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STOCKLOGS: A CLASSROOM EXERCISE FOR TEACHING THE LOGISTICAL RELATIONSHIP OF LOCATION AND INVENTORY

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ABSTRACT

An important decision for logistics managers is to determine the number of locations at which to stock goods for subsequent sale and movement to consuming points. This decision requires an understanding of the relationships within the logistics system. To help students develop an appreciation for this decision and its underlying complexities an interactive simulation has been developed. The following paper describes the basic problem encountered by logistics managers, the simulation and how it is used in the classroom.

INTRODUCTION

For many organizations a major logistical decision is determining how many locations at which to stock inventory. This is not an easy decision because the relevant costs are in conflict and therefore must be traded off with one another. The decision to have fewer stocking locations will result in lower inventory costs but higher transportation costs. In addition, customer service levels will decline because product is not as close to customers. On the other hand, the decision to have more stocking locations will reduce transportation costs and raise customer service levels but increase inventory costs.

The effect on transportation costs of increasing the number of stocking locations is clear and well understood and is based on transportation economics (Ballou, 1985). More stocking locations mean that product can be moved in large volumes closer to the demand point thus reducing the expensive, small volume distance from the stocking point to the demand point.

The effect on inventory levels is more complicated and harder to understand (Bowersox, et al., 1985). It is important not only that students know that inventory levels will increase as the number of stocking locations increases but it is even more important that they understand why this occurs. This paper describes an exercise, which has been developed to give students an understanding of this basic logistics principle.

DESCRIPTION OF STOCKLOGS

The task facing the teacher of logistics is to develop in the student a full understanding of these relationships and their cumulative effects. In addition to presenting to the student a discussion similar to that contained in the previous section of this paper it was felt that placing the student in the role of a decision-maker would be an effective way to develop the desired understanding of these concepts. To this end a small, interactive program was written in BASIC and named STOCKLOGS.

STOCKLOGS simulates the inventory levels in a physical distribution system and allows the user to experiment with the number of stocking locations, the annual demand in the system, the cost to carry inventory, the uncertainty of demand, the value of the product and set-up or ordering costs. The user can manipulate any one or several of these variables. STOCKLOGS quickly calculates the base stock, safety stock and average inventory in the system and the annual cost to carry that inventory.

STOCKLOGS assumes that the market area is constant and that changes in the number of locations simply divides up the market demand equally. For example, if demand is 100,000 units for the entire system and there is one warehouse, 100,000 units will be assigned to move through that warehouse. If the number of warehouses is increased to two, 50,000 units will be assigned to move through each warehouse.

Notice that transportation costs are not included in STOCKLOGS. Students must be cautioned that a final decision on the number of stocking locations must consider transportation costs.

USING STOCKLOGS IN THE CLASSROOM

STOCKLOGS is used in the classroom as a one-time assignment at the end of the inventory or warehousing sections of a logistics course. Preferably, the student is familiar with stocking strategies and is comfortable with the concepts of safety and base stock. STOCKLOGS is a very effective way to cap off the inventory section of a logistics course because it integrates the concepts of base stock, safety stock and stocking strategy.

Students are provided with a diskette containing STOCKLOGS and a short assignment sheet/manual. The assignment consists of leading the student through a series of experiments so that she or he learns the relationships of the variables in STOCKLOGS. Students must also explain why the inventory levels are changing. For example, students are asked to increase the number of stocking locations from one to ten, to report the results and to explain the results.

The last question on the assignment sheet is a very important one, which asks if there are other factors, which should be considered. The student should be aware that transportation costs should be decreasing as the number of stocking locations is increasing and that a decision about stocking locating is not complete without an analysis of transportation costs. They should also be aware of the factors that can affect base stocks. For instance, the firm may be using a variable quantity/fixed interval inventory system rather than calculating an EOQ. There are also factors, which can modify the EOQ such as volume freight rates, the use of a just-in-time system or a minimum stock policy.