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DEVELOPING AN OPTIMAL MULTIVARIATE FORECASTS MODELFOR SUPPLY CHAIN INVENTORY MANAGEMENT—A CASE STUDY OF A TAIWANESE ELECTRONIC COMPONENTS DISTRIBUTOR

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ABSTRACT

By reducing the volume of inventory and the ratio of obsoleted stock, enterprises can not only lower their cost and risk in a great amount, but also increase their flexibility of capital management. Thus, inventory issues are always taken seriously in enterprises' supply chains. In the last decades, both industries and academia have come up with multiple solutions to avoid the damage caused by market volatility and to diminish the bullwhip effect. Examples include Toyota Production System (TPS), vendor managed inventory (VMI), collaborative planning, forecasting, and replenishment (CPFR) and so forth. However, little research has addressed the issue regarding with the optimal order amount given the forecast of customers' demand. The issue is important because order amount is directly related with stock shortage and the inventory cost. To answer the question, this research aims to develop an optimal multivariate forecast model to determine how much and when we should order so that the inventory cost and the rate of stock shortage can be minimized. We will develop a decision support system (DSS) to implement our model.

The bullwhip effect shows that if a retailer periodically updates the mean and variance of demand based on observed customer's demand data, the variance of the orders placed by the retailer will be greater than the variance of demand [4]. Lee et al. (2007) [6] suggested information sharing and coordinate orders among the supply chain are solutions to alleviate the adversity of supply chain uncertainty that mentioned above, including the whiplash effect and dead stock risk. This research will develop an optimal multivariate forecasts to solve the problem [3] [4]. Multivariate forecasts use more than one equations if the variables, such as lead time, backlog and stock, are jointly dependent. We will compare our proposed model with exponential-smoothing forecasting model and a moving-average model to see which model is more applicable. We will also compare a correlated demand with a demand with linear trend to determine which one will be used in our optimal forecasting model.

Decision Support System (DSS) can integrate analytical models responsive to the view point of a business process such as demand management [5]. Thus, we will implement our analytical model using DSS. Even though several researchers have already developed DSS regarding with inventory management, like Achabal's research in 2000 [1] and Cakir's research in 2008 [2], few of them emphasize environmental dynamics such as demand uncertainty, significant seasonality, short product life cycle or high competitive intensity. Our model will address this issue by developing a multivariate forecasting model which considers multiple uncertainty factors. We will collect data from an electronic components distributor (ABC company).

The data collection will be started at the beginning of 2016 and completed before March 2016. The data will enable us to test and refine our analytical model and make the DSS more feasible. We expect the DSS can support the ABC company to decide how much they should order and when is the best time for ordering in terms of reducing inventory. Therefore, the contribution of this research can be two-folded: first, to design a DSS that can actually help the case company to manage their orders more effectively, and, second, to find out variables that are related to inventory optimization in a dynamic environment and to develop an analytical model that is more general to be applied in other industires.

Keywords: Decision Support System (DSS), Supply Chain, Inventory, Multivariate Forecasts, Electronic Components Distributor

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