CHAPTER 3

INTRODUCTION TO COMPUTERIZED BUSINESS MANAGEMENT SIMULATIONS

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The purpose of this chapter is to provide general information about computerized business management simulations, the so-called business games. The chapter is divided into five sections. In the first section, historical information is provided along with sources of information about business games. The primary focus of the second section is on what constitutes a business game and how games are classified. The third and fourth sections deal with issues involved in selecting and using computerized business games, respectively. In the final section, a bibliography of a large number of the games currently available is provided.

BACKGROUND

It has now been more than a quarter of a century since the first practical business game was introduced by the American Management Association in 1956 (Meier, Newell, and Pazer, 1969). Rapid growth in interest in computerized business games during this 30 plus years can be documented in at least three ways. First, the number of games available has increased dramatically. The most recent edition of *The Guide to Simulations/Games for Education and Training* (Horn and Cleaves, 1980), for example, lists hundreds of such games. Second, a number of organizations and journals devoted to business games have come into existence. Third, in the most extensive research to date, Faria (1987), documents the increase in the number of users of computerized business games. His research, which is included in revised

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form as the next chapter in this guide, is particularly noteworthy because it covered both usage in academia and business.

Given the rapid growth one might assume that the educational merits of business games are well established. The fact is, however, that their educational merits have been subject to considerable debate. There are studies which indicate that other forms of pedagogy are just as effective or more effective than business games, while other studies find the reverse to be true. Individuals who are interested in reading about learning in business games are referred to the articles by Greenlaw and Wyman (1973), Keys (1976), and Wolfe (1985), which review the more rigorous of the studies dealing with learning in business games. The Wolfe (1985) study is particularly useful since it is a 10-year update of the Greenlaw and Wyman (1973) study and therefore makes comparisons to the earlier study. In addition, the chapter in this guide by Wolfe should be reviewed. Finally, for information about learning in business games as well as for other information about business games the proceedings of the Association for Business Simulation and Experiential Learning (ABSEL), which began in 1974, should be reviewed. To simplify the review of the ABSEL Proceedings, consult A *Comprehensive Guide to ABSEL'S Conference Proceedings* (1974-1981) by Goosen (1982). The *Journal of Experiential Learning and Simulation*, which was published from 1979 through 1981, and *Simulation & Games*, which began in 1970, are also useful sources of information.

THE NATURE OF COMPUTERIZED BUSINESS GAMES

In computerized business games, game players (participants, students) assume the role of decision-makers in organizations. Frequently, the complexity of the game is such that the participants are grouped into teams of three or more members. The teams' decision areas may cover the total firm or a functional unit of a firm, depending on the focus of the simulation. The participants are provided with a player's manual which presents the "rules of the game," describes the environment, and gives a starting point for the firm. The starting point is usually the same for each firm in the industry. The participants submit a set of decisions for their firm to the game administrator (the instructor or trainer or his/her designee). Each set of decisions usually represents a quarter of a year or a year of operation of the firm. The game's administrator, using the computer, processes the decisions and returns the results to the participants. The participants, given their current situation, prepare another set of decisions which are then processed by the game administrator. The fact that participants make decisions for a number of decision periods forces them to live with the consequences of their previous decisions.

The output (results) received by participants generally consists of at least a balance sheet and an income statement. Frequently, at least one page of supplemental output is provided each firm and in some instances a great many pages are provided.

Business games may be classified on a number of dimensions. First, as alluded to earlier, business games may be classified by subject matter as functional or total enterprise. A functional business game is one which is designed to "focus specifically on problems of decision-making as seen in one particular functional area" (Cohen and Rhenman, 1961, p. 140). In contrast, a total enterprise game is one "designed to give people experience in making decisions at a top executive level and in which decisions from one functional area interact with those made in other areas of the firm" (Cohen and Rhenman, 1961, p. 140). Total enterprise games would be used in courses or training programs which are designed to give an overview of business management, such as the senior or graduate level business policy course, the freshmen level introduction to business course, or a management development program on strategic management. While this range from freshmen to senior to graduate to business executive may seem broad, the fact is that the level of complexity and expectations can be set so that even a single game may be used for diverse audiences.

A second way in which business games have been classified is as competitive or non-competitive. The primary basis for this distinction has been whether the decisions of players influence the results of one another (competitive) or not (non-competitive). For example, in a competitive game, if all else is equal, and Firm 1 charges a lower price than Firm 2, Firm 1 will sell more than Firm 2. In a non-competitive game, on the other hand, the participants are competing against the computer model or an environment rather than one another. As Thavikulwat (1988) has recently argued, however, the use of the terms competitive and non-competitive to describe the nature of the market in business games is ambiguous because such terms may have other meanings than whether the decisions of the players influence the results of one another. He suggests, for example, that a game could be seen as competitive depending upon the nature of the relationships the game user establishes between players. For example, a grading scheme which causes one's performance evaluation to vary depending on the performance of another could create a competitive environment, even when decisions of participants do not influence the game results of one another. For this reason Thavikulwat (1988) suggests that the phrases "dependent-across firms" or "independent-across-firms" be used to describe the nature of the market in a game. Thus, games in which the demand for individual firms depends on the decisions of the other firms in the game would be "dependent-across-firms" while those in which demand for individual firms is not dependent on the decisions of other firms in the game would be

"independent-across-firms." While Thavikulwat's (1988) suggested classification scheme focuses on demand, it would appear that it could apply to other factors which could be used to create competition among firms in a game. For example, the supply of labor or raw materials could be fixed so that firms must compete for them, thereby creating a competitive environment which is a function of supply not demand conditions.

Thavikulwat's (1988) conceptualization clearly has improved upon an earlier classification scheme. As we write about games in the future we need to carefully describe the types of competition, if any, which exist in games as designed or which were created by actions of the game user.

A third classification of business games of interactive or noninteractive refers to how participants interact with the computer. In an interactive game, participants play the game at a computer terminal or, more frequently today, at a microcomputer. Participants respond to questions at the terminal, receive an immediate response, and then submit additional decisions. In noninteractive games, decisions are submitted to the game administrator, run through the program, and the results are returned later. A recent combination of interactive and noninteractive has come into being as a result of the advent of microcomputers. A number of games, for example (Jensen and Cherrington, 1984; Scott and Strickland, 1985), now provide for the student to work at a computer terminal or microcomputer with an interactive program to put their decisions on a disk which they turn in to the game administrator. The game administrator then merges the disks of all participants and runs the simulation in a noninteractive fashion. Currently, demand-dependent-across-firms games are handled in a noninteractive mode since the decisions of the players influence the results of one another and therefore must be processed by the computer concurrently. The reader will note from the chapters in this guide by Patz and Chiesl that this type of constraint may change in the future.

A fourth classification of business games is on a continuum from industry specific to generic, depending upon whether or not a specific industry is being simulated. In an industry specific game, the authors attempt to replicate very closely the actual industry whereas in the generic games only general business relationships, such as the downward sloping demand curve, are replicated. In between industry-specific and generic games are those games which identify the specific product, such as electronics, but which do not attempt to replicate the industry closely. A fifth dimension along which business games may be classified is whether they are designed to be played by individuals or teams. Although many games can be played by individuals, the complexity frequently is such that team play is highly recommended. In addition, group play is sometimes recommended for behavioral reasons since the participants learn to work in groups, deal with conflict, communicate with and motivate others, and exercise leadership. On the other hand,

some games are recommended for individual play because the game is seen as relatively simple or so that individual performance can be assessed. Sixth, computerized business games can be classified as being basically deterministic **or** stochastic, depending upon the extent to which random events occur. Seventh, a relatively new basis for classifying business games is in terms of the type of computer on which the game is to be run. Are we using a mainframe (including minicomputers) or are we using a microcomputer? This category may be further subdivided in the future as researchers compare games which were written directly for the microcomputer versus those which were originally written for mainframe computers and then were adapted to the micrcomputer.

Eighth, business games may be classified according to degree of complexity. As has been noted by Keys (1977), there are two dimensions of complexity in business games-game variable complexity and computer model complexity. According to Keys (1977, p. 5) the best measure of game complexity is "the number of individual decisions inputs per round of game play (a decision set)." The issue of game variable complexity also has been addressed by Butler, Pray, and Strang (1979), Raia (1966), and Wolfe (1978). An issue closely related to game variable complexity of how much information is needed for effective game play has been addressed by Biggs and Greenlaw (1976). The complexity of the computer model deals with items such as the program language, number of lines or pages of output, memory required, etc. Thus, this aspect of complexity is more concerned with computer hardware and software issues. A final way in which business games could be classified is according to the time period simulated. Does each decision set cover one day, one week, one quarter of a year, a year, etc? The time period simulated is important since it indicates whether participants are to focus on short term operating decisions, longer term strategic decisions, or both. Given this background information and dimensions along which business games may be classified, we will now turn our attention to selecting the simulation.

SELECTING A COMPUTERIZED BUSINESS GAME

When selecting a business game, the user must first identify the learning objectives for the course involved and decide whether a business game would help to meet the objectives. What is to be accomplished? If the stated objective in the business policy course is to expose the student to a variety of industries, leadership styles, decision-making styles, and managerial problems, then a set of case studies should be used rather than a business game. If, on the other hand, the objective is to provide the students with an opportunity to make decisions in a dynamic environment in which they will

be required to use previously learned tools, to integrate the various business functional areas, and to live with their prior decisions, then one might well decide to use a general management simulation.

With the objectives firmly in mind you are now ready to identify the game characteristics along the dimensions previously cited. Since the dimensions are mutually exclusive, you may select any combination desired. For example you could select a general management, competitive, noninteractive, non-industry, team-oriented, somewhat stochastic, and mainframe game for the business policy course. Within a specific game you will frequently find that there is some discretion concerning these dimensions. For example in the functional game *FINANSIM: A Financial Management Simulation* (Greenlaw and Frey, 1967), which is nonindustry, noncompetitive, noninteractive, recommended for team play and somewhat stochastic, the user can have the student input decisions and receive results right at the terminal to give an interactive effect. Further, the game could be played by individuals and the stochastic nature reduced by providing players with demand figures.

Further complicating the users' decisions along these dimensions is the fact that each dimension has certain advantages and disadvantages. For example, industry games add a degree of realism not found in generic games, but one runs the risk that participants will make decisions based upon what actually happened in the industry rather than through careful analysis of the game environment. Or, in a competitive game, a single firm may make irrational decisions which disrupt the game for other participants.

Once you have established what it is you are looking for, you can begin to identify games which are available which will meet your needs. As a starting point review, *The Guide to Simulations/Games for Education and Training* (Horn and Cleaves, 1980) provides descriptive information for hundreds of games. It covers such things as characteristics of the game, equipment needed, publisher, estimated playing time, etc. Next, review the publishers' lists of available books to see what they have, and contact the publishers' representatives to see if anything new is available. Incidentally, because simulations are a relatively new market for the publishers, the representatives are frequently not well-informed and therefore are often not a good first source of information. Finally, consult members of organizations such as ABSEL and colleagues at other institutions to see what is being used.

Having identified the simulations in which you are interested, you should obtain the student and instructor manuals, and the computer center manual, if there is one. It should be pointed out here that microcomputers have changed the way in which instructor and computer center manuals become available. A number of microcomputer simulations now include the instructor and computer center manuals on the disk with the program. With the disk you receive a brief set of instructions on how to load the disk and print Out the manuals. Review the students' manual carefully to be sure the game

does what you want and also for readability. Some of the most widely used simulations have student manuals which are very unclear, which creates problems for the students in their decision-making. For example, one simulation in the second edition kept references to rules which were not being used in the second version of the game. An unclear manual will contribute to poor decisions on the part of the students and will require a great deal of classroom time. In reading the student manual, check how complex the game is. How many decisions do students have to make per round of game play? In *FINANSIM: A Financial Management Simulation* (Greenlaw and Frey, 1967), there are 12 decisions per decision set; in *Tempomatic IV: A Management Simulation* (Scott and Strickland, 1984) about 50; and, in the *Carnegie Tech Management Game* about 300. What is the nature of the output the students will receive? In one general management game, the students receive not only an income statement and balance sheet but a complete production and sales analysis, and a cash flow statement. In addition, they receive estimated cash flow, production capacity, etc. for the next quarter. In some simulations, however, the student will have to calculate these figures. Again, what are your objectives?

It is also important to assess what output the game administrator receives. Such information can range from none to summary data to grade indices. Read the instructor's manual to gain additional insight into how the game operates to identify how much control you have over the simulation. For example, can it be tailored to replicate a specific industry or changed from one semester to the next?

Frequently information on actually running the simulation is given in the instructor's manual rather than a separate computer center manual, and you will need someone to read this information unless you possess the appropriate computer knowledge. The person with the computer expertise does not have to be a member of the computer center staff however. This writer has had success in operationalizing simulations by having undergraduate student assistants do the work. In some instances they have been paid, while in other instances an independent study was set up. in one instance, an undergraduate student developed a procedure for adapting games designed for mainframe computers to minicomputers (Biggs and Smith, 1982). In another instance (Biggs and Slocum, 1976), a student who agreed to get 10 simulations up and running on our system one summer actually operationalized 50 simulations. Total cost of the project, including purchasing the simulation packages, was under $1500.

This shotgun approach to having simulations available, rather than the more procedural rifle method which is being suggested here, is useful if one wishes to involve a number of faculty in using computerized business games, since the ease of availability may cause reluctant faculty to give games a try. In the case just cited, the ease of availability did result in rapid adoption

and, within two years, we had a problem. In one year we were using six different simulations in seven different courses-introduction to business, business policy, principles of accounting, principles of marketing, principles of finance, advanced finance, and investments. One should pity the poor student who in one semester was playing and therefore learning the rules of three different simulations. You can appreciate his problem when you know that at one point he decided to dominate the industry in one of the simulations and therefore put $100,000 into advertising. Imagine his horror when the results came back and he had done very poorly because in that simulation he needed $1,000,000 not $100,000. He had mixed the rules of two of the simulations. You need to keep the student in mind when multiple simulations are being used in your institutions.

A criterion in selecting a simulation about which people frequently worry is the cost. As my early comment points out, however, the cost of the simulation is frequently minimal. While it is true that some simulations cost $10,000 or more, most of the simulations available from publishers can be obtained for the cost of the tape (card deck at one point) or disk, $5 to $20, and in most instances for free. You should be aware however, that some publishers will tell you that the program is free but is only available to adopters. When you receive such notification write a letter to the publisher which indicates that you would not consider adopting a simulation which you had not had an opportunity to test on your system. In fairness to the publishers, however, you are obligated to have done your homework before you request the program. You should not have students purchase manuals for a game until you know it will run. Also note that tapes or disks are available from the publisher; you do not have to punch the program into the computer.

Finally, before you make the final selection decision, do at least one trial run on your system. Many of the simulations today provide you with a trial run data deck and a copy of what the output from the trial run should look like. Do the trial run and check the student output carefully. You should also check the history output which will be used as part of the next period's input to be certain it looks okay and also to become more familiar with the simulation.

It is strongly recommended that you take the output from the trial run. add a set of dummy decisions, and do an additional run. You should do this to make sure that the successful trial run was not a fluke, to test the rules of the simulation, and to try to blow the simulation up. The successful trial run could be a fluke because of differences between your computer and the computer on which the simulation was developed. For example, the trial run for *PORTSTRAT A Portfolio Strategy Simulation* (Gitman, Robana and Biggs. 1980) ran beautifully on many machines. Because the simulation was developed on a 32-bit machine, however, the random number generator fails

on a 16-bit machine. Since the random number generator does not have to be used in the trial run, the problem does not show up until the next run. It should be pointed out that the 16 versus 32 problem was known to the authors and therefore they provided instructions in the instructor's manual on how to modify the simulation. They also provided a way to by-pass the random number generator to give the game administrator greater control and as an alternative to modifying the program. You should look for such information in the instructor's manual.

The trial runs should also be used to test the rules of the simulation and to try to blow it up in order to find where the holes are. A few examples will point out the types of problems encountered. In one simulation the author accidentally put in an upward sloping demand curve. Fortunately, this error was caught before the simulation became available. In another simulation it was possible to fire more salespeople than your firm employed. The effect was that cash flow and profit improved because the expense per salesperson was now a positive value and the salesperson expense was treated as a receipt. In one simulation a change in one variable caused demand for the industry to go negative (i.e., customers in that quarter returned more than they bought). A more subtle error exists in one simulation which has a penalty payment for early bond retirement. The penalty is assessed when the last payment is made, even though it should not be. Even harder to detect was the situation in one simulation which provided for the production decision to be limited by raw materials, workers, or plant capacity, whichever was lower. In fact, if you violated all three constraints your decision would be implemented. In another instance the sales per team were calculated and allocated before the number of salespersons available was checked. Later, the number of salespersons for which the team was charged was reduced to the number of salespersons available, but the market share calculation was based on the number assigned. Thus, you could get the benefit without the cost.

Before turning to the decisions associated with using business simulations, you should know that it is possible to get programs which have been pre-tested and evaluated; however, you must pay for the service. The organization which evaluates and debugs programs is known as *CONDUIT* (Helper, 1977).

USING A COMPUTERIZED BUSINESS GAME

You have now selected your simulation and it is running perfectly, so your troubles are over. Wrong! You now have a whole new set of decisions to make. First, are you going to use the simulation as written or is there something you wish to modify? Here are two examples of why you might

want to modify a simulation. In one simulation, as originally written, if you stockout in an area, you lose one salesperson. There is no recognition of the magnitude of the stockout; a stockout of one unit or 10,000 units results in the loss of a salesperson. In this same simulation plant capacity never wears out; therefore, depending upon the demand schedule, students may be able to play the game and never be faced with the plant capacity decision. It is recommended that you use the simulation once before making any modifications. however.

A second decision you need to make is what other activities you are going to package around the simulation. Are you going to require reports and/or calculations? For example, in the business policy course in which three years are simulated, one could require a strategy report and management reports after each simulated year of operation. In addition, the students could make oral presentations to a board of directors. There are instructors who require students to keep a log in which they must record the rationale for each set of decisions and others who require students to submit pro forma statements with each set of decisions. Some instructors have labor negotiations take place during the game. The list of activities with which you can surround a game is virtually unlimited. A few words of caution are in order, however. First, don't try to introduce too many activities. Second, remember that each semester you have a new group of students. You know the simulation but they do not. If you add in a new activity, ask yourself if something else should be dropped. An example of an extra activity which illustrates the increasing complexity being put into simulation is the fact that at least two games (Jensen and Cherrington, 1984; Scott and Strickland, 1984) now have separate management information systems available to supplement the simulation. Again, be careful that you do not overload the student.

A third decision you need to make is when during the semester the simulation should be introduced. While there are no hard and fast rules, this writer's personal experience and belief in distributed learning suggest that the simulation should be introduced early in the semester. Initially there should be more time between decision due dates than later in the semester. As the decision-making progresses, the time needed tends to decline at an exponential rate, so it is not uncommon to find teams which spent six to eight hours on their first set of decisions making their last sets in 30 to 45 minutes.

The creation of the teams is a fourth decision you must make. If you are going to organize the students into teams, you have to decide on team size and on how to create the teams. The literature would suggest that for moderately complex games teams are best, and that teams of three to five are optimal (Wolfe and Chacko, 1982). This writer's experience with moderately complex total enterprise games suggests three is the optimal number. With more than three, one individual frequently gets a free ride. Functional simulations can often be handled by individuals. As with all these decision

areas, however, your objectives are important. If you really wish to create a hierarchy and have a great deal of interpersonal behavior, then you would have larger teams. Some writers argue that instructors should create teams by random assignment or by forced assignment to balance team skills. For example, a good balance might be a finance major, a marketing major, and a production management major. Others suggest that students should create their own teams for pragmatic reasons-they have to be able to meet outside of class (Wilson, 1974)-and because students prefer to create their own teams (Sugges, 1983). Offsetting the need to match schedules, however, is the fact that students may not be the best judges of who should be on a team. In some instances, they pick on the basis of friendship only to find out that they do not work well together. In some instances, when students create their own teams, all the stronger students are together and all the weaker students are together. It is interesting to note, however, that the strong teams do not necessarily perform well if they are composed of strong-willed individuals who will not compromise. Overriding these problems, however, is the fact that students must get together outside of class, an increasingly difficult problem as we deal with part-time students who are working full-time. The issue of the effect of team cohesion on game performance has been addressed by Wolfe and Box (1988).

A fifth decision you will need to make is how you will grade performance in the game. Some simulations have grading packages built into the simulation. For example, one package uses seven variables (Sales, NI, ROS, ROE, ROA, EPS, and Stock Price). The instructor can weigh these variables. For each period an index is calculated for each team by finding the top team for each variable, giving that team l00%, dividing each of the other teams by the top team, multiplying by the weights, and summing the weighted percentage score for each team. Such an index should never be used as the only basis for assigning a grade. Rather, the instructor should also look at the decisions in terms of reasonableness. What has been argued is that the instructor should use multiple variables, both qualitative and quantitative measures, and should look at both input and output measures. Interestingly, Sugges (1983) found that the majority of students preferred that the instructor set quantitative criteria to evaluate company performance. This writer recommends that the performance grade be at least 20¾ to create an incentive to perform, but not more than 25¾ when team play is involved so that a non-participant does not get a good grade as the result of the work of others. The reader who wishes more information concerning grading performance in business games should refer to Biggs (1978). Butler and Parasuraman (1975), Hand and Sims (1975), and Sims and Hand (1975).

You will also find that you need to make decisions while the students are playing the game as unanticipated events take place. What do you do when

a team member comes to you and says, "I am doing all the work?" Peer evaluations at the end may help alleviate this problem as will a provision that a team member may be fired. In fact peer evaluations at various times throughout the semester appear to be superior to end of game peer evaluations alone (Anderson and Lawton, 1988). What do you do if you find out in a competitive simulation that collusion is taking place? What do you do if someone posts a notice, which appears to be from you, which indicates that demand in the next period will drop 30%, and one team believes it? What do you do if a student finds a loop hole in the simulation and takes advantage of it? What do you do if there is an input error? If the students input their own decisions, you can say "too bad" but if you or your assistant have put the decisions in incorrectly you rerun. Be sure to leave adequate time between decision deadlines. These comments are not meant to exhaust everything one needs to consider when using a simulation. The reader is referred to the chapter by Fritzsche and Cotter elsewhere in this book for other considerations, as well as additional comments on items discussed in this chapter.

SIMULATION BIBLIOGRAPHY

It is hoped that the above comments have pointed out to you that statements such as, "Use a computerized simulation in your course, it's easy," or, "Computerized business simulations don't require any work on the instructors part; they run themselves," are foolish and fall in the same category as the statements: "Look why don't you take our old baby crib? We won't be needing it any more," or, "You'd be crazy not to claim it as a deduction."

It is also hoped, however, that the comments have illustrated that by drawing upon research, careful planning, putting forth some effort, and experimenting, one can incorporate computerized business simulations into a wide variety of courses successfully. Such games can efficiently contribute to learning effectiveness.

As a final attempt to help the reader in the search for appropriate simulations, a list of some of the business games currently on the market is provided in the Appendix. The simulations listed in the Appendix are presented in Table 3-1 according to whether they are of a general management or functional nature and also by whether they are for the mainframe, micro, or both types of computers. A number of these simulations are evaluated in the chapter in this guide by Keys and Biggs.

TABLE 3–1
Computerized Business Games Listed by Author

Mainframe Computer	*Micro Computer*	*Mainframe & Micro Computer*
	General Management Games	
Babb 1979	Aronson, Gekoski 1984	Cotter, Fritzsche 1986
Barton 1974	Cotter, Fritzsche 1985	Edge, Keys, Remus 1985
Darden, Lucas 1969	Cretien, Jennings 1988	Henshaw, Jackson 1986
Eldredge, Bates 1984	Eldredge 1984	Jensen, Cherrington 1984
Frazer, 1975 1977	Funk, Smith 1985	C. Scott, Strickland 1984
Gupta, Hammon 1974	Hinton, Smith 1985	T. Scott, Strickland 1985
Keys, Leftwich 1977	Infoware 1984	J. R. Smith 1987a
McFarlan, McKenney, Seiler 1970	Keys 1988	
Meredith 1977	Jensen (due out) 1989	
Nichols, Schott 1972	Mills, McDowell 1985	
Smith, Estey, Vines 1974	Ness 1987	
Strang, Pray 1981	Penderghast 1988	
Thorelli, Graves 1964	Pettit 1985	
	Pitta, Sewell 1988	
	Priesmeyer 1987	
	Reality Technologies 1986, 1988	
	J. R. Smith 1985	
	Smith, Golden 1987a, 1987b, due out 1989	
	Wilson, Hickman 1982	
	Functional Games	
Boone, Hackleman 1971	Beutell, Schuler 1986	Faria, Nulsen, Roussos 1984
Boone, Kurtz, Braden (due out 1989)	Boudreau, Milkovich 1988	Gitman, Robana, Biggs 1981
Brobst, Bush 1982	Carrell, Smith 1988	Ness, Day 1984
Brooks 1987	Chapman 1988	
Goosen 1973	Cosenza, Boone, Kurtz 1988	
Greenlaw, Frey, Vernon 1979	Cretien 1989	
Greenlaw, Hottenstein 1969	Day, Dalrymple 1985	
Greenlaw, Kniffen 1964	Faria, Dickinson 1987	
Johnson, Hendrick 1984	Fisk, Fisk 1984	
Keiser, Lupul 1977	Galloway, Evans 1987	
	Gates 1986	
	Larreche, Weinstein 1988	
	Low 1985	
	Mason, Perreault 1987	
	Schnaars 1985	
	G. N. Smith 1983	
	J. R. Smith 1987b	
	Sprenger, Werdkamp, Burns 1987a, 1987b	
	Zocco 1987	

With the exception of the Scott and Strickland simulations, the simulations which are usable on both mainframe and microcomputers have the same title and publication date. One additional comment regarding the bibliography is of interest. Five years ago the list would not have included simulations for service industries, whereas today there are an increasing number of such simulations available. Likewise, five years ago there would have been very few games available for the introduction to business course.