discussion

After comparing and studying all the related papers in Table 1, there are 8 papers about forecasting, 1 paper about aggregate planning, 1 paper about disaggregate planning, 3 papers about MPS, 2 papers about RCCP, 3 papers about lot sizing, 2 papers about safety stock, and 1 paper about capacity requirement planning. Mostly all of the paper do the forecasting step for projecting the upcoming period demand to do the production planning while the next step every papers is very various depends on the aim of the research.

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