Design of production control board for make to order home industry

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Abstract. This study discusses the design of a production control board in the home industry. The home industry that implements a response strategy to consumers makes to order, and a production system strategy is a flow shop. The design of the production control board is intended as a tool to see when an order starts and finishes, the position of the order when to accept orders, and the production capacity owned. A home industry that is the object of research is the bag home industry. The research methodology is a case study, and the model used is a modification of the Gantt chart. The design results show the production control board can work as a tool in planning and controlling production activities.

1. Introduction
Companies that carry out make to order (MTO) production strategies generally have planning stages [1], 1) the entry-level order, 2) the order release level and 3) the order sequencing/dispatching level. In stage one is the decision to accept or reject an order. At this stage, the decision is determined by various things such as price, time [2], capacity owned [3,4], and so on. In this case, a negotiation process is needed [5]. The second stage is the order received, and it is necessary to set when the order is released. The third stage is scheduling; which orders must take precedence in fulfilling the desired performance criteria [6-8].

At stage one of accepting or rejecting an order, the home industry is a dilemma. When ordering a lot, if you accept the fear that production capacity is insufficient, and if you refuse to fear, consumers are disappointed. We need tools that can provide information about production capacity. Visual aids can be used to obtain information on plans and conditions of the shop floor that can assist in making decisions.

The use of visual tools as a tool in management activities has been widely investigated [9-13]. In manufacturing, visual displays are used as a reference in achieving production targets, conducting controls and evaluations. To make a visual display that informatively needs a good design process. In this study, the visual display was designed as a production control board. The design of this tool must show the current condition of the shop floor, the production targets that have been passed and future production targets. The object of research is the home industry of making the bag. So, the purpose of this research is to get a design of production control board that is suitable for that home industry.

2. Methodology
The methodology that will be used in this study will follow in figure 1.
The methodology will follow the steps below:

- **Identification of the production process.** That is to find out what processes will be carried out by the workforce. For that, we can use the operations process chart.
- **Identification of the workforce.** That is to determine the level of skills and abilities of the workforce.
- **Distribution of the production process to the workforce.**
- **Identify the time needed by the workforce to complete the assigned production process.** The skills and abilities of the workforce will distinguish the time of completion of their work.
- **Calculating the capacity of each workforce.** The calculated capacity is the capacity to work on the production process per unit time.
- **Calculating company capacity.** Having known the production capacity of each workforce, the company's capacity can be calculated.
- **Modify the Gantt chart.** That chart used can describe the production capacity of each workforce and the company's capacity.

### 3. Results and discussion

The home bag manufacturing industry, which is the object of research, has a series of production processes. In general, the work is divided into two sections, preparing raw materials and sewing. The first job includes the procurement of materials, preparing the pattern, and cutting the bag material into the ready part of the sewing. The second job is to sew all parts of the ready sewing part.

The workforce (WF) owned is five people. WF 1 is in charge of preparing raw materials, and four WF’s are tasked with sewing. The four workforces have different sewing capabilities, so the bags produced for the same amount, different finishing times. Figure 2 shows the Gantt chart designed with orders of 20 dozen bags.
Figure 2. Design of production control boards.

In Figure 2, WF 1 has a task at the beginning of time and consumes time for one day. WF 2, 3, 4, 5 worked the next day at the same time and had the same task of sewing as many as five dozen bags. The time to complete the sewing job differs depending on the skill of each WF. WF 2 has 2.5 days, WF 3 is 3.5 days, and WF 4 and 5 are 5.25 days. Horizontal axis states the day of the week, where one day 10 hours of work. The vertical axis states WF with RT, which means Regular Time, OT means Overtime. The vertical black line is a marker of time that is running; this line can shift left and right. The vertical black line is used to control targets and realization of production per date indicated by the line. In Figure 2 the vertical black line shows the day of Tuesday at the first hour, this shows that target of WF 1 has finished his work, WF 2 and 3 are finished first dozen and working on the second dozen, and WF 4 and five are working on dozen 1. The target must be checked with the realization on the production floor. Overall, 20 dozen orders are targeted for completion within six days, 6 hours.

The production control board designed can make a production plan for one week. In that time, the plan can be changed as long as the capacity of each workforce is sufficient. We can see the WF 2 capacity can do ten dozen, WF 3 can get seven dozen and WF 4, and 5 are five dozen a week, as shown in Figure 3.

Figure 3. Production capacity.

This tool can show how to handle different orders. For example, that home industry has two orders, each ten dozen, as shown in Figure 4.
Based on the plan, it can be determined when starting and when an order is completed, this is in line with the research conducted by Bateman et al. [9], Tezel et al. [13] and Wojakowski [14], this tool can answer production planning problems. As in figure 4, one order starts working on Sunday and finishes Wednesday and the second order starts Tuesday and finishes Saturday.

A vertical black line is used to exercise control over the production plan, to see the target production plan until that day compared to its realization. As in figure 4, the vertical line shows Tuesday at the beginning of work. At that time, WF 1 must have finished preparing materials for order 1, WF 2 and WF 3 must have finished first dozen and are working on the second dozen, and WF 4 and 5 are carrying out the first dozen. If the realization in the shop floor is not by the target production plan, it must immediately change the plan so that the planning target is reached.

In Figure 5, It is shown if WF 3 is unable to carry out its work for three days, then the work is distributed to workers 2, 4 and 5. so the first order is late for one day, and the next order will be completed the following week.

The current production control board design cannot be used to plan for more than one week. The development of this design is to answer how the planning is more than one week by not changing the simplicity of this tool so that it is still suitable for use in the home industry.
4. Conclusion
The conclusion that can be obtained from this research is to get a production control board design that can describe production activities for one week at home bag manufacturing industry. This design cannot be used for production planning for more than one week. The future design is to design overcome the longer planning time.

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