# MEASURING THE IMPACT OF INVENTORY CONTROL PRACTICES: A CONCEPTUAL FRAMEWORK

Kamaruddin Radzuan[1], Abdul Aziz Othman[2], Herman Shah Anuar[3], Wan Nadzri Osman[4]

[1,2,3,4]School of Technology Management and Logistics, Universiti Utara Malaysia.

**Abstract.** Inventory control provides method to manage the flow of materials or goods in the supply chain. Since controlling inventory is not the only mechanism to ensure an adequate inventory levels, it is also able to reduce inventory related cost. The manufacturing sector holds large inventories with quite complicated process and policy related to inventory control, especially when involving external party whether they are supplier or customer. The manufacturing companies always confront with issues related to inventory management, which includes bullwhip effect on demand, increase of inventory cost, late delivery, and inventory shortage. Therefore, a key challenge for manufacturing company is to determine how to control the inventory flows effectively as to get the best overall inventory performance. Since inventory control manages to cover a wide range of aspects, it is chosen to focus on specific element such as inventory monitoring and ordering; control limits; and replenishment decisions. Lacking of an inventory control practices that normally occurred among manufacturing companies had lead this paper to propose a framework on inventory control practices to acquire that knowledge.

**Keywords:** inventory control practices, inventory performance, manufacturing company

## 1. Introduction

In the manufacturing environment, productions operations can be significantly affected by ineffectiveness of inventory control. It is estimated that the average holding cost of manufacturing goods inventory is approximately 30% of the total value of the inventory [1]. Inventory control involves many levels of the organization, starting from the shop floor workers to the top management commitment. Therefore, it encounters various problems in the implementation.

Presently, Malaysian manufacturing sectors face heightened levels of competition in both domestic and international markets. Despite of its spectacular achievements in the manufacturing sector, Malaysian manufacturers confront with poor inventory performance. The main problems were the impact of bullwhip effect on demand, increase of inventory cost, lack of on-time delivery, and inventory shortage [2]. In addition, there is an increasing awareness about the suitability of the inventory control practices. Although researchers and practitioners have recognized that inventory control practices can increase the performance, there has been limited empirical research that has directly associated the inventory monitoring and ordering, inventory control limits, and replenishment decisions, and inventory performance, particularly in the supplier perspective and Malaysia manufacturing context.

Therefore, the purpose of this research is:

a) to investigate the association of inventory monitoring and ordering, inventory control limits, and replenishment decisions and inventory performance;
b) to predict the inventory monitoring and ordering, inventory control limits, and replenishment decisions on inventory performance;

in the Malaysia manufacturing company.

A conceptual framework is a research tool intended to assist a researcher in developing an understanding of the situation under investigation. In this study, inventory performance is conceptualized as being dependent on the inventory control practices (inventory monitoring and ordering, inventory control limits, and replenishment decisions).

## 2. Review of Related Literature
### 2.1 Inventory monitoring and ordering

Monitoring and ordering here is refers to the frequency of supplier monitoring the customer's stock levels in order to decide the inventory replenishment. There are several alternatives for monitoring and ordering the replenishment by supplier. According to Waller et al. [3], most of the inventory reduction can be attributed to frequent inventory reviews, order intervals, and deliveries. Frequently monitoring the inventory levels can provide updated information about the inventory levels. Thus, assists the supplier to make the right decisions on inventory replenishment, which in turn can reduce the cost and improve services performance. However, frequently monitoring and make ordering if needed were appropriate when the fluctuation of demand is high [4]. Continuous review allows the supplier to make ordering in constant size, which is easier to administer than variable one and supplier knows how much to send [5]. Administration and transport can also be tailored to the specific needs perhaps a full truckload at a time.

Meanwhile, Sezen [6] suggested a guideline in monitoring and ordering inventory. One important consideration is the cost of each review. Costs related to the review process may include the cost of review personnel, ordering and transportation costs. The study also shows that average inventories decreases, as the length of the review period gets shorter. However, the total lost sales also increasing sharply when longer review periods was applied. In terms of the safety stock requirement, products having high variable demand may need shorter review periods, and products with low fluctuating demand may require less frequent reviews [6].

### 2.2 Inventory control limits

The inventory control limits refer to specific levels of inventories that set by managerial in order to ensure the availability of stock. The inventory control limits were calculated based on the expected demand over respective replenishment lead times. The inventory control limits can be used to avoid extremes inventory [7]. The minimum and maximum limits can also be used to protect product availability for the buyer [8][9]. The minimum is the lowest quantity, which the particular line should be allowed to drop if deliveries are to be maintained. While, the maximum limit is the highest quantity of inventories can be stored, which it may be considered an excessive stock is being carried, if beyond the limits.

Wild [7] proposed that the two limits need to be adjusted, the identified target range should be both attainable consistently, and is acceptable for planning and coordination with other activities. The two limits should also be in line with the demand or there will be a shortage of inventory or there is excess inventory that takes shelf space [10]. By reducing the maximum level, average inventory levels can be reduced and thereby increase the turnover rate and reduce inventory carrying costs [11]. On the other hand, the minimum level can ensure the availability of inventory for customers to consume. However, imposing a minimum and maximum limit together with the penalty cost to ensure the availability of safety stocks can causing slack in the supply chain, which in turn increase the customer service levels, but limited on cost performance [12].

### 2.3 Replenishment decisions

This element concerns the extent to which the supplier is authorized to make replenishment decisions about quantity and delivery time. In certain circumstance, replenishment decision can be made fully determined by the supplier [13] [11] [14] where the supplier has the right to decide on both quantities, time for delivery [4], and location [15]. This alternative would logically give the supplier more freedom and flexibility in the inventory control process.

According to Yao et al. [13], when suppliers have the autonomy to retain orders until an agreeable dispatch time is reached, it is expected that economic consolidated dispatch quantity will accumulate before an order is dispatched. In addition, suppliers can gain more benefit by means improved

optimization of its manufacturing and distribution [16] as well as for minimization of out-of-stock expenses through the possibility to prioritize customer orders [3].

### 2.4     Inventory performance

The main objective of inventory management is to minimize the total cost of relevant costs to ensure profitable operations [17] as well as maximize the customer service level [18]. To be specific, the objective of inventory control to include: to ensure adequate supply of products to customer and avoid shortages as far as possible; to make sure that the financial investment in inventories is minimum (*i.e.,* to see that the working capital is blocked to the minimum possible extent); efficient purchasing, storing, consumption and accounting for materials is an important objective; to maintain timely record of inventories of all the items and to maintain the stock within the desired limits; to ensure timely action for replenishment; to provide a reserve stock for variations in lead times of delivery of materials; to provide a scientific base for both short-term and long-term planning of materials [19].

However, ineffectiveness of  inventory control practices can impact the organization operations include: high rate of order cancellations; excessive machine downtime due to material shortage; large scale inventories written down because of price decline; distress sales; widely varying rate of inventory losses; large writing down at the time of physical inventory taking; continuous growing inventory qualities; and liabilities to meet delivery schedules and even production rate [20].

## 3.     Proposed Conceptual Model

The review of theoretical and empirical literature indicates that the above issues have been widely studied. However, to the best of the authors' knowledge, none of the previous studies had attempted to include all the three determinants of inventory performance, namely, inventory monitoring and ordering; control limits; and replenishment decisions and inventory performance into a single study. The framework of the proposed conceptual model is given below.
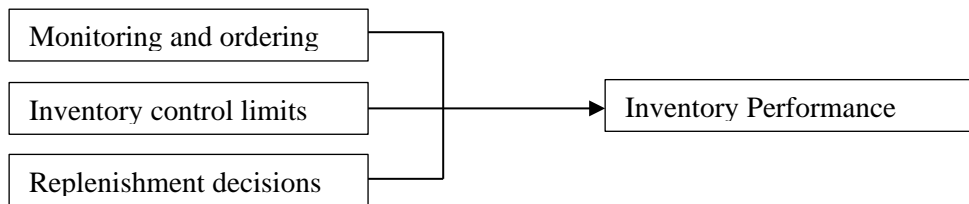


Figure 1: Research framework of inventory control practices

The following hypotheses are formulated based on the above addressed issues:

*H1: There is a significant and positive relationship between inventory control practices and inventory performance.*
*H2: The inventory control practices have a significant and positive impact on inventory performance.*

## 5.     Methodology

The sample of this study will focus on departments of purchasing, planning, logistics and operation in the manufacturing companies, who's responsible in managing inventories. The sampling frame for the data collection included members of the Federation of Malaysia Manufacturer (FMM) 2011. FMM members are likely to be involved in the inventory management of the firm. Little empirical data has been published on this topic; therefore; a survey method of data collection will be considered

appropriate [21]. The questionnaire is the main instruments of this study. A six-point Likert scale will be used in this study to indicate the degree of agreement for each criterion, with 6 (strongly agree) as the maximum and 1(strongly disagree) as the minimum. The reliability test will be used to test how reliable and consistent of the set of items correlated with others [22]. The internal consistency reliability will be higher if the Cronbach's alpha is closer to 1 [23]. In addition, Pearson correlation analysis will be used to compute the correlation between variables and multiple linear regressions will be used to analyze the relationship between a single dependent variable and the three independent variables in the study.

# 6.    Conclusion

The proposed model provides linkages amongst inventory monitoring and ordering, inventory control limits, replenishment decisions, and inventory performance. An inventory control practice has become one of important agenda for organizational sustainability and competitiveness. The right approach of inventory control practices can be used for enhancing customer service level and cost reduction in the entire supply chain. A good inventory control practices have proven can maintain high performance for the manufacturing company. The intention of this study was to fill up the gap about the lack of research in inventory control practices, which investigates the inventory control practices element that contribute to the inventory performance in order to increase the sustainability and competitive advantage of manufacturing companies in Malaysia.

# 7.    References

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