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A MICROCOMPUTER SIMULATION FOR TEACHING RETAIL LOCATION STRATEGY

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ABSTRACT

Microcomputers are becoming increasingly evident in classrooms across the country. The inherent advantages of micros with respect to simplicity, cost, and flexibility makes them well suited for designing and running simulations. The authors discuss the relative benefits of microprocessors, followed by a presentation of the concept of microsimulations. A microsimulation of retail location strategy decisions is described along with the results of classroom testing. Conclusions are offered on the bright future of microcomputers in classroom simulations.

INTRODUCTION

The combined characteristics of microcomputers' increased flexibility, availability, and decreasing costs have brought micros into the classroom for a vanguard of college educators. An indication of the increased interest in and use of microprocessors was the recent micro workshop held at the 1981 ABSEL meeting in Orlando, Florida.

Albeit small, the enthusiastic group, represented by Ron Jensen (1981), Ron Frazer (1981), Ken Goosen (1981), and Corey Schou (1981) and supported by other micro- users such as Dave Fritzsche served not only to introduce the concept of micros but sought to kindle a flame of sorts in other prospective users in attendance. The demonstrations and discussions pointed out that the use of microcomputers in designing simulations and business games had released many educators from the difficulties encountered with mainframe simulations. Mainframe batch-style simulations are subject to delays from maintenance downtime, limited availability of data line link-ups, stow turnaround during peakload periods, and loss of input or output from CPU "crashes". In contrast, the microcomputer offers self-contained memory and computing capability, low cost of acquisition and operation, simplified operation; faster (almost immediate) turnaround; ability to interface with a variety of peripheral equipment (e.g., television, printers, video cassette recorders, tape players, etc.), and convenience of operation. These advantages more than outweigh the limitations of "small" memory constraints or the unavailability of sophisticated software for micros.

The Microcomputer Involved

Quite frankly, and with no pretense of grandeur, this paper is intended to highlight the advantages of the use of a microcomputer in developing and running microsimulations and to describe the experiences of the authors in their development and application of microsimulation to retail location decisions. Inasmuch as the microcomputer involved was an ATARI model and this particular company's products have not been discussed in the ABSEL literature, it seems appropriate to digress momentarily to describe its specifics. The ATARI 800 is the current "top-of-the-line" model of the ATARI brand which contains a 10K operating system (ROM) and comes with a 16K random access memory (RAM). The RAM is expandable to 48K through the addition of memory packets. The system used in this microsimulation had 32K; buffers and other Interfaces reduced the effective RAM to about 29K. ATARI accommodates ATARI BASIC language which permits all standard BASIC commands plus color graphics and a broad range of sounds. The microsystem outputs directly to a color television as the monitor. A wide variety of standard hardware is available in the form of disc drives, modems, monitors, printers, and the like. The only device used in this simulation was a cassette input unit. The ATARI 800 and the tape drive retail for around $1300. (Substantial savings may be effected if one opts for mail order or other discounters). ATARI was selected by the author who purchased it after inspection of APPLE and Radio Shack Models with the resultant belief that ATARI's color graphics and sounds were superior.

Microsimulations in the Classroom

A microsimulation is a scaled down version of the usual mainframe business game, designed to illustrate a specific decision area. The learning process for these types of simulations is minimal but nontrivial and students are asked to make quick, simple decisions a- bout the operations of a hypothetical business firm under several different environments. The objective is to illustrate the parameters of the decision, some potential decision environments, and the results of applying a formalized decision approach or heuristic.

The microcomputer is particularly well suited to this type of simulation due to its simplicity, speed, and mode of operation. Using a console and a monitor screen, students can: (1) activate the programmed instructions for the rules of the game; (2) enter their own decision; and (3) receive the simulation results, all without the necessity of instructor intervention. Decisions under different conditions can be quickly entered and the particular consequences displayed on the monitor. The microsimulation with microcomputer is useful for both individual student instruction and team competition. (See aforementioned cites)

THE RETAIL LOCATION STRATEGY MICROSIMULATION

Overview

As part of the material for a marketing channels course a microsimulation of a retail location decision for a new firm was developed. The objective was to illustrate the various parameters of a location decision (i.e., customer travel effort, distance, alternative site location, competitors' store location; competitors' marketing efforts, the firms' marketing efforts), as well as the outcome of team decisions for three different industry environments. Although only one simulation was developed for the course, it is possible to develop a series of course modules with a micro- simulation to illustrate the material contained in each. The present simulation took one class meeting (one hour) to familiarize students with the rules and procedures for operating the microcomputer and two classes to run four teams through 4 decisions each.

The required time could be decreased if simulation instruction were handled outside of class via handouts or lab sessions or the students were already familiar with the operation of microcomputers. Clearly, the fact that only one microcomputer unit was available and only class time was used extended the time frame.

Simulated Environment

For the retail location simulation, students were divided into teams and provided with background information on the rules and simulated decision environment. The unique niche of microcomputers stems from their immediacy of turnaround and intimacy of operation. However, there are significant opportunities for simulation writers to incorporate some "fun" aspects of micros as well. Consequently, the present simulation make ample use of the color graphics and musical sound features to maintain student attention and interest. Figure 1 summarizes the various steps in the microsimulation endeavors to relate the "special effects' of the simulation incorporated for this purpose. Teams were provided with the following information:

1. Objectives - Teams were shown a map of an urban area on which alternative sites for a retail store were positioned. Teams were asked to select the most advantageous position for the particular environment in which they were competing.

2. Decision Environment Teams selected one of three types of retail stores to operate; convenience, shopping, or specialty. Both team stores and competitors' stores were the same type. Convenience, shopping and specialty environments each contained different sensitivity of response to the location and the marketing decisions the team selected.

3. Environmental Data - a) Teams were given information about the general retail trade area via a television monitor which depicted a map of the area. The map was constructed on a grid and contained two major traffic arteries (north-south and east-west) and a river. The grid location of these geographic attributes was randomly varied from one decision to the next. b) The 25 major subdivisions were located on the map, each representing a randomly determined number of houses.
c) The competitors' locations were then overlayed on the map and teams were given information on their grid locations and approximate floor space (randomly varied between 20,000 50,000 sq. ft.)
d) Teams were told that the competitors were assumed to be in a relatively stable environment with no pronounced aggressiveness on price or promotion. e) Finally, the possible alternative sites were sequentially displayed on the map, giving grid location, monthly rent, and square footage. f) Teams were told that distance of location from the market (subdivisions) was important and that consumers tended to use the main arteries as much as possible. The river barrier imposed the constraint that consumers travel to the nearest bridge figuratively to reach a retail location.

4. Decision Alternatives Based on the trade area information, location of competitors, size of competitors stores, available retail sites, distance from major cluster of subdivisions, teams were required to select the site they thought most advantageous. After the site selection decision, teams were asked to select the most effective level of price and promotion to effectively generate sales from the location. The purpose was to illustrate the problems encountered in trying to overcome distance by lowering price or increasing promotion.

5. Decision Evaluation - Once the decision was entered, teams received hypothetical results of competing with the other firms. The microcomputer generated for the teams' store and the competitors: unit sales, total revenues, and profit levels.

6. Decision Refinement After receipt of the results of the first round of decisions, teams were allowed to make other rounds of promotion and price decisions. The location, of course, was fixed by the original decision, and through successive interactions, teams could determine the impacts of the other two variables. Competitors' actions, however, were subject to random variation.

FIGURE 1
MICROSIMULATION FLOW AND SPECIAL EFFECTS

FLOW SEQUENCE	SPECIAL EFFECTS
Introduction to the simulation	Text
Description of the objectives	Text
Decisions:	Text
Type of environment (convenience, shopping, specialty stores) Number of competitors Number of site alternatives	Text
Market Area Map	
River location Main arteries (E-W and N-S)	Black background Blue river, yellow roads Sounds with each Text on bottom
Subdivisions' location	Sounds with each subdivision Each appears in pink
Competitors' locations Floor space Grid location	Each flashes in white Quick, pulsing sounds with each Text on bottom
Available selection sites Grid coordinates, floor space, rent	Each flashes in white and blue Longer, pulsing sounds with each
Site selection (Team decision)	Chosen one flashes white, blue, yellow. Pulsing sounds with flashes. Unchosen ones disappear
Price and Promotion (Team decision)	Tone sounds based on size of each (inverse)
Results computation	"Computing" sounds (high-pitched)
Results output Price, promotion, square footage, and profit	Long sounds for each
Request for new price and promotion	Four long beeps if "yes"
New decision or new map	Text
or	
Terminate exercise	Blank screen

Specific Functional Forms and Determinants

As we indicated in the previous section, the micro-simulation accommodates three competitive retail environments: convenience stores, shopping stores, and specialty stores. Regardless of the environment, the demand generated far each store is a function of the store's location (distance from subdivisions) and relative price and promotional levels, With respect to the distance factor, the linear distance of each subdivision from each competing store is computed and then squared with the intent of simulating "perceived" distances as opposed to actual distances. In those cases where the subdivision and the store fall on opposite sides of the river, the squared distance is doubled as a means of indicating the additional distance which must be traveled in order to cross the river on one of the two bridges. Giving the various distances, each store gains a proportion of the demand in each subdivision as a function of the distance between the two relative to the total distance from that subdivision to all stores.

The computation of price and promotional elasticities is relatively simplistic. For promotion, the proportion of demand garnered is directly related to the proportion of total promotion accounted for by any one competitor. Similarly, in the case of price, the proportion of demand is the reciprocal of the store’s price proportional to the total of all prices. The simulation in its present form does not take into consideration carryover effects, nor does it assume any store loyalty. In other words, demand is a direct function of period-specific promotion, price and location.

All three of these competitive variables are combined through the use of a weighted average approach to determine a final proportion of total demand accounted for by each competitor. Differences between the competitive environments are reflected in the arbitrary weights used in the weighted average approach. For instance, the convenience store environment places the heaviest weight (e.g., 70%) on the distance variables; whereas, the specialty store environment places the lowest weight (e.g., 30%) on this factor. The shopping store environment loads about 50% on the distance factor. The intention underlying the use of weights is to illustrate to student-users that the competitive marketing variables differ in their impact on demand generation given alternative retail store environments.

Costs are computed in a straightforward manner, and these values also are sensitive to the type of retail store involved. In particular, while direct costs such as promotion and rent are handled identically in all three competitive environments, indirect costs such as overhead are specific to the type of store environment. For instance, the microsimulation embodies the assumption that specialty stores require more image-building overhead expenses than do shopping stores which require more, in turn, than do convenience stores.

Net revenues are, once again, computed in a relatively straightforward manner. The total demand resulting from the combination of price, promotion, and location is computed in terms of units, and this amount is applied to the price chosen or generated for each competitor. Costs are then computed and subtracted to determine a net revenue figure.

RUNNING THE MICROSIMULATION

Certainly a number of alternatives exists with regard to the running of any microsimulation, and it is the intent of the authors to provide information on their initial use of the simulation.

Orientation to the microsimulation took the forms of class lecture and a practical demonstration. The introduction to the microsimulation included a description of microcomputer simulation in business courses. Also comparisons between microcomputer simulation and mainframe computer simulations were noted. The orientation session ended with a few trial runs by volunteers from the class who were willing to try the simulation as their peers looked on.

Students were then divided into teams as indicated earlier in the paper and provided with instructions as to the need to develop strategies and to test the results of alternative marketing tactics within the same environment as well as across environments. Additionally, each team was supplied with a worksheet to record specifics as to environment, grid coordinates, decisions and outcomes. In the succeeding class meeting each team was provided with sufficient time to play the simulation within and across two of the three environments. Due to the fact that only one monitor and microcomputer were available, the running of the simulations necessarily encompassed two complete class periods. At the end of these experiences, student teams were instructed to write a paper summarizing their experiences and pointing out generalizations with regard to retail site location strategy and interrelationships of marketing decision variables such as price and promotion with the chosen location. In general, it was the authors’ observation that the teams easily learned the rules and operating procedures for the microsimulation. Inasmuch as student teams were told that their results would be composed into a paper at the end of the simulation, motivation remained high throughout the process. Interestingly, students applied marketing principles of location analysis and marketing strategy from the textbook fairly consistently during the first rounds of decision variables and then began to deviate toward practices which appeared to work best in terms of the specific environment they were facing during their current simulation exercises. In other works, situation-specific refinement of textbook principles resulted.

CONCLUSION

Figure 2 serves to illustrate the unique niche served by microcomputers and microsimulation. The retail location strategy experience operates as a totally independent, highly involving, and therefore, effective learning device. It requires a minimum of hardware or usage experience, but delivers a maximum of descriptive and immediately available feedback. Students have practically instantaneous results on their decision-making ventures, providing a effective learning experience through trial-and-error and reinforcement. Despite the drawback of no hard copy (an easily remedied situation with the addition of a printer), students proved themselves quite capable of recording salient decision inputs and incorporating the results in subsequent decisions. The learning curve for this type of pedagogical tool accelerates quite rapidly and demonstrates the potential of mini-simulations.

The authors will resist the temptation to wax philosophical on the ultimate impact of microcomputer simulations in the typical business course. Instead, we offer a “tongue-in-cheek” question: “Wouldn’t it be nice if our students line up, quarters in hand, to play our simulations the way they do at the video games arcades?” Convergence may be nearer than we think.

FIGURE 2

TECHNICAL ASPECTS OF THE RETAIL LOCATION STRATEGY MICROSIMULATION

HARDWARE:

Microcomputer:	ATARI 800 (32K capacity)
Input Device:	Cassette tape drive (ATARI 410)
Input Medium:	Cassette Television (any brand)

SOFTWARE:

Programmed Language:	BASIC (ATARI version)
Memory Required:	About 14K
Input time:	3 minutes, 35 seconds
Number of Lines	311

PROGRAM SPECIFICS:

- Parameter (Decision inputs)
- Competitive environment (Specialty, shopping, or convenience stores)
- Number of competitors (1 to 9)
- Number of available sites (1 to 5)

Monitor Display

- Text
- Main roads (north-south, east-west)
- Subdivision locations (25)
- Competitors' locations (as per requested)
- Available site locations (as per requested)
- Results (Text)

Competitive strategy decisions:

- Chosen site
- Price level
- Promotion level

Demand computation/logic:

- Adaptation of Huff logic
- Proportional response to price, promotion, and location
- Sensitivities of marketing variables vary by retail environment

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