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important. UPC scanner data has vast untapped potential to tailor prices, products, and promotions to each stores' special needs. Chains are adopting scanners more quickly than independents are and even if independents install scanners and learn how to use the data effectively, they are likely to have the merchandising advantage they had when chains standardized sales efforts among all or many stores in a market.

Independents will have difficulty preserving their market niches. Industry sales growth has slowed and chains are looking for new sales opportunities. With the additional merchandising flexibility made possible by scanners, chains could compete more effectively in the market niches.

Independents lag in new store construction. As new supermarkets get larger, independents find it is more difficult to build stores because of the high costs, difficulty in securing financing and choice locations, length of time and other problems in store construction, and increased risks. Independents probably will operate very few of the superstores and combination grocery-drug stores that are expected to become the predominant type of supermarket in the 1980's.

Independents rely heavily upon discarded chain stores. Several chains are replacing their stores with superstores and combination stores and others are likely to sell stores due to financial problems. However, it appears unlikely that recycled stores will become available at the same pace as in the 1970's. In addition, affiliated wholesalers have gained the expertise to operate supermarkets, and if their growth and profit objectives are better served by integration into food retailing, they could acquire and keep recycled stores. Although this does not now appear likely, eight wholesalers now rank among the Nation's 100 largest food chains.

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AN INTERACTIVE SUPERMARKET FRONT-END COMPUTER SIMULATION MODEL

by

Vaughn Roller
Cornell University
Ithaca, New York

Checkout operations in U.S. supermarkets pose a dilemma for store management. First, a slow understaffed operation can precipitate consumer ill will which ultimately translates into lost sales. On the other hand, maintaining a service policy which results in shorter checkout lines may cause underutilization of both labor and equipment. This research addresses the problem of the resultant customer service - labor cost trade off. The FRONTLINE interactive simulation model was designed as a decision aid to be used in training exercises and optimal checkout design experiments.

Methodology

FRONTLINE is a computer simulation of a multiple line, multiple service checkout station queuing model which provides for the input of real time managerial skills. To the trainee the model appears as a management game with which he/she interacts via a video

computer terminal. Demand on the checkout system is simulated to resemble either the business pattern of the user's store or historical sales data from which a sales forecast can be made. Based on his/her forecast of demand the player enters a planned labor schedule for the period of interest (e.g., an eight hour period). After several parameters such as the number of registers, equipment type, check authorization procedures and express lanes are entered, the trainee initially assigns scheduled personnel to checking and bagging tasks at the various checkout stations. The specified environment is then displayed on the screen as a 'bird's eye' view of the checkout area.

Simulation commences with the arrival of customers awaiting service who queue up into the checkout lines, and the processing of those customers at a rate determined by the specific operating parameters (e.g., equipment type, express lane policy). The user may interrupt the simulation to adjust the amount or assignment of labor at any point during the game. These interruptions simulate managerial intervention to balance service policy objectives (i.e., average line length or waiting time) with labor cost minimization. At the end of the simulated period the system displays performance statistics such as net dollar sales per labor hour, labor cost percent of sales, average customer waiting time and equipment utilization rate.

Major Findings

Experiments are planned to determine optimal equipment and operating procedure configurations within sales volume and service policy constraints. Essentially this involves replicating the 'game' at several levels of variables such as number of lanes, type of equipment and operating procedures. The potential of this model as a training aid is demonstrated by experience with groups of store management personnel. Labor productivity achieved by managers varied by 30 percent from least to most efficient when all factors except labor scheduling and assignment were held constant.

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