

Priority Strategy in Clothing Production Scheduling Using Mathematics Model

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Abstract. The purpose of this study is to combine the parameters that influence in the priority of scheduling clothing production. The result is a mathematical model to be used in the determination of production priorities. Mathematical model than use for determination new job priority. Mathematical models can be useful for make decisions over a short period of time.

1. Introduction

Generally, Priority is an action that arranges items or activities in order of importance, Production planning is production planning and module in company or industry. Strategy is high-level planning to achieve one or more goals under conditions of uncertainty, Strategies generally involve setting goals, determining actions to achieve goals, and mobilizing resources to carry out actions [1, 2]. Production scheduling is the task to assign jobs to machines over time [3]. The mathematical model is an abstract representation or interpretation of the physical reality used for analysis and calculation [4].

Many studies has been reported how to identified parameter to determine priority as shown by Schmidt [5], Millar, S. N. [6], Schwiigelshohn and Yahyapour [7], Berry [8], Öner-Közen and Minner [9] that focus in scheduling technique. Although their models have been referred by many reports, their methods have still limitations, especially in associated with business objectives and customer needs, some detail in operational area. In priority strategy in production scheduling at least 4 area that can combine to make some optimization and achieve goals of scheduling [10].

Based on our previous studies on the other literatures [11-13], there are several parameters other than parameters related to operational matters, such as resource availability [11], using parallel work concepts [12], marketing approach [13] that can be used in priority strategies to increase company profits in correlation with production scheduling. With the categories that have been mentioned before the company is expected to better maximize the tangible and intangible benefits in the design of production plans with mathematical model method approach, we propose specific parameter base on categories that most correlated with this purpose of production scheduling i.e. value of product profits, deadlines, time consume of production, marketing strategy.

2. Research method

The mathematical model was formulated based on the parameters considered most influential in the production scheduling. This model then applied to determine the priority value of the product to be produced or is being produced. Based on literatures and field studies we formulate parameters that affect priority in clothing production:



2.1. Profit

Profit is the main goal of business creation. Profit is inversely proportional to the cost of production for each model, if the production cost is less than the value of sales then the profit will be yield, and vice versa. The bigger the profit (K) obtained from a particular model, the production priority value of that model is potentially increased.

2.2. Production time

The length of production of a clothing model is related to the complexity to make that particular model. This value determines the number of clothes that can be made within a specific production time span. The complexity is usually influenced by the installation process of additional accessories such as decorative clothes that require high precision, or the connection between parts of clothes that has a special style so that the pattern or motif of each part—like the arm and body of the clothes—has to be neatly connected one with the other in order to produce a seamless pattern.

The longer the production time (T_p) required, the fewer quantities that can be produced, thus potentially lowering the value of the production priority for a particular model.

2.3. Production deadline

A production completion deadline related to the schedule of a model must be able to go on sale at the store. The delay in the fulfillment of this deadline has the potential to cause the model to be unsold, due to customers becoming more interested in buying clothes with similar models that are already in store from competing companies. Because the clothing model is influenced by trends that exist in a specific area or is associated with special days such as holidays or school activities, the correct models and its quantity in the store has to be ready on time.

Potential losses can also occur when the completion of production of a particular model is too fast, far from the deadline set by the sales department. This is because the warehouse costs required to keep that particular model will swell, the availability of places for storage of other products becomes reduced, and also will disrupt cash-flow if there are products that are not directly sold after production.

The smaller the remaining time to deadline for a model (T_d), the higher the value production priority of that particular model will be.

2.4. Marketing strategy

In contrast to other researchers mentioned earlier, in this paper we consider the marketing strategy as an important parameter that can determine the value of production priority. A marketing strategy is a value determined by the sales department as a result of observing customer purchasing patterns as well as production patterns of clothing models from competing companies. If a model is deemed necessary for immediate production, then the value of the marketing strategy (m) will be set high by the sales department, and vice versa. **Table 1** show the value of m is between 0.1 to 1 according to it interests.

Table 1. Marketing strategy value.

Marketing Strategy	Value
Innovation	1
Stock Security for a certain period	0.9
Consumer Order	0.8
Competition with competitors	0.7
Fulfillment for a given event	0.6
remaining stock is 1/4 from safety limit	0.8
remaining stock is 1/2 from safety limit	0.5
remaining stock is 3/4 from safety limit	0.1

We summarize the parameters that determine the value of the production priority (P) of a model in this quadruple:

$$P = \{ K, T_p, T_d, m \} \tag{1}$$

P = production priority value
 K = profit
 T_p = production time
 T_d = time to deadline
 m = marketing strategy

Formulation to determine the priority of products to be produced:

$$P = K \frac{T_p}{T_d} m \tag{2}$$

With P value we can determine the priority value of the new job that come when production process is running and decide whether this job is insert into job list that is running or rejected, when a new job is accepted there will be a job must be halted. If product have higher priority over another products then the product must take precedence over another product for the production.

3. Result and discussion

we applied propose method to production data shown in **Table 2** which consists of 3 running processes (product a, b, c) and 1 new order (product d) and **Figure 1** shown the process order product d is coming.

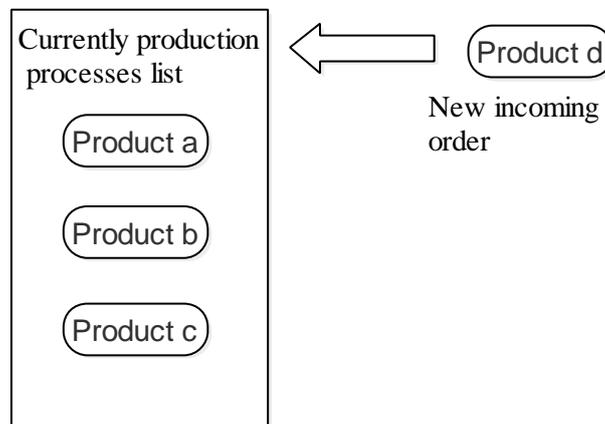


Figure 1. New product d order is coming.

Table 2. List of currently running production jobs and new order job.

ID	List Products	Qty Orders	Profit(K)	T _p /days	T _d /days	m	Priority Value
1	Product a	4000	16000	4	8	1	31250
2	Product b	2000	5000	2.5	6	0.8	8333.33
3	Product c	1000	1428	1.4	6	0.2	531.25
4	Product d	1500	3500	2.5	4	0.6	4520.08

After new order product d is coming, we need to recalculate each product priority for determine which product must be halted if product d is inserted to the process, recalculate priority value of product is in base on 8 hours per days. Calculating priority of product a is shown below.

$$\begin{aligned}
 P^a &= K^a * T_{pa} * 1/T_d^a * m^a \\
 &= 16000 * (4000/(4 * 8)) * (1/(8*8)) * 1 \\
 p^a &= 31250
 \end{aligned}$$

For priority product a is 31250, the result calculating priority for each products shown in **Table 2** column priority value. After knowing each production priority value then the lowest value must be removed from the production process list and wait for one of the production process is complete the new process is shown in **Figure 2**.

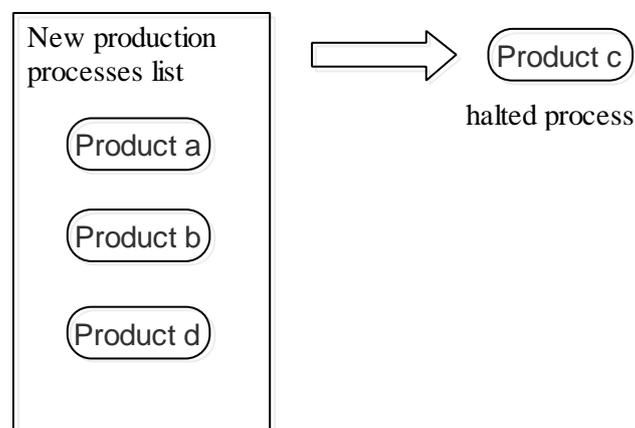


Figure 2. New process list after calculate priority value.

In this case product c will be halted from currently process until one of the process in list process is finished.

4. Conclusions

Using propose formula of priority strategy, decision that taken when new order come will avoid wrong decision by management because with this formula we can view profit per product before we accept the product for production and make some benefit to the decision, future work after priority value has been decided the future work make some process for automation.

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