BIDSIM: Using a Competitive Bidding Simulation to Highlight Pricing Issues

Article *in* Journal of Marketing Education · August 1983

DOI: 10.1177/027347538300500207 · Source: OAI

2 authors, including:

Gerard J. Tellis
University of Southern California
107 PUBLICATIONS **11,497** CITATIONS

SEE PROFILE

BIDSIM: Using a Competitive Bidding Simulation to Highlight Pricing Issues

George M. Zinkhan and Gerard Tellis

BIDSIM is a case and simulation exercise which is designed to introduce users to important pricing issues such as monitoring competitive activity and drawing up contingency plans. BIDSIM is different from other marketing simulation games in that inputs are very simple and no "black box" is required to process output. Through the dynamics of competitive sealed bidding, BIDSIM is able to create a realistic pricing environment with a minimum knowledge of simulation models. Such simplified simulation exercises may prove to be especially useful to marketing educators who are interested in providing students with hands-on training in the classroom.

Pricing can be a difficult subject to teach. It is both an art and a science (Birnbaum 1981). We have developed a case and simulation exercise, called BIDSIM, which highlights the issues that arise in a special type of pricing situation—sealed-bid pricing. Sealed-bid pricing, or competitive bidding, is especially useful for teaching students about pricing since both qualitative and quantitative techniques are available to aid decision-making.

Marketing textbooks agree that the major factors to consider when making a pricing decision are costs, demand, and pricing strategy used by the competition. The importance of these factors varies, however, under different circumstances. Under sealed-bid pricing it is important to consider costs and demand, but expectations about how competitors will price are especially relevant. Thus BIDSIM is a good vehicle to introduce students to competitive analysis.[1]

The term "competitive bidding" refers to situations in which a buyer asks two or more competing suppliers to submit bids on a proposed purchase or contract. The buyer then makes a purchase from the bidder who offers the best proposal. What is "best" to any given buyer depends on such factors as price, delivery time, reputation for quality of products, or past performance on contracts. Competitive bidding is prevalent in original equipment manufacture and defense contract work (Harper 1966).

Where purchase orders or contracts are awarded largely on the basis of price (when all other factors, such as quality and service, are equal), the low bidder is normally the winner. This is the situation that exists in BIDSIM where the bidder has the problem of trying to submit a bid that will help the firm achieve its objectives, while at the same time trying to beat competing bids. The competing bidders in this game have as their objective to maximize immediate profits—immediate profits being defined as the difference between the bid made and the costs involved in fulfilling the contract (Harper 1966).

BIDSIM COMPARED TO OTHER MARKETING GAMES

The chief advantages of BIDSIM are that it is easy to set up and administer; with a minimum of assumptions and inputs, it creates a highly realistic and dynamic pricing environment; and it highlights multiple pricing issues, many of

George M. Zinkhan is with the Department of Marketing at the University of Houston, Houston, Texas. Gerard Tellis is with the Graduate School of Business Administration, University of Michigan, Ann Arbor, Michigan. The authors would like to thank Keith Cox, Merle Crawford, Chris Hart, Phil Hendrix, and Bill Robinson, whose comments and suggestions made the development of BIDSIM possible.

[1] Instructions for implementing BIDSIM and a more detailed case write-up are available from the second author.

which have implications beyond the situation when sealed bids are used. For example, students learn about the importance of monitoring competitors' activities, about contingency planning, and about the effects of overcapacity in an industry. At the same time, the exercise is not difficult to administer and understand. Unlike other simulation exercises, such as MARKSTRAT (Larreche and Gatignon 1977) or HINESBURY MILLS (Easkin and Montgomery 1975), a complex computer program is not required to process and summarize competitive activity. In other words, there is no black box in BIDSIM; each participant can perform all necessary calculations by hand. In comparison to other marketing games, BIDSIM has the potential for high payoff from a pedagogical point of view; and yet the mechanisms of operation are so simple that a complex computer program is not required to run the game.

OBJECTIVES

BIDSIM can be used as a forum to introduce students to a host of pricing issues. The simulation exercise has been developed to accomplish the following objectives:

1. to make users more aware of some of the qualitative and quantitative techniques available to aid pricing decisions;
2. to give users experience in monitoring competitive behavior;
3. to teach users the importance of contingency planning;
4. to demonstrate the effects that overcapacity can have on an industry;
5. to highlight the nature of competitive situations in terms of mutual interests and cross purposes; and
6. to introduce some legal issues in pricing.

The instructor has the flexibility to pursue only a subset of these objectives rather than attempting to accomplish the full set in a limited amount of time.

THE BIDSIM EXERCISE

A class of students is divided into several teams, each team consisting of approximately three members. The teams act as managers of manufacturing firms; these companies manufacture integrated circuits and compete with one another to win sealed-bid contracts. These integrated circuits are relatively standardized so that quality and service are about equal across the various firms. Since there are few opportunities for competing firms to improve the quality of their product offering, the low bid is usually the winner. Here, firms are pursuing a low-cost strategy rather than a segmentation or differentiation strategy. Thus, the strategic options available to competing firms are limited, but the situation created is realistic and does reflect the pricing constraints that exist in some industries. Specifically, the game is relevant to two types of real-life pricing situations: 1) those occurring in undifferentiated product-markets where competition proceeds primarily on price and 2) those in the post-growth stage of some industry life cycles where, owing to sudden demand or regulation shifts, supply exceeds demand. In both situations, price competition ensues as the basis for retaining customer patronage.

Participants are given information about the integrated circuit business and learn that overcapacity exists in the industry. Under these circumstances, only a few firms are able to win contracts in any given bidding period. Each company is relatively low in cash and, therefore, needs to win some profitable bids in order to remain in business.

The bidding exercise may be used for 12 time periods or a shorter span, if so desired; in each time period, the companies vie with one another to win contracts. Every team starts out with a positive cash balance, fixed costs, committed capacity, uncommitted capacity, and variable cost figures. These amounts vary across the different competitors. The major objective set for the firms is for long-term market position with a good cash balance and a high level of profitability. The immediate objective is to win contracts at a price which will achieve the above long-term objective. The only constraint a firm faces is that it may not carry a negative cash balance; when a negative cash balance occurs, the company is out of business. In a modification of the game, it is possible to contract work out to other companies or to obtain loans from a central bank at variable interest rates. However, all loans must be paid back at the conclusion of the game.

At the start of the BIDSIM exercise, each company establishes certain objectives to accomplish and formally writes out a pricing strategy to follow. At the end of the game, a winning team can be declared using one or more of the following criteria: (1) market share; (2) final return on assets; (3) cumulative return on assets.

The manufacturers differ from one another in terms of capacity, total fixed costs, variable cost per unit, and contractual obligations. At the start of the game, total industry demand is known, but manufacturers have little information about the competition. As the game proceeds it is possible to infer a competitor's fixed cost, variable cost, and pricing strategy. A very important part of this exercise is monitoring a competitor's behavior and adjusting pricing strategy accordingly.

The game is designed to depict a common pattern of industry evolution. When there are many companies and supply exceeds demand, competition is fierce and prices remain low. As some companies are driven out of business by lower prices than what they can support, demand outstrips supply and prices and profits rise.

BIDSIM can be administered in three possible ways. Under the first method, bids are submitted over 12 different class periods (taking five minutes out of each period) and the instructor acts as the controller, selecting the winning bids and making loans where appropriate. Under the second method, the entire game can be completed in one class period as bids are continuously submitted and selected. In this second mode, a team of students acts as the controller, examines the teams' books, and announces the winning bids while the instructor oversees the game. Under a third method, a computer program acts as the controller. This allows the game to be played over the course of the semester or to be played all in one period with each team sitting at a terminal. In both instances, the computer program tracks the cash balances of each team and selects the winning bids. This third mode is undoubtedly more efficient, but, at the same time, less flexible.

All three versions of the game have proven to be successful both at the undergraduate and at the graduate level. Students, however, seem to like the game better if it is played at a more leisurely pace. When BIDSIM is compressed into a shorter time period, an atmosphere approximating that of the Chicago Board of Trade tends to exist. When played over a longer period, users have a greater opportunity to perform detailed supporting analyses, such as probability calculations to summarize competitive behavior.

When the game is administered, one potential problem that can arise concerns participants who are eliminated from the game. Several options exist, and instructors are free to select the option which best suits their particular circumstances.

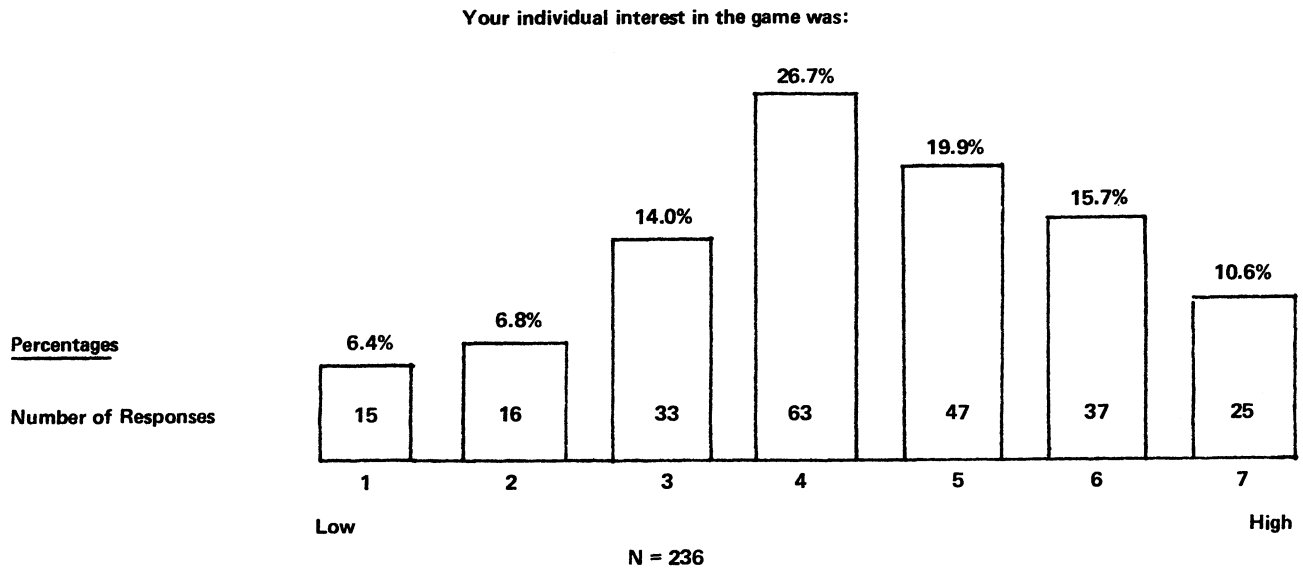
One alternative is to distribute the beginning cash balances so that all firms remain solvent through the course of the game; a drawback associated with this solution is that some of the excitement and dynamism introduced by the overcapacity situation is eliminated. Another alternative involves the incorporation of losing members into the controller group; this works especially well when the instructor acts as controller and allows students to take over complete command of the game's progress. When firms are quickly eliminated, it is sometimes possible to start a new game for the losers; this option is particularly attractive when there are many sections participating. A fourth alternative allows insolvent members to be acquired by or to join with firms that remain solvent. Or, as a final option, those who are eliminated can become observers and be required to work up a group presentation regarding the outcome of the game and its implications. We have found that interest in the game remains high, even among losing team members, and many are eager to see how the game is resolved.

BIDSIM AS A LEARNING EXPERIENCE

BIDSIM, as it simulates a competitive environment, can be a stimulating learning experience for students. In seven different sections, each with a different instructor, questionnaires were distributed at the end of the course to assess the effectiveness of various course activities such as lectures, group projects, term papers, and case discussions. Figure 1 shows a histogram of involvement scores associated with the BIDSIM game. High scores are equivalent to high involvement; and, as Figure 1 shows, BIDSIM receives consistently high ratings. Out of a total of 236 students, only 31 (13.2 percent) rated BIDSIM in the lowest two categories of

FIGURE 1

HISTOGRAM OF INVOLVEMENT RESPONSES[a]



[a]These responses were gathered in seven different sections, each with a different instructor.

involvement. The majority of respondents (72.9 percent) rated BIDSIM at the neutral point or higher in terms of involvement.

It is impossible to assess the relative success of BIDSIM without comparing it to other classroom activities. In this spirit, Table 1 displays the mean interest score for BIDSIM when compared with the mean interest score for all other class activities. As the t-test results show, BIDSIM was significantly more interesting ($p < .01$) than other comparable learning experiences such as lectures, case discussions, and group projects. It is to be expected that playing a game would be perceived as a more interesting activity than listening to lectures, even by good lecturers; but, in this instance, BIDSIM is also able to outperform other participatory activities such as case discussions, group presentations, and role playing.

Of course it is one thing for an exercise to be enjoyable or interesting and quite another thing for the exercise to be a valuable learning experience. Two hundred thirty-five students—members of the same seven sections mentioned above—rated BIDSIM as a learning experience. As shown in Figure 2, the majority of students (55.3 percent) felt that their ability to make

TABLE 1

COMPARATIVE INVOLVEMENT SCORES

	Mean	SD	t-stat	p<[a]
Involvement with BIDSIM (M1)	4.36	1.63	2.66	.01
Mean involvement for other class activities (M2)	3.94	1.71		

[a] The null hypothesis

$$H_0: M_1 - M_2 \leq 0$$

is rejected ($p < .01$); BIDSIM receives higher ratings than other classroom activities.

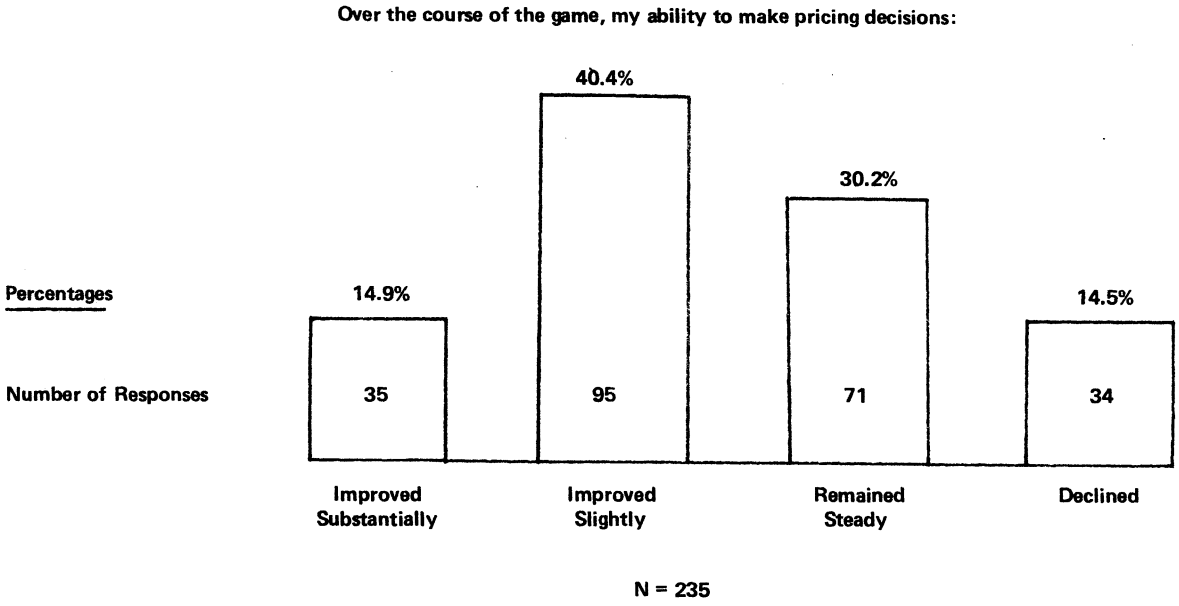
pricing decisions increased over the course of the game. A little less than one third (30.2 percent) thought that their pricing skills remained steady; and a minority (14.5 percent) believed that their skills declined. Overall, then, BIDSIM seems to have provided a valuable learning experience for most students.

COMPETITIVE DIMENSIONS

An interesting feature of BIDSIM is that no two exercises turn out exactly the same.

FIGURE 2

HISTOGRAM OF STUDENT LEARNING[a]



[a]These responses were gathered in seven different sections, each with a different instructor.

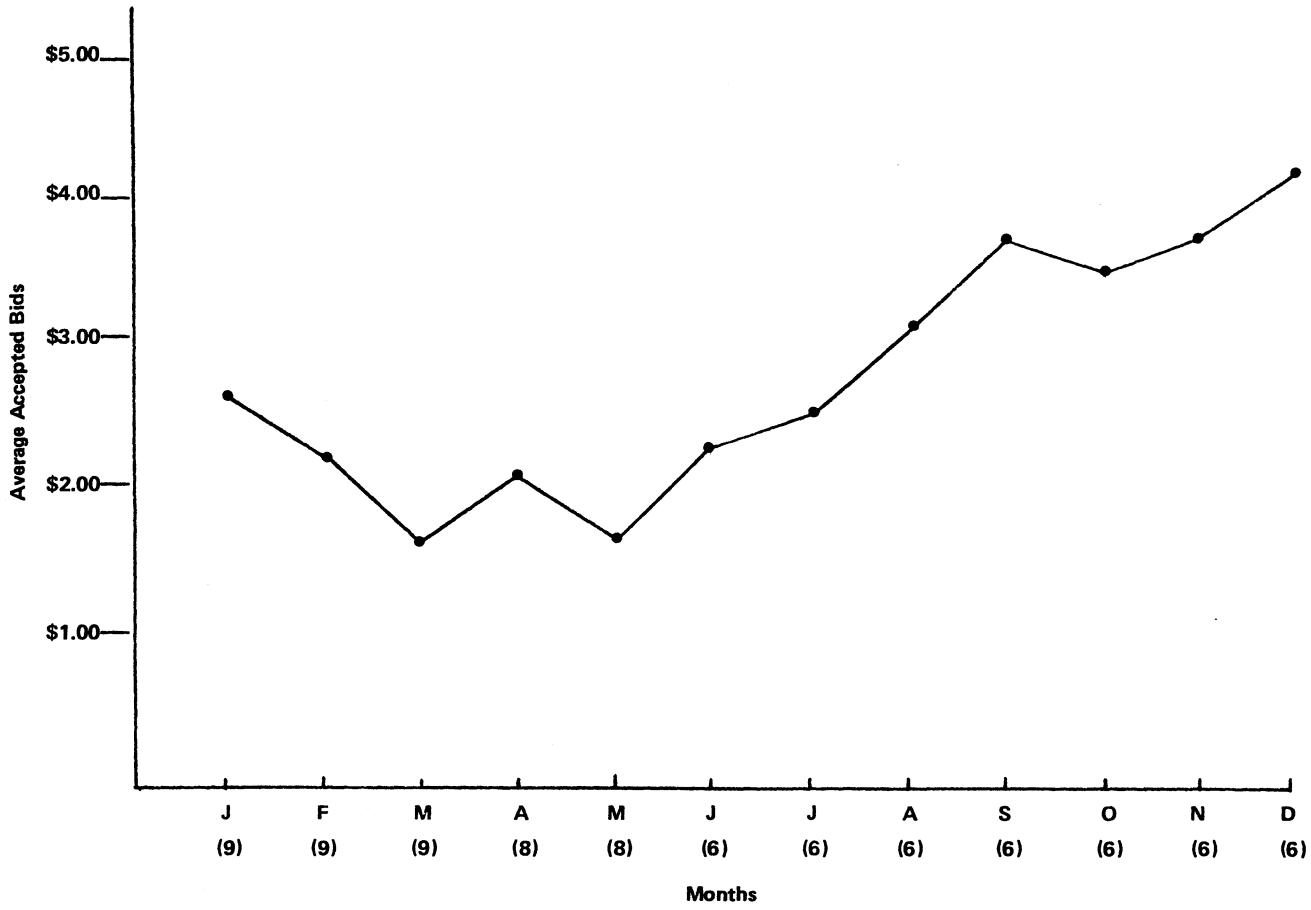
Sometimes all companies manage to remain in business. Other times only a few firms are able to survive, and these reap large profits as supply shrinks. Thus, from the controller's point of view, it is best to keep many firms solvent while continuing to accept low bids. The management teams are in competition with one another for a limited number of customers but, at the same time, share mutual interests. It is good for the industry if prices and profits can be set at high levels; however, there is quite a bit of pressure for one company to undercut an industry price in order to gain business and keep the plant operating at full capacity. Sometimes there are movements to establish cartels, but these usually collapse under their own weight. In addition, the controller is empowered to discipline any instance of price collusion among manufacturers. In this way BIDSIM can be used to highlight some of the legal aspects of pricing.

When there is overcapacity in the industry and when each firm starts out with a limited amount of cash, prices remain low throughout the first few bidding periods. Some firms, unable to win contracts at profitable prices, go out of business and thus ease the overcapacity situation. The survivors usually take advantage of this situation, and several are able to complete the game as profitable, ongoing concerns. Figure 3 presents the average prices which prevailed over the course of one particular game. Such an exhibit, presented at the game's conclusion, provides the students with valuable insights concerning the mechanisms of sealed-bid pricing and industry overcapacity.

As shown in Figure 3, prices start out rather low. The variable costs per unit average $1.00 in the industry, with no firms willing to sell below that cost. However, the full cost (variable and fixed costs) of providing a single unit is approximately $2.00 for the industry. At the start of the game, when competition is fierce and firms fear bankruptcy owing to cash flow problems, some firms are willing to produce below full costs. In this way, Figure 3 can be shown to students to emphasize the points that: (1) firms may be willing to price temporarily below their full cost-floors and (2) sealed-bid pricing is based on expectations about how competitors will price rather than on a rigid relation based on the firm's own costs.

FIGURE 3

AVERAGE ACCEPTED BIDS BY MONTH[a]



[a]Figures in parentheses indicate the number of solvent firms remaining in the industry.

As overcapacity is relieved in the industry and as firms gain experience about their competitors' activity, prices begin to rise in June and July. The industry begins to take on more oligopolistic features, and it becomes more attractive to operate in. It must be emphasized, however, that Figure 3 represents only one possible outcome of the game. Sometimes all firms are able to remain in business and reap substantial profits. Other times, the competition remains fierce and cutthroat throughout. The actual outcome that emerges depends upon: (1) the way that initial conditions are established by the instructor, and (2) the competitive behavior of the participants.

Even though BIDSIM operates through sealed-bid pricing, the type of environment that is created at the start of the game is characteristic of any market where there is free competition. The Chicago Board of Trade has already been mentioned. Another good example is the airlines industry after deregulation. Several companies are in weak financial condition; total demand is relatively fixed; and some firms (e.g., Braniff) are forced out of business through price competition.

As the bidding game proceeds and some firms are eliminated, the industry tends to resemble an oligopoly. However, as long as seven or eight firms remain active, overcapacity continues to be a problem and firms are highly motivated to win contracts by underpricing the competition. Thus, BIDSIM provides insight into the functioning of a free market over a time

period characterized by overcapacity. Through the interplay of market forces and bankruptcies, this oversupply situation is relieved.

Nevertheless, actual closure of firms in the game is not inevitable. It depends very much on the extent to which supply exceeds demand, the level of fixed costs, and the extent to which loans are available at reasonable rates. Indeed, it is advisable that the controller organize the game to retain most of the firms, at least until the last few periods, in order to maximize participation and learning for the students.

Even given the above organization by the instructor, the nature of the ensuing competition is not exactly predictable and depends on the conduct of the teams. Just as in real oligopolistic markets, price setting may be either independent, especially at the beginning of the game, or collusive. Past experience indicates that explicit agreements are difficult with many competitors and break down under pressure even when few firms remain in the industry.

Should a situation arise (because of either closure by firms or the design of the instructor) when demand exceeds supply, then the game provides a good occasion to discuss public policy issues. Will the firms price as high as the trade will bear? Will they sacrifice profits for customer goodwill? Will they forego profits for fear of government intervention? In this way, the legal and ethical issues associated with predatory pricing can be emphasized and discussed at the conclusion of the game.

DISCUSSION

Most competitive situations contain elements of both mutual interest and cross-purpose. This mixture is part of what makes their analysis so challenging (Doty 1974). In the case of BIDSIM, each competitor has some control over the situation, but no single competitor has full control. Some of the control is in the hands of other competitors. At the start, competitors know little about one another. As time passes, however, those companies which survive are able to learn something of the strategy that the competitor is using. When enough information is available about prior bids, then it is possible to estimate a probability mass function to summarize the behavior of an "average" competitor or one competitor in particular. This probability mass function can then be used to suggest the best bid (Friedman 1956).

It is essential for the management team to conduct a cash flow analysis and, if possible, to estimate the cash flow patterns of competitors. Another quantitative technique which is available to aid in price setting is the expected profit criterion whereby a decision-maker can combine the probability of winning a particular bid along with the profitability of that price (Churchman et al. 1957).

Just as in the real world, accurate information about the competition is sometimes difficult to acquire—especially since there can be as many as 10 or 15 competitors in BIDSIM. It is only gradually that information becomes available about competitors' strategies. For this reason, especially at the beginning of the game, quantitative bidding models cannot be very precise and are of limited usefulness to the teams. Decision-makers often do not have accurate estimates of the probability that competitors will make certain bids or of the profits they can expect on given contracts. Since this is the case, qualitative analysis or managerial judgment must be used to set prices.

One of the most important distinctions that can be made about competitive situations is whether the competitors are allowed to communicate explicitly before making their decisions. Under BIDSIM, competitors can communicate to a limited degree through public pronouncements, but they must stop short of price fixing or any binding agreements which specify a mutual course of action. Since the law forbids collusion, tacit communication and politicking are most important. Even though competitors are not allowed to communicate directly, "understandings" sometimes surface. One particularly dominant firm can emerge as a price leader.

SUMMARY

Through quantitative bidding models, qualitative analysis, cash flow calculations, or competitive surveillance, the teams in BIDSIM set prices to place in their sealed envelopes. This variety of methods emphasizes that decision-making in competitive bidding situations is a tricky, delicate, and difficult business. BIDSIM represents a highly realistic environment, and it simulates a type of price setting that is prevalent in both the industrial goods market and in the government sector. In our experience with

BIDSIM at two universities, students enjoy the exercise and rate it highly both in terms of interest and in terms of a successful learning experience. The competition that emerges between teams is usually quite spirited, and we have found that BIDSIM is a good vehicle to introduce students to important pricing issues.

REFERENCES

Birnbaum, Jeffrey H. (1981), "Pricing of Products is Still an Art," *The Wall Street Journal* (November 25), 25, 35.

Churchman, C. West, Russell L. Ackoff and E. Leonard Arnoff (1957), *Introduction to Operations Research*, New York: John Wiley & Sons.

Doty, L. (1974), "Overview of Competitive Situations," Boston, MA: Intercollegiate Case Clearing House.

Easkin and Montgomery (1975), "Hinesbury Mills (A) (B)," in *Cases in Computer and Model Marketing: Data Analysis*, Palo Alto, CA: Scientific Press, pp. 1-28.

Edelman, Franz (1965), "Art and Science of Competitive Bidding," *Harvard Business Review* (July-August).

Friedman, Lawrence (1956), "A Competitive Bidding Strategy," *Operations Research* (February), 104-112.

Harper, Donald V. (1966), *Price, Policy, and Procedure*, New York: Harcourt, Brace and World, Inc., Chapter 5.

Larreche, Jean-Claude and Hubert Gatignon (1977), *Markstrat: A Marketing Strategy Game*, Palo Alto, CA: Scientific Press.