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A ROLE-PLAYING SIMULATION FOR THE PLANNING AND CONTROL OF A MULTIPLE-PRODUCT SALESFORCE

by

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ABSTRACT

A role-playing game was developed to simulate and analyze behavioral decisionmaking in companies which use a multiple-product salesforce. The game was designed as a learning tool to assist players in observing the dynamic interactions of various subgroups within a sales organization over time. Potential players include both managers and students.

The simulation is designed for two players who each act as a compensation planner for one of the two divisions in the company modeled by the game. During each month of the 24-month simulation, each player must determine the commission which will be paid to a sales representative for selling a product from that player's division. The decisions of the other groups in the hypothetical company (salesmen, customers, and the managers who set sales objectives) are modeled using decision rules based on the concept of bounded rationality. The role-playing game therefore differs from classical optimization models which, assume objectively rational behavior and define the optimal solution to a problem in a static situation.

The game was tested in workshops involving managers from the sales organizations of two companies: Data General Corporation and AT & T. The results of both workshops indicate that the game is effective in helping players learn about decisionmaking in a sales organization. The responses of the players also indicated that such a simulation is most effective if it directly resembles the situation faced by managers and their organization.

The first chapter of this thesis compares the role-playing game to several classical optimization models dealing with sales planning and control. Other examples of role-playing games designed as learning tools are also mentioned. Chapter 2 describes the design of the game and the decisionmaking environment it creates. Suggestions for using the game in a sales planning and control workshop are presented in Chapter 3. Results of the field tests at Data General and AT & T are described in Chapter 4. Conclusions and recommendations are presented in Chapter 5.

Thesis Supervisor: John D. W. Morecroft, Associate Professor of Management

Biographical Note

Brilsford Flint was awarded the Master of Science Degree in Management from the Alfred P. Sloan School of Management at MIT in June 1986. His primary areas of study at the Sloan School were Finance and Corporate Strategy & Planning.

Prior to entering the Sloan School in the fall of 1984, Bril was an engineer with Amoco Production Company in Casper, Wyoming. He was awarded the Bachelor of Science Degree in Mechanical Engineering from MIT in May 1983. His undergraduate thesis was titled "Return on Investment Analysis of Cogeneration Systems."

Bril was a 1979 Presidential Scholar, a two-time recipient of the American Gas Association Scholarship, and was also awarded the White Memorial Grant by the National Society of Professional Engineers. He is an associate member of the Research Society of Sigma Xi and a member of the Tau Beta Pi and Pi Tau Sigma honorary engineering societies.

A previous article by Mr. Flint titled "Factors Affecting the Economics of Small, Free-Standing Cogeneration Systems," was published as a Technical Paper by the American Society of Mechanical Engineers in 1984. This paper also appeared in the International Journal of Turbo and Jet Engines.

After obtaining his Master's Degree from the Sloan School, Mr. Flint joined the management consulting firm of Bain & Company as a Consultant in their Boston office.

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Additional thanks go to those individuals at Data General and AT&T who offered their time and comments during my field testing of the role-playing simulation game.

Further inspiration and assistance were provided by Mr. Rationalization, the B-man, Howard, Howard & Dominique, Milo, $, Michael and *Spendthrift*, LS, Towering Pines & Upper World Cup (excellent, GG), Lenox Hill, my tennis game, Betty and her friend, Bobby V's, OPEC, TAB, Team C-E (including Mr. Minitab), DH, golf lessons, SB's, KB (I'll wait), SL, MC (where are you anyway?), Pooter, pH, my friends in Casper, the Adventure in Moving, AM (why?), CC (and where are you?), Doctors Evans and Hewitt, the one and only Nathan, π, William the Musician, Eddie, Boston, and the Citgo Sign.

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Chapter One

Introduction and Background

1.1 Introduction

The study of business management has produced a vast array of models for the purpose of analyzing managerial behavior and decisionmaking. An excellent decision model is often distinguished from a mediocre one by its understandability. Even the most accurate and insightful model of managerial behavior will be of little value if its significance cannot be communicated to the manager whose behavior is being modeled.

In addition to being comprehensible, managerial models should spur further thought and discussion about the organizational structure or managerial issue in question. A decision model should never be viewed as the last word on the situation which the model seeks to simulate or optimize. A good model will often create more questions than it answers. Such a model can serve as an excellent foundation for problem-solving discussions and scenario testing. While models should focus attention on relevant issues, they should not constrain the discussion and thought process of model users. A good balance between focus and flexibility can help to improve managers' understanding of the actual business situation under scrutiny.

One way to create an understandable, flexible model is to develop a role-playing game which simulates some portion of the real life environment which is being analyzed. Such a role-playing game can serve a dual function as both a traditional model for the purposes of policy design and forecasting, and as a learning tool to help communicate the concepts included in the model.

As a learning tool, a role-playing game has a significant advantage over the typical non-interactive, mathematical decision model. The traditional analytic model is usually presented to managers and students in a written report or verbally in the form of a lecture. Even if a lecture takes the form of a "two-way discussion" between the modeler and the manager, the manager is only *hearing a description* of the model, which is itself an abstraction of reality. A role-playing game offers the opportunity for a manager or student to *experience* the model firsthand. This eliminates one level of abstraction and places the manager closer to the reality about which he is trying to learn. A role-playing game can offer an experience which can be more easily be compared to reality, making it that much easier for the manager to comprehend any lessons learned and then apply them to his actual working environment.[1]

In fact, a role-playing game can (and should) be designed to make potential players eager to participate. The concept of a role-playing simulation represents learning by an actual experience, rather than learning by being told. Learning retention is often improved through a direct learning experience.[2]

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1. Katona, George, Organizing and Memorizing, New York: Hafner Publishing Co., 1967, Chapter 4.
2. Ibid.

This thesis describes a specific role-playing simulation developed for the reasons described above. In this case, the game relates to issues in the area of sales planning and control. Specifically, it deals with salesforce compensation and the allocation of sales time to different product lines. The next section of this chapter explains the relationship between this particular role-playing game and some of the traditional decision models previously developed for the study of sales planning and control. The final section of Chapter 1 briefly mentions other role-playing games and computer-based learning tools which can be used to study managerial behavior and decisionmaking.

Chapter 2 describes the specific concepts of sales planning and control which were used in developing the role-playing game. This chapter also explains the nature of the game; including the internal workings of the computer-based, interactive model and the interface presented to players.

Chapter 3 explains the suggested use of the game. The description includes specific instructions on playing the game and also suggestions for making it a part of a workshop pertaining to issues of sales planning and control.

Actual field tests of the role-playing game were made within the sales organizations of two large, technology based companies: Data General and AT & T. The results of these field tests are described in Chapter 4. Conclusions and recommendations for additional work are presented in Chapter 5.

1.2 Review of Decision Models for Sales Planning and Control

Optimization Models

Much of the previous work in the areas of salesforce compensation and time allocation has taken the form of "optimization analysis." For example, Montgomery, et al [3] developed a decision-calculus model to find the optimal allocation of sales effort among multiple products by a salesforce of limited size. Montgomery's model assumes however, that the goals of management and the salespeople are perfectly aligned. In his model, the objective of both groups is to maximize company profits.

Other models have included a divergence between the objectives of management and sales personnel. Farley [4] proved mathematically that the optimal compensation plan for a company is one that pays equal commission rates on the gross margin of all products sold by the salesforce. Under this plan, salesmen attempting to maximize their commission income will also be maximizing their contribution to company profits. The assumption that the primary goal of salesmen is to maximize their income has been questioned however. Other factors, such as the desire for leisure time or the desire to achieve a quota (Winer [5]) have been shown to have an impact on salespeople's objectives.

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3. Montgomery, David B., Alvin Silk, and Carlos Zaragoza, "A Multiple-Product Sales Force Allocation Model," Management Science, Vol. 18, No. 4, Part II, December 1971, pp. 3-24.
4. Farley, John, "An Optimal Plan for Salesmen's Compensation," Journal of Marketing Research, Vol. 1, May 1964, pp. 39-43.
5. Winer, Leon, "The Effect of Product Sales Quotas on Sales Force Productivity," Journal of Marketing Research, Vol. 10, May 1973, pp. 180-183.

Farley and Davis [6] developed a revised model which uses iterative adjustments to commission rates and sales quotas to optimally allocate salesmen's efforts. This process involves input from both management and the salesforce, and recognizes the fact that these two groups may have different goals. It is questionable that in an actual sales organization however, that both groups would be able to acquire all of the information necessary to reach an optimal solution.

Darmon [7] used several different hypotheses concerning salesmen's objectives to develop compensation schemes which would permit profit maximization for a company. Later, Darmon [8] described a model based on a series of linear programs to help find an optimal compensation scheme depending on which one of several personal objectives a company's salesmen are assumed to pursue.

All of the models mentioned so far are static in the sense that they find an optimum solution to a problem for a given set of assumptions. These assumptions involve factors which will change over time in an actual organization however. None of the models deal with the issue of adjustment if the organization is not in equilibrium at the optimal state. Due to changing conditions, the optimal compensation plan or allocation of sales effort will change over time. Clearly, in an actual organization, commissions and time allocation cannot be changed instantaneously. Therefore, it is safe to say that such

6. Davis, Otto, and John Farley, " Allocating Sales Force Effort with Commissions and Quotas," Management Science, Vol. 18, No. 4, Part II, December 1971, pp. 55-63.
7. Darmon, Rene, "Salesman Behavior and Compensation Structure," New Marketing for Social and Economic Processes and Marketing's Contribution to the Firm and to the Society, 1974 Combined Proceedings, Chicago: American Marketing Association, pp. 503-508.
8. Darmon, Rene, "Alternative Models of Salesmen's Response to Financial Incentives," Operational Research Quarterly, Vol. 28, No. 1, i 1977, pp. 37-49.

an organization could very easily be in a non-optimal condition at any point in time.

A Behavioral Model of a Sales Organization

While the static models may define the optimal conditions which a company should strive to achieve, they do not deal with the reality of achieving optimality in a complex organization. Morecroft [9] has developed a behavioral model of a sales organization which provides insight into the interactions among various subunits within the organization. His Salesforce Time Allocation Model uses a set of decision rules to model the behavior of various actors in the organization such as salesmen, managers and customers.

The decision rules used in Morecroft's model are consistent with the theory of "bounded rationality" first proposed by Simon [10] of the Carnegie School. In Simon's words, "The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world, or even for a reasonable approximation to such objective rationality."

These limitations are not only determined by the limits of human thinking but also by the organizational setting in which decisionmaking takes place. The work of Cyert and

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9. Morecroft, John D. W., "A Behavioral Simulation Model of Sales Planning and Control in a Datacommunications Company," Working Paper WP-1761-86, Alfred P. Sloan School of Management, MIT, Cambridge, MA, March 1986.
10. Simon, H. A., "Rationality and Decision Making," Models of Man, New York: John Wiley, 1957, p. 198.

March [11] indicated that decisionmaking in actual companies is in fact much simpler than the behavior anticipated by the classical optimization models that assume objectively rational behavior. Morecroft [12] and Sterman [13] have described the implications of bounded rationality for behavioral modeling. These implications include the limited information-processing capability of humans, who tend to take only a few factors into consideration when making decisions. People often use "rules of thumb," ignoring much of the available information. In addition, limited information-processing capability forces people to divide the task of management into smaller units. For example, companies often factor their decisionmaking by functional department, such as finance, marketing, and production.

The decisions of the managers and policy making units in Morecroft's Salesforce Time Allocation Model (STAM) exhibit the concept of bounded rationality. The model simulates the interaction of these decision makers and shows that the resulting behavior of the organization as a whole may be far from optimal.

Morecroft's STAM also recognizes that the implementation of decisions does not occur instantaneously. The model allows the behavior of the sales organization to be simulated period by period over time. The decision rules used by salespeople and managers in the model can easily be altered to test a variety of scenarios or hypotheses.

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11. Cyert, R. M., and J. G. March, A Behavioral Theory of the Firm, New Jersey: Prentice Hall, 1963.
12. Morecroft, John D.W., "System Dynamics: Portraying Bounded Rationality," OMEGA: The International Journal of Management Science, Vol. 11, No. 2, 1983. pp. 131-142.
13. Sterman, John D., "Behavioral Modeling of the Economic Long Wave," Journal of Economic Behavior and Organization, Vol. 6, 1985, pp. 17-53.

For example, as Farley's optimization model suggested, the behavior of the sales organization could be simulated under the assumption that planners will attempt to adjust commissions to pay equal rates on the basis of gross margin across product lines. The ability to test a wide variety of scenarios makes the Salesforce Time Allocation Model extremely powerful.

The Role-Playing Game

The role-playing game described in this thesis is in fact based on a simplified version of Morecroft's Salesforce Time Allocation Model. The major difference between the STAM and the role-playing game is that in the game, a player assumes the role of one of the managers in the sales organization. In Morecroft's model, the decision rules for all of the managers and salesmen in the organization are specified by the modeler and then simulated by the computer.

The role-playing game complements the Salesforce Time Allocation Model in several important ways. First, it can be used as a learning tool to help managers and students understand the larger, completely automated model, as well as operation of a salesforce in general. Use of the game as part of a workshop on sales planning and control can capture the attention of managers and students, and thereby spur interest in learning more about sales planning and control via the STAM.

Both the role-playing game and the Salesforce Time Allocation Model can be used to test various scenarios of salesforce and management behavior. The role-playing game can also be used to help improve confidence in the decision rule the STAM uses to simulate the behavior of the actual manager. Given similar scenarios, the outcome of the game can be compared to that of the computer simulation to see if the decision rule provides results similar to those produced by the role-player.

In summary, the Salesforce Time Allocation Model and the role-playing game are distinguished from the classical optimization models by their portrayal of the actual behavioral decisionmaking process in an organization. The optimization models assume objectively rational behavior. Morecroft's model and the role-playing game described herein assume decisionmaking based on bounded rationality.

1.3 Examples of Other Role-Playing Games and Computer-Based Learning Tools

There are several examples of role-playing games which have been developed to serve as learning tools. One of these is the Beer Distribution Game developed by Jay Forrester and the MIT System Dynamics Group. As described by Sterman [14], one of the purposes of this game was to allow players to "experience the pressures of playing a role in a complex organization." The Beer Distribution Game is a board-based simulation involving four players. It is particularly useful in demonstrating the problems resulting from information delays in a multiple-level distribution system.

There are also examples of computer-based role-playing games. Sterman and Meadows[15] developed a one-player, computer-based game to illustrate how macroeconomic behavior is influenced by capital investment. In this simulation, the player manages the capital producing sector of the economy. Meadows [16] also designed a game dealing with the allocation of resources in developing countries.

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14. Sterman, John D., "Instructions for Running the Beer Distribution Game," System Dynamics Group Memo D3679, MIT, Cambridge, MA, Oct. 1984.
15. Meadows, Dennis and John D. Sterman, "Stratagem-2: A Microcomputer Simulation Game of the Kondratiev Cycle," Simulation and Games, Vol. 16, No. 2, June 1985, pp. 174-202.
16. Meadows, Dennis, "STRATAGEM-1: A Resource Planning Game," Environmental Education Report and Newsletter, Vol. 14, No. 2, 1985, pp. 9-13.

Use of computer based teaching models extends beyond decisionmaking in a business or economic context. Kreutzer [17] has developed a computer-based workshop dealing with arms races and decisionmaking behavior in a political situation.

All of these games and learning tools provide insight into the difficulty of managing complex organizations which include several decisionmakers and policy making groups with divided responsibilities, conflicting goals, and limited information. They are all descriptive in the sense that they attempt to model decisionmaking as it actually is. This is in contrast to normative models which describe what behavior would be optimal under a given set of assumptions.

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17. Kreutzer, David P., "A Microcomputer Workshop Exploring the Dynamics of Arms Races," System Dynamics Group Memo D-3689-1, MIT, Cambridge, MA, 1985.

Chapter Two

Design of the Role-Playing Game

2.1 Major Actors and Policy Decisions

As an initial step in designing the role-playing simulation, it was necessary to identify both the principal decision makers in an actual sales organization and the types of policy decisions that they make. The responsibilities, goals, and incentives of the managers in such an organization must be considered in order to understand the logic behind their decisions. Observing their use of available information is also crucial in understanding the actions that they take.

This section will briefly describe the way in which several of the key policy making units within a sales organization operate. The specific titles of individual managers and their exact duties may vary from organization to organization, but the descriptions that follow include concepts which should be common to most, if not all sales organizations.[1]

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1. Please note that the descriptions in this section are based directly on those given in Morecroft, John D. W., "A Behavioral Simulation Model of Sales Planning and Control in a Datacommunications Company," Working Paper WP-1761-86, Alfred P. Sloan School of Management, MIT, Cambridge, MA, March 1986.

Salesforce

In an organization where the salesforce sells a variety of product lines, the salespeople must make a decision as to how much of their time to devote to each product. Consider the simple case where a salesman must split his effort between two types of products. Assuming the salesman prefers more commission income to less, he will adjust his allocation of sales effort depending on the relative commision he receives for each product and on the average amount of time it takes him to sell each type of product. Knowing the commissions and the times per sale, the salesman can compare his payoff in terms of 'commission per hour of sales effort' for each product line.

At any point in time however, just because one product may have a higher relative commission per hour of sales effort than another, a salesman will not spend all of his time selling that product. The compensation scheme may change as often as every month and the sales representatives will have a variety of ongoing contacts which they will find advantageous to maintain. Their time allocation will therefore change gradually if a commission imbalance exists. In addition, product prices relative to the competition and the delivery times for products will change. This will affect the amount of time a sales representative needs to sell a particular product. This too will cause variations in the expected commission per hour of sales effort.

In summary, the allocation of sales effort is a dynamic process which is likely to change over time. Salespeople will make frequent adjustments in the allocation of their time depending upon which product line, in their judgement, will give them the biggest payoff. The salesmen's decision concerning the allocation of their sales time is depicted in Figure 2-1.

Figure 2-1: Salesforce Time Allocation

Compensation Planning

Compensation planners occupy an intermediate position between the sales objectives set by the company and the salesforce. They attempt to establish a compensation scheme (often based on some sort of commission or bonus system) which will induce the salesforce to achieve the sales objective.

One measurement which has a strong influence on the compensation level set by compensation planners is the salesforce's performance against sales objective. For example, if sales for a particular product are below the corporate sales objective, the compensation planner will probably increase the commission rate for this product line in an attempt to attract a higher proportion of sales effort from the salesforce. If sales exceed the objective, there will be pressure to maintain or even reduce compensation. However, resistance from the salesforce may inhibit the compensation planner from reducing the commission rate. In practice therefore, it is often easier to increase commission rates than to reduce them.

Figure 2-2 provides a pictoral representation of the compensation planner's decision.

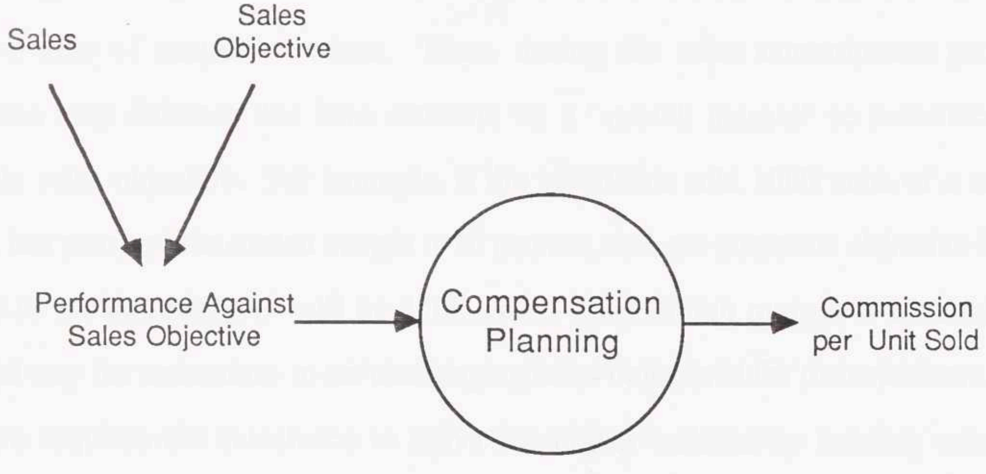

Figure 2-2: Compensation Planning

<u>Sales Objective</u>

The sales objective is the result of a business planning procedure which consolidates information and judgement from market analysts, the salesforce, product managers, and manufacturing planners. This process ususally begins with an estimate of total industry volume for each type of product. Using historical data and various business assumptions (such as new product introductions, price changes, expected delivery intervals and expected competitor strategies), market analysts make an estimate of the company's expected share of industry sales in each product line. Multiplying the expected share by the estimated industry volume produces the company's sales forecast by product line over the current planning horizon.

Because managers often find it difficult to integrate information from so many sources however, the recent history of customer orders often plays a dominant role in determining sales objectives. Planners compute a base estimate of demand using last year's volume of customer orders. Then, during the sales commitment process, executives may increase this base estimate by a "stretch margin" to determine the corporate sales objective. For example, if the salesforce sold 1000 units of a certain product last year and the stretch margin is 10 percent, then the corporate objective for the product in the coming year will be 1100 units. The stretch margin is a simple but powerful way for executives to set challenging sales objectives for the salesforce. The objective requires the salesforce to strive for higher volume by holding salesmen accountable for an objective which is higher than last period's sales.

Performance against the sales objective will be monitored in the coming period by comparing the sales-to-date with the sales objective which was established at the beginning of the period. (As already mentioned, the compensation planner uses this measurement in making adjustments to the commission rates.) The decision policy for establishing the sales objective is represented in Figure 2-3.

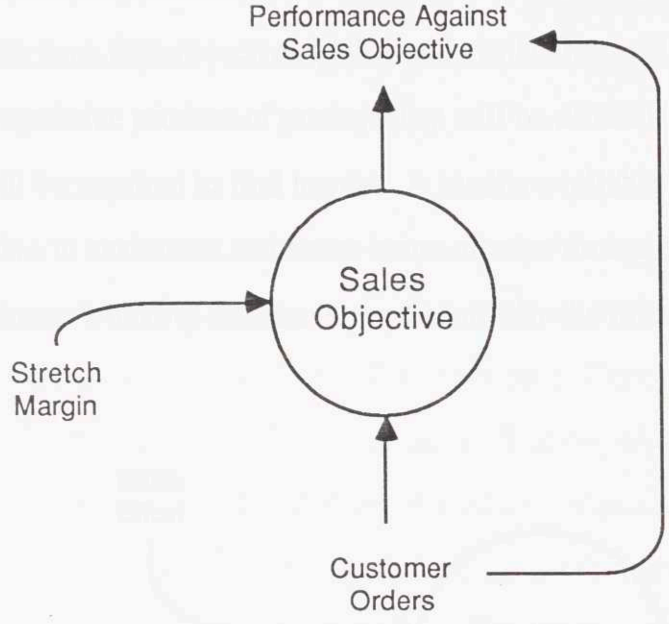

Figure 2-3: Sales Objective

Customer Ordering

A customer's decision to order a company's product is largely dependent on such factors as price / performance ratio, availability, and quality relative to the competitors' products.

However, another principal factor which must be considered is the sales effort put forth by the company's salesforce. Especially for complicated and expensive products, personal interaction between a salesman and the customer plays a major role in the customer's decision to buy. In many cases, the customer may not be aware of a product's existence or of its most basic features before a sales representative approaches him. In such instances, the customer's decision is obviously influenced by the amount of time a salesperson spends in describing the product. Once the customer understands the nature of the item, factors such as quality and availability will become important. For example, an expensive product of poor quality will be difficult to sell. A great deal of sales effort will be required to find buyers. A readily available product of high quality will be attractive to customers and fewer hours of sales time will be required to make a sale. The customer's buying decision is represented by the information flows shown in Figure 2-4.

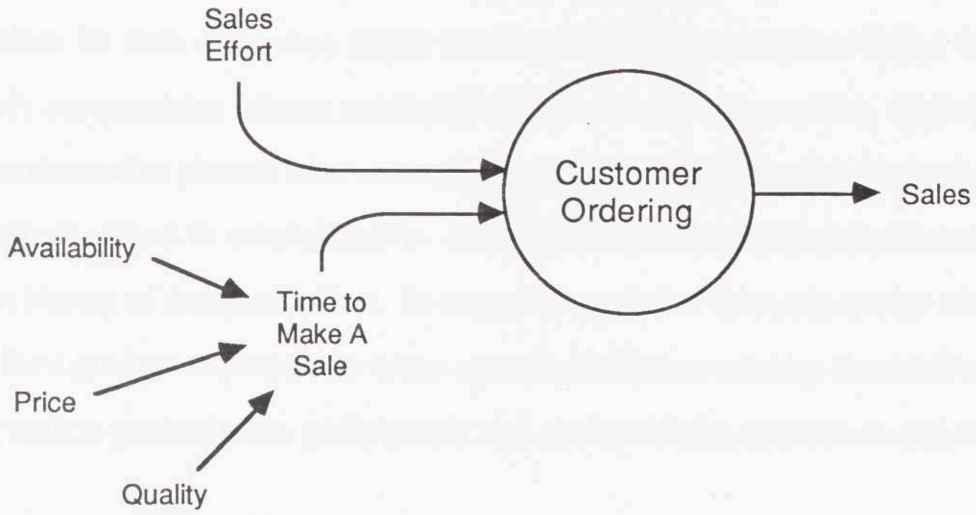

Figure 2-4: Customer Ordering

The Entire Feedback Structure

The decisionmaking components just described can be pieced together to show how an entire sales organization functions. Before being shown such a diagram, game players should be encouraged to try joining the components together for themselves. This will force them to think about the interactions among various groups and managers within an organization and how information flows among the various decisionmaking units.

One way to visualize a sales organization using the decisionmaking components described above is shown in Figure 2-5. This diagram models a company with two divisions (A and B), each producing a different product. They share a salesforce which must allocate a limited amount of time between each division's product. The salesforce determines its time allocation based on the relative commission offered by each division's compensation scheme and the time it takes to sell each product. Each division has a compensation planner who varies the commission rate depending on the division's performance against its sales objective. Sales objectives are in large part determined by the past history of customer orders. In any given period of time, the market will place orders for a product in proportion to the amount of effort exerted by the salesforce and factors such as product price, performance, and quality relative to those of competitors.

As indicated in the diagram, the flow of events generates a negative (or goal seeking) feedback loop in each division. The goal seeking behavior can be understood with the following thought experiment. Consider the loop for Division A in Figure 2-5 and ignore for the moment any changes which would be made in the Division B loop. Suppose that the system is in equilibrium, meaning that at the current level of commissions, there is a constant sales rate which equals the sales objective. Now consider what would happen if the commission rate in Division A was decreased. The salesforce would find this division's product less attractive to sell and would

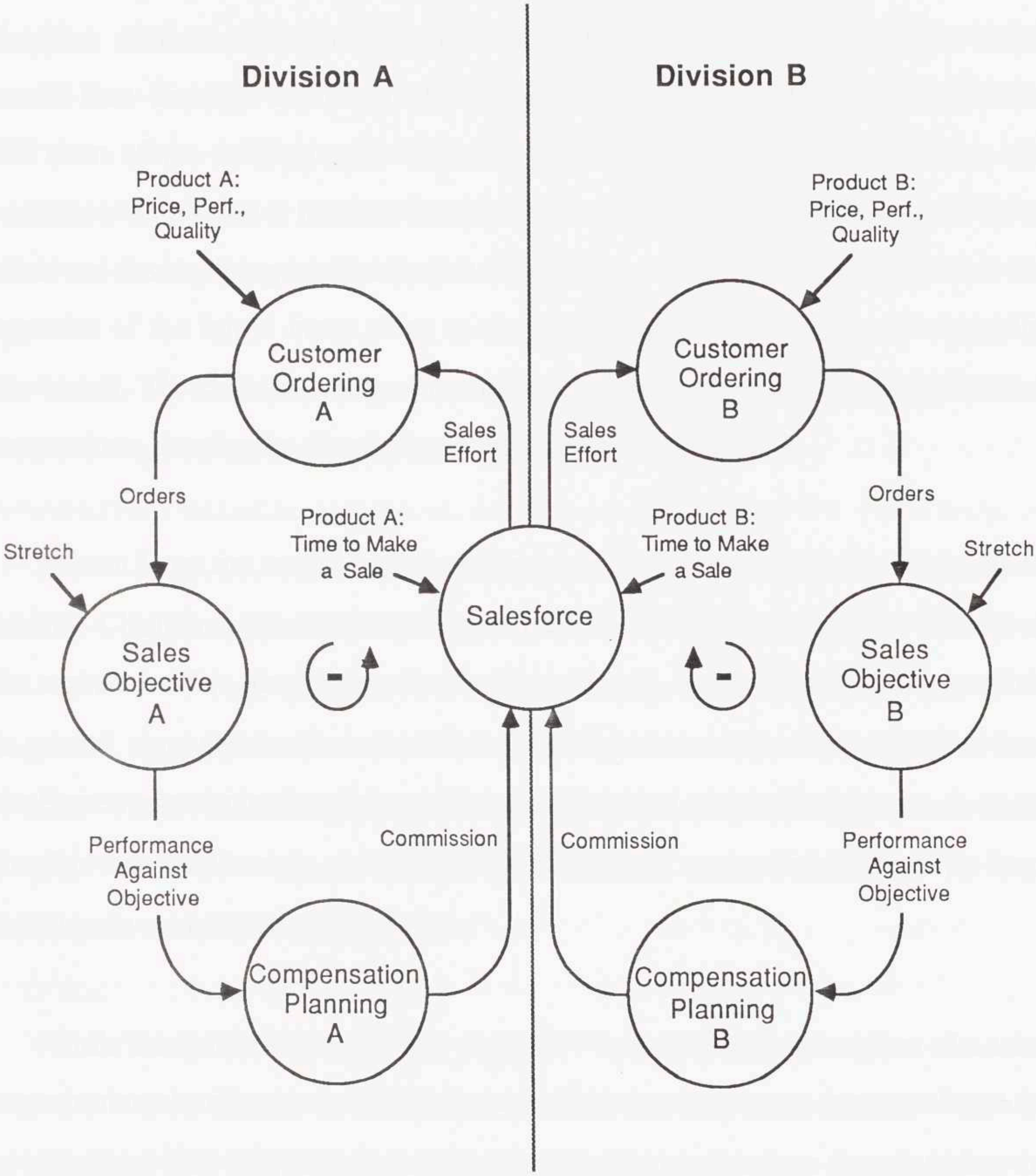

Figure 2-5: Feedback Structure of a Multiple-Product Salesforce

therefore decrease the sales effort devoted to Division A's product. Customer orders would then decrease as a result of the reduced sales effort. Actual sales would then fall short of the existing sales objective. The shortfall would tend to force the compensation planner to increase the commission rate in an effort to attract more sales effort and thereby bring sales back up to the objective. Note that this adjustment is the opposite of the initial input given to the system (the commission was originally decreased). The Division A loop of the system is attempting to return to its equilibrium state and can therefore be described as a "goal seeking" structure.

If both loops are considered, the behavior of the entire system is not as easy to predict. Changes in one division will clearly affect the other by causing the fraction of the total sales effort devoted to each division to change. It is possible however, to think in general terms about various scenarios which might occur. Given that salesforce time is a limited resource in this system, it is conceivable that a competition between divisions for that time could erupt. A bidding war would then occur, characterized by large increases in commission rates over time.

While the system represented in Figure 2-5 is a simplified description of a sales organization, the diagram does include some of the most important features of such an organization. The simplicity should be considered as an advantage since it makes the model "generic" in the sense that it can be used to describe a very general class of sales organization. By making additions to this basic structure, one could model most organizations which use a shared salesforce in this manner.

2.2 Decisionmaking Environment

In order for a role-playing game to be both realistic and effective as a learning tool, the environment created by the game must replicate the conditions which would be experienced in the actual organization. This section describes how the decisionmaking environment of the role-playing game was designed in an effort to approximate the actual conditions found in a sales organization.

The Game Structure

The role-playing game was designed using the basic structure shown in Figure 2-5. Conceivably, a game could be designed around any of the 'actors' in the system: salesmen, compensation planners, customers, or the managers responsible for developing sales objectives. I chose to develop a two-player game in which each player assumes the role of a division compensation planner. A two-player game seemed appropriate to demonstrate the potential competition for salesforce time which might arise in an organization where two or more divisions share a salesforce.

The two players using the game make decisions based on the information they receive and the goals that they are trying to accomplish. The decisions and actions of the other groups depicted in Figure 2-5 are simulated by a computer program. Alternatively, the role-playing simulation could have been constructed using a board game. After making their decisions, the players would have then followed a set of instructions to calculate the actions of the other groups in the sales organization. However, by using a computer to make these calculations, the players are free to concentrate on their own decisions. Use of the computer also speeds up the game and eliminates the drudgery of performing the same calculations after each decision in the game. Performing these calculations by hand could have detracted from the learning experience of the simulation.

It would also be possible to design a similar game for one player by automating the decisions of one of the compensation planners. However, I felt that having an actual, identifiable counterpart acting as the other compensation planner makes the game more realistic for players. A one-player, computer-based game could tend to create a somewhat sterile environment for the simulation.

The Two Divisions

The two divisions in the game have been given slightly different characteristics. Division A can also be referred to as the "Small Systems Division," while Division B is also called the "Large Systems Division." As in an actual company, these divisions produce different products for different purposes. For example, in a computer company, the Small Systems Division (A) might produce personal desktop computers selling for $1000. The Large Systems Division (B) might produce an interconnected network of 2 or 3 engineering workstations selling for $5000. Alternatively, in a manufacturing company, the Large Systems Division might be thought of as producing flexible, multiple-tool machining stations while the Small Systems Division would sell a small, individual drill press.

Larger systems will in general take more hours of sales time to sell. In the game, it is assumed that on average, it takes five times as long to sell a large system as it does to sell a small system. For simplicity, the initial equilibrium for commission rates also exhibits a five-to-one ratio. The commission for the large sytems is five times the commission for small systems. Under these conditions, a salesman would receive the same payoff per hour on average by selling either product. Given these circumstances, salesmen will be indifferent and will not change their current allocation of sales time among the two products. Starting from an equilibrium condition allows players to learn the protocol of the game before a "problem situation" is encountered.

The Players' Decision

The game simulation lasts 24 months. Each month, both players, acting as the compensation planners of their respective divisions, must determine the commission which will be paid to a salesperson for selling each division's product. Players may raise, lower or maintain their commission rate as they see fit.

Although the term "commission" is used in the game, players may think of this decision variable as any type of incentive compensation which might be used. For example, some companies give salespeople points for each sale completed. At year end, these points are used to compute an end-of-year bonus. Other companies give special prizes such as trips or vacation credits. The "commission" used in the game can be considered as a proxy for any of these incentives.

Information Provided to the Players

Every period during the game, the computer displays information for use by the players. The computer provides a screen of data for each division in succession. The information which is shown was selected in an attempt to duplicate the most important data which a compensation planner would have available in an actual sales organization. Figure 2-6 shows how the information for Division A would be presented to players during the game. A similar screen is also shown for Division B in each period.

Figure 2-6 shows the status of Division A at the end of Period 7 during a hypothetical game. Sales figures, sales objectives, commission rates, and salesforce satisfaction for the past two periods (periods 6 and 7 in this case) are shown. Providing data from only the past two periods of the game is a conscious effort to model the use of information in an actual firm. In most companies, there is a strong reliance on the most recent data. In the game, players must record the information for later use if they wish to track any long term trends or cycles. As in a real organization, effort must be expended if information is to be stored for later use. Players are not provided with a formal record sheet for recording data, but many players do choose to write down information as the game proceeds.

Salesforce satisfaction is the only variable which has not been discussed. In the game this variable will be either a "+" or a "-", depending on the change in the commission rate in the last period. An increase in commissions would certainly please salesmen in an actual firm. In the game, the player is reminded of this positive effect by seeing a "+" in the row denoting salesforce satisfaction. Decreasing the commission level might tend to discourage salesmen and could conceivably result in a decline in productivity. Including the salesforce satisfaction variable in the game is intended to remind players that in an actual company, their decisions would have a definite impact

DIVISION A - Small Systems

Score:

Sales Exp. / Rev. 10.8%
Sales / Objective 112.8%

	PERIOD		
	6	7	8
SALES	744	765	
SALES OBJECTIVE	603	627	650
COMMISSION / UNIT SOLD	111	115	
SALESFORCE SATISFACTION	+	+	

Figure 2-6: Status Screen for Division A at End of Period 7

on salesforce morale.

The player's are also shown the division's sales objective for the coming period (period 8 in the example shown). Based on the past performance against sales objective, player A must decide how to adjust Division A's commission level in an attempt to induce the salesforce to meet the objective. Motivation to do so is given by the "Score" which is also shown in Figure 2-6. Two measures of player performance are given: sales expense as a percentage of revenue and sales as a percentage of the sales objective. Both of these measures were actually used as performance indicators in the companies where the role-playing game was tested. Both scores are calculated as six-month moving averages. Six-months is a relatively short time reflecting the conditions generally found in actual firms. Long-term measures are rarely used in performance evaluations. Therefore, there is often pressure to produce immediate short-term results.[2]

The two scores can provide conflicting motivations. A high expense-to-revenue ratio indicates that commissions may be too large. This provides pressure for the player to reduce the commmission level. However, if sales are falling short of the division sales objective, there will be pressure to increase commissions in an effort to attract a greater proportion of the total sales effort. In actual companies, performance is often based on a combination of such offsetting goals. The player is forced to balance the two objectives in the game just as an actual compensation planner would do in a firm.

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2. For a general discussion of the emphasis on short-term results, see Forrester, Jay, Industrial Dynamics, Cambridge, Ma: The MIT Press, 1961, p. 8.

Both players are allowed to see the data from both divisions before making their decisions. This seems realistic in the sense that within a company, sales figures for all divisions would probably be reported throughout the firm.[3]

Company and Player Goals

As the preceding description of the game environment indicates, the objectives of each player and of their "company" are not aligned in the role-playing game. This is typically the case in most organizations. It is almost impossible to make the objectives of all employees match those of the company.[4,5]

Even though the two players in the game work for the same company, they are likely to feel competition with each other. In a real organization, this competition clearly exists as well. Managers will often be competing for a limited number of promotions to the next level within the company. In the game and in reality, this competition can produce results detrimental to the company. For example, as mentioned earlier, pressure to meet sales objectives can lead to a competition for salesforce time. Commissions will then be bid up to a level above that otherwise necessary for the company to achieve a given level of sales revenue.

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3. The limitations of the computer program prevent both players' decisions concerning next period's commission rates from being entered simultaneously. In an actual company organized in a manner similar to that in the game, decisions from both compensation planners would probably be due at the same time. This can be duplicated in the game environment by having both players review the data from both divisions, and then having them secretly write down their decisions at the same time, before entering them into the computer.
4. Vancil, Richard F.,"What Kind of Management Control Do You Need?" Harvard Business Review, March-April 1973, pp. 75-86.
5. Lyneis, James M., Corporate Planning and Policy Design: A System Dynamics Approach, Cambridge, Ma: The MIT Press, 1980, pp. 5-6, 19-20.

2.3 Description of the Personal Computer Model

This section describes the micro-computer based program used to create the role-playing game. The simulation was designed on an IBM PC using the macro programming capabilities of Lotus 1-2-3. Although 1-2-3 does not present an extremely flexible programming environment, it was chosen for several reasons. First, the IBM PC and Lotus 1-2-3 dominate the business computing market. A large number of managers in many companies (and the author) are familiar with 1-2-3. This familiarity makes it easier to make use of the game in a variety of locations with the greatest chance that a compatible computer will be available to run the simulation.

Second, even though 1-2-3's programming features are limited, the structure of the game is simple enough to be implemented using 1-2-3. In addition, 1-2-3 has a useful graphics capability which is used at the end of the game to show the behavior of the players and their imaginary company over the course of the game.

Finally, the features of 1-2-3 make it relatively easy to create different scenarios for the game. Parameters may be altered directly in the spreadsheet to present players with different situations. This flexibility allows the game to be tailored for players in a particular company for example. The game then provides a more realistic simulation. A high degree of familiarity with the game spreadsheet is required before these modifications can be made however.

Full documentation of the Lotus 1-2-3 spreadsheet is given in the Appendix. There are four main components of the spreadsheet: the game introduction, the player interface, the calculation table, and the macro program which drives the game. Each of these will be described separately. An entire cell by cell listing of the spreadsheet is presented in Appendix E.

The Game Introduction

After the game spreadsheet is loaded into the Lotus 1-2-3 environment [6], the players see the game introduction. It consists of five screens of text (see Appendix A) which describe the game and the scenario in which the players will be making their decisions. It includes a description of the information which players will receive throughout the game, a summary of how the other groups in the organization (salesmen, customers and the managers who set sales objectives) make their decisions, and a description of the two measures used to evaluate the performance of each player.

The Player Interface

An example of the information presented to players was shown in Figure 2-6. The spreadsheet macro updates each division's information screen every period. Instructions telling the players to review the data and then enter their decisions are also displayed on the screens at the appropriate times. (See Appendix B.)

At the end of the game, the players are given their final performance measures (expense-to-revenue ratio and sales-to-objective ratio) and a menu of graphs which they may view. These graphs are produced on the screen by the spreadsheet macro using the

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6. The game spreadsheet file is approximately 25 kilobytes in size.

1-2-3 graphics capability. Using these graphs, players can compare the sales of each division over the entire length of the game, or their individual division's sales plotted with their sales objective over time. Commissions paid by the two compensation planners over the course of the game can also be compared visually. Examples of these graphs are shown in Chapters 3 and 4.

Calculation Table

This table of data is never seen by the players during the game, but all of the calculations are made and stored in this area of the spreadsheet. Each period, the players' new commission entries are transferred to this area. Calculations to determine that period's sales, the new sales objectives, salesforce satisfaction and the player performance measures are then made. Detailed listings of all the equations are presented in Appendix C.

The Spreadsheet Macro

This program drives the operation of the spreadsheet. After the players enter their commissions each period, the macro transfers the entries to the calculation table area of the spreadsheet and commands the calculations for that period to take place. Once they are completed, the macro updates the information presented to the players by transfering the appropriate data from the calculation table to the user interface area of the spreadsheet. The next entries are then requested from the players.

The macro also includes commands to create the graphs which players may view at the end of the simulation. Players view the graphs of their choice by simply hitting the appropriate keys as instructed. The macro program is listed in Appendix D.

Chapter Three

Use of The Game

This chapter contains suggestions and recommendations on how the role-playing game can be used as a learning tool. The first section presents a framework for using the game as part of a workshop dealing with salesforce planning and control. Specific instructions for running the game itself are presented in Section 3.2 . The final section of this chapter discusses several of the key points which should be included in a post-game debriefing session.

3.1 A Workshop for Sales Planning and Control

An effective way to use the role-playing game is to make it part of a structured workshop dealing with the planning and control of a multiple-product salesforce. A workshop will improve the likelihood that participants will come away having learned some definite lessons which they can apply in their own workplace or educational environment.

A good way to begin would be to have participants read pages 17 to 23 of Chapter 2, which discuss the major actors and policy making units within a sales organization.

Before being shown the remainder of Section 2.1, which is the subsection entitled "The Entire Feedback Structure," participants should be encouraged to conceptualize and define how they think the various subunits would be interconnected in an actual organization. Such a discussion would present an opportunity for various participants to provide their views on the workings of a sales organization. This exchange of ideas could be especially effective if the participants come from various groups within a sales organization. Such a discussion can make workshop participants realize that people from different groups within an organization have entirely different perceptions of how the organization operates.

The feedback structure shown in Figure 2-5 and the accompanying pages of text (pages 24-26) titled "The Entire Feedback Strucure," should then be presented to participants. It should be pointed out that Figure 2-5 is not the only right answer when it comes to connecting the various decision units. Workshop participants may have come up with very different, but valid models. Figure 2-5 can provide a common ground for discussion however.

If the participants are from an actual company, Figure 2-5 may or may not accurately model the functioning of the company's sales organization. There will most probably be some similarities however. Even if there are differences, this representation should be able to provide new insight and learning into the operation of any company's sales organization.

A discussion of the pros and cons of the model depicted in Figure 2-5 could then be followed by some hypotheses concerning the behavior of the model under various circumstances. A good lead-in to the game would be to discuss the scenario which the game creates: Given that the organization is initially in equilibrium, what will occur if the sales objective for one of the divisions is suddenly increased by 10 percent? The role-playing game offers workshop participants the chance to create a simulation of this scenario.

At least two players are needed to play the game. One becomes the compensation planner for Division A. The other assumes this role for Division B. It is also interesting to have teams of two or more participants filling each role. This can add to the enjoyment of the game and promote some interesting interaction among the various players. The game itself takes approximately 20 to 30 minutes to play.

After the game is played, participants should then be encouraged to view and discuss the graphs produced by the game spreadsheet. These graphs can be used as a basis for discussion in the post-game debriefing session described in the final section of this chapter.

After these discussions, the game could be played again if there is interest in trying out suggestions for improving the behavior of the role-players' imaginary company. If someone has a detailed knowledge of the game's structure, different scenarios could be produced by varying some of the parameters in the spreadsheet.

Approximately 2-3 hours are needed to conduct the type of workshop just described. An IBM personal computer or compatible machine, Lotus 1-2-3 software, and a diskette containing the game spreadsheet are needed to conduct the role-playing game.

3.2 Protocol for Playing the Game

The actual play of the game is described in this section. After Lotus 1-2-3 has been loaded into the IBM PC or a compatible machine, the file containing the game can be retrieved from the game diskette. Players will then have an opportunity to read the introductory text included in the game spreadsheet.

After reading the introductory material, players are instructed to press the "Home" key on the keyboard. This moves the cursor to the player interface area of the spreadsheet. The Division A status screen will be shown on the computer monitor at this point. The screen will also be showing an instruction to press the "Alt" and "Q" keys simultaneously to start the game. At this command, the spreadsheet macro is invoked. It initializes the game by putting the appropriate information in each division's status area of the worksheet.

After this is done, Division B's status will be shown on the screen. There will also be instructions for both players to view the data on the screen, then press the return key to view Division A's status. After reviewing the status of both divisions, each player should make his decision concerning next period's commission rate for his division. Both players should write down these decisions. The screen will instruct player A to enter Division A's commission rate for next period into the computer and press the return key. Player B will then be instructed to do the same. The spreadsheet macro then proceeds to do the necessary calculations and update the division status screens in the worksheet. The next period arrives and players are again instructed to review both divisions updated status, make their decisions and then enter the new commission rates.

Until the third period of the game, the organization is intended to be in equilibrium. Sales for both divisions match the sales objectives. Through the first two periods, players should enter the same commission rates indicated for Period 0. These initial periods are designed to acquaint players with the protocol of the game.

In Period 3, the sales objective for Division A is increased by 10 percent. This is the only exogenous change made during the game. After this period, the sales objective will always be a six-month moving average of past sales for each division (including the effect of the 10% step input). When Division A's objective is suddenly increased in Period 3, the players will have to decide if and how to adjust their commissions to cope with the change.

Players should be allowed to make their decisions as they see fit during the remainder of the game. Although the idea of collusion should not be mentioned to players before or during the game, they should not be prevented from colluding if the idea occurs to them. In an actual organization, collusion would be possible and would probably be advantageous from the company's viewpoint. Collusion did in fact occur during several of the game tests involving students from the Sloan School. Collusion does not guarantee a quick return to equilibrium however. This takes several periods to achieve. Agreements between players were sometimes broken as pressure to raise or lower commissions tempted them to change their commission rates.

After commissions are entered for Period 24, the game ends. The final performance measures appear on the computer screen, along with a menu of graphs which the player may view. Pressing the "Alt" key and the appropriate letter will create these graphs:

Press "Alt" and:	to Graph:
S	Sales of Divisions A and B
C	Commissions of Div. A and B
N	Normalized Commissions
A	A: Sales and Objectives
B	B: Sales and Objectives

The only graph which may not be self-explanatory is the plot of normalized commissions. For each division, each period's commission rate set by the role-player is divided by the initial equilibrium commission used at the beginning of the game. The normalized commissions for both divisions can then be plotted on the same scale and will allow an easy comparison between the commissions paid by the two players.

3.3 Post-Game Debriefing

Following the playing of the simulation, a debriefing session should be conducted to discuss the results of the game. The graphs provided by the 1-2-3 spreadsheet can be very helpful during this discussion. Graphs from an actual game are shown in this section.

Sales

Several interesting effects can normally be observed by looking at the graph showing the sales of Divisions A and B over time. As shown in Figure 3-1, role-players typically produce fluctuating sales over the course of the game. Players should be asked how other groups within the company, particularly the manufacturing department, would view these oscillations. Production managers dislike fluctuating demand. Their costs are generally minimized when a constant production level can be maintained. Widely fluctuating sales can necessitate maintaining larger inventories. For expensive products, the extra inventory carrying costs would be substantial.

It should also be pointed out to the players that they are responsible for generating any oscillatory behavior that occurred during the game. In most firms, there is a tendency to blame "business cycles" on customer buying patterns or the economy in general. In the game, customers are passive in the sense they will buy as little or as much of a product as the salesforce wants to sell. Their buying is directly related to the amount of sales effort exerted on behalf of a particular product. Therefore, as the results of the role-playing game typically show, oscillations in sales can be generated by the internal operations of the company itself. A one-time increase in the sales objective was the only exogenous change made to the system. Any oscillations are produced by the decisions of the role-players.

The size of the fluctuations in Division B's sales rate will be smaller than those of Division A. The difference is the result of the game scenario and is not due to differences in player skill. Since the total available sales effort is constant and it takes five times as long for a salesman to sell a product from Division B, small changes in Division B's sales rate will result in much larger changes in Division A's sales rate. The behavior of Division B will therefore appear more stable. This relative stability has significant implications as far as performance evaluations in an actual company are concerned. The manager of a Division similar to B will have an easier time making his division look like it is performing consistently. The inherently more volatile nature of Division A puts its manager at a disadvantage in this regard.

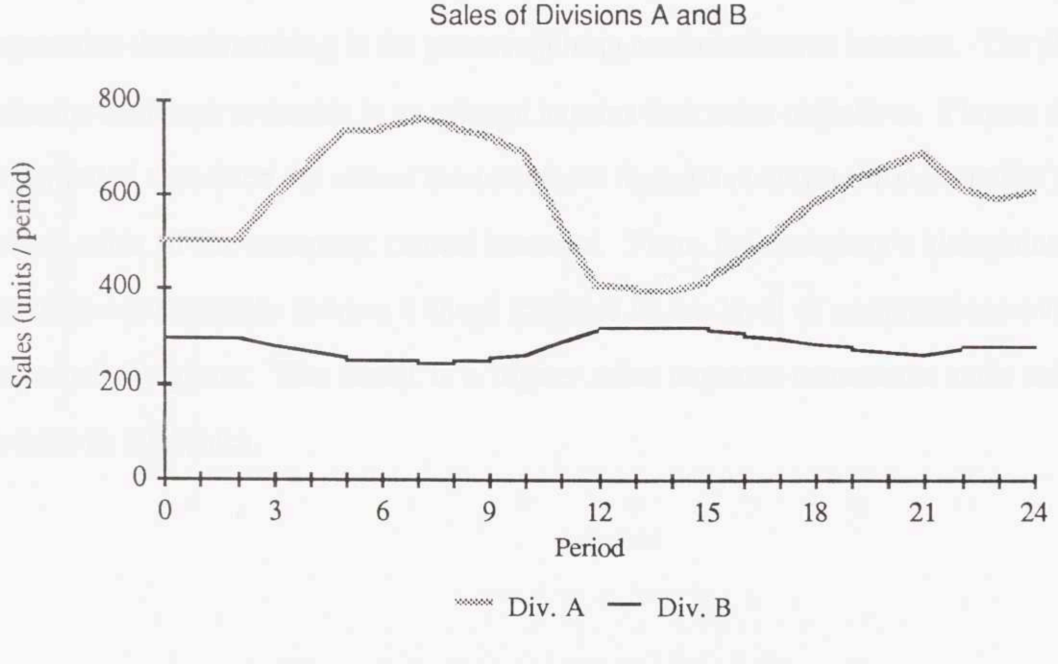

Figure 3-1: Graph of Sales for Both Divisions

Commissions

After observing the company's sales over time, players should be asked how they produced this behavior. The answer can be seen in a comparison of the commission rates paid by each division. Graphs of absolute commissions and normalized commissions are shown in Figures 3-2 and 3-3 respectively. Players should recognize that their fluctuating commission rates produced the oscillations in sales over the course of the game. The normalized commission graph is especially effective in demonstrating the competition for salesforce time which may have occurred. As Figure 3-3 indicates, the players tend to "leapfrog" past each other several times over the course of the game.

Typically, by the end of the game, commission rates have been increased to a level much higher than they were at the beginning of the game. It should be pointed out to the players that there is nothing in the game requiring commissions to increase. The players make the decisions to do this in an attempt to meet their sales objectives. Players should be reminded that since the size of the salesforce remains constant throughout the game, overall sales of the company cannot increase. From the company's viewpoint, it is therefore not desirable to have a sharp increase in the level of commissions over the course of the game. The result is a higher sales expense-to-revenue ratio with no increase in total sales.

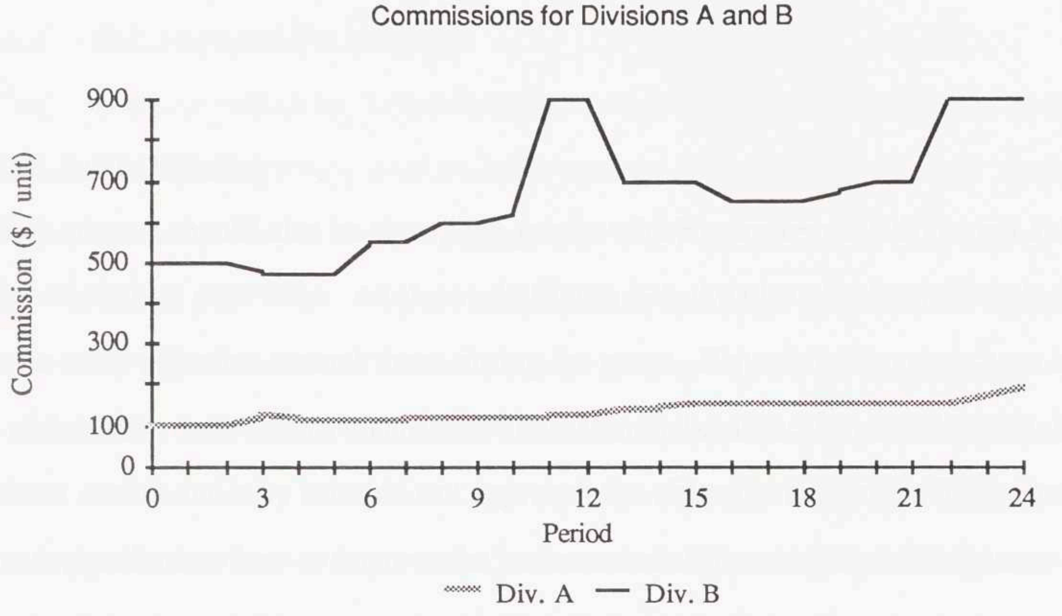

Figure 3-2: Graph of Commissions for Both Divisions

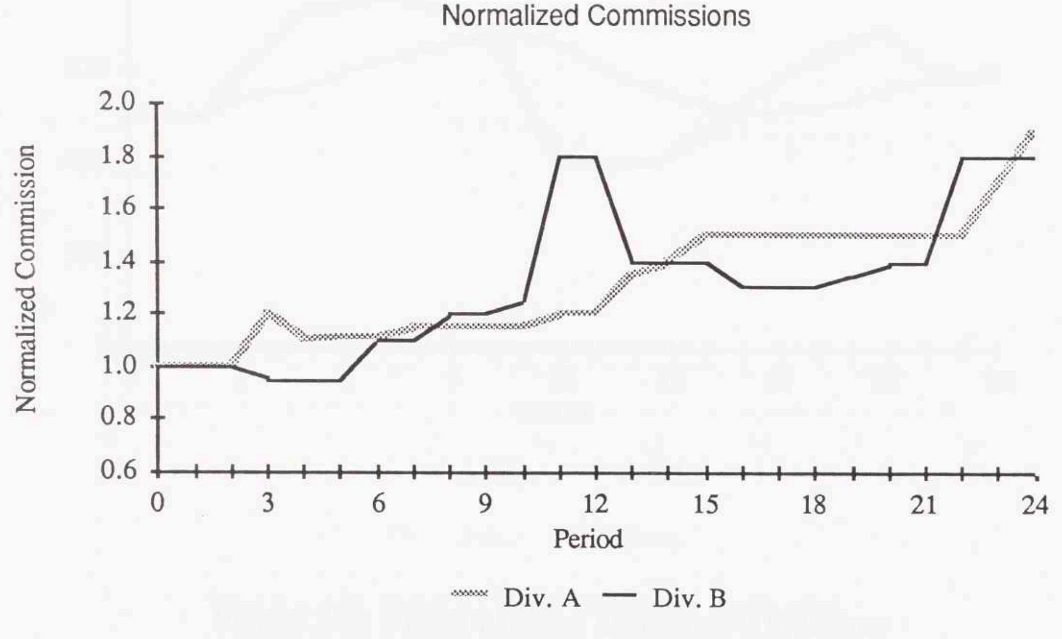

Figure 3-3: Graph of Normalized Commissions

Sales vs. Sales Objective

Both players should also be shown the graphs which compare each division's sales to sales objectives over time. As shown in Figure 3-4, the plot of sales will typically cross the sales objective several times during the game. Players tend to overshoot and then undershoot their sales objectives. They should be asked to consider why the overshoot occurs and why sales do not approach the objective smoothly. This should lead to suggestions on how to improve the performance of the company in the game.

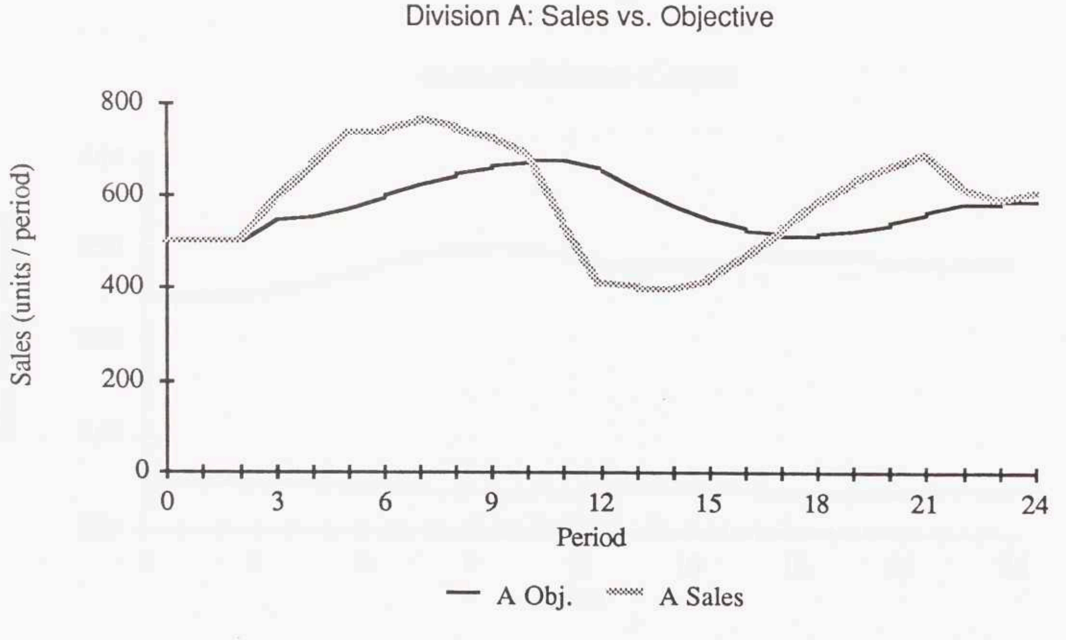

Figure 3-4: Graph of Sales and Sales Objectives

Suggestions for Improved Performance

Suggestions for improving the performance of the imaginary company can come in two forms: changes in the way compensation planners make their decisions or changes in the underlying structure of the organization. If the compensation planners do not respond so quickly and vigorously when their division's sales do not match the sales objective, the amount of overshoot can be reduced. Figures 3-5 through 3-8 show the results of a game in which the players were not allowed to increase their commissions by more than 1% in any single month. This prevented players from overreacting. As shown in Figure 3-5, overall company performance was improved since the fluctuations in sales were diminished substantially in comparison to the fluctuations shown in Figure 3-1.

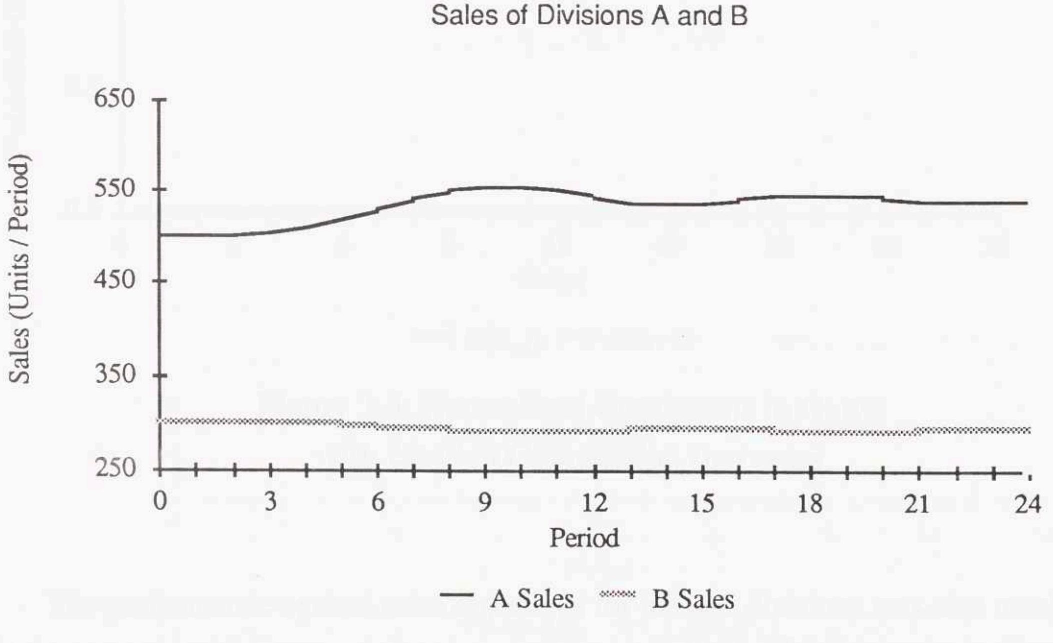

Figure 3-5: Sales of Both Divisions in Game with Limited Commission Increases

Figure 3-6 shows the commissions set by players over the course of the limited commission game. There is still evidence of a bidding war since the paths of the commissions paid by the compensation planners cross each other several times. But the amplitude of the "leapfrogging" is much smaller than in the game shown in Figure 3-2 (where there was no limit placed on commission increases). Limiting the size of commission increases also resulted in lower commissions at the end of the game than in the unconstrained simulation. The company's sales expenses are therefore much lower.

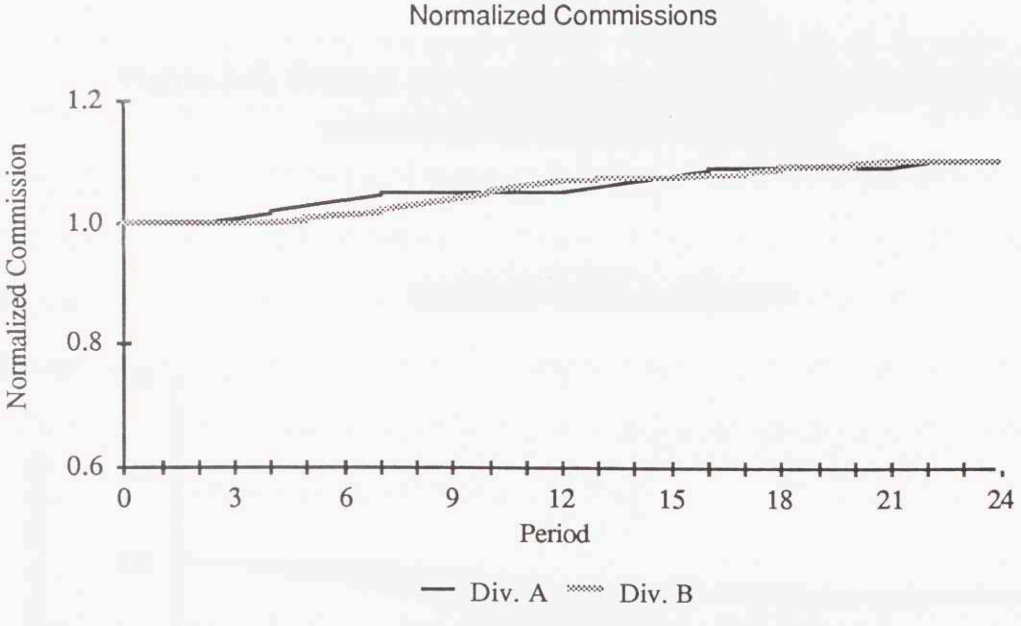

Figure 3-6: Normalized Comissions in Game with Limited Commission Increases

The performance against sales objectives for the two divisions was also much better in the game in which commission increases were limited. This is shown in Figures 3-7 and 3-8. Although there are fluctuations, the sales rates never stray very far from the sales objective.

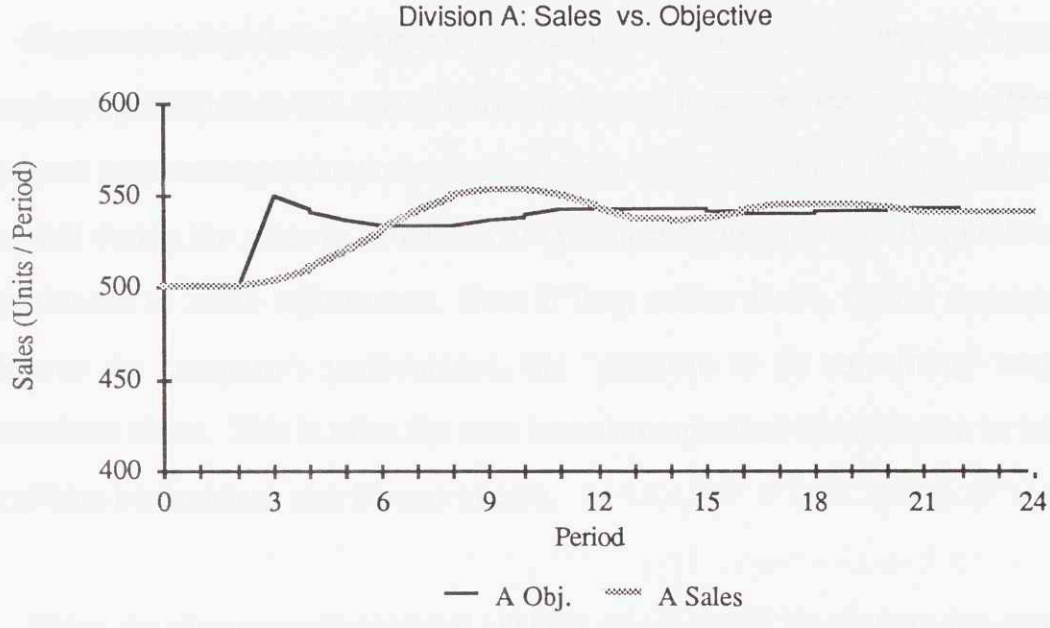

Figure 3-7: Division A's Performance Against Objective in Game with Limited Commission Increases

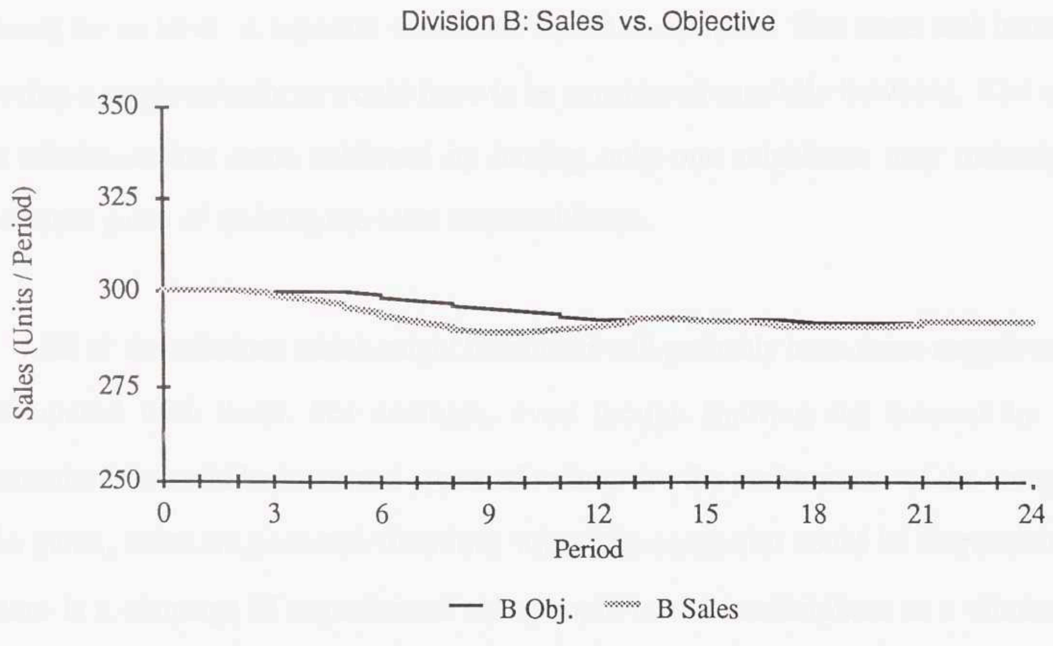

Figure 3-8: Division B's Performance Against Objective in Game with Limited Commission Increases

Cooperation among the compensation planners would be another way to improve the company's performance. As was already mentioned however, individual performance measures may create pressure to break any cooperative agreements. Asking players how they felt during the game is an effective way to get them to discuss the pressure they experienced to make adjustments. Even if they realize that a slower response will improve the company's performance, the "pressure to do something" may still overwhelm them. This is often the case in real companies. The pressure to improve short-term performance may be very intense.

There are also several structural changes which could be made to the system to improve its performance. If a single compensation planner (or a single group) was responsible for establishing commission rates for both divisions, the tendency for internal competition for salesforce time might be reduced. Another potential solution would be to have a separate salesforce for each division. The costs and benefits of having a single salesforce would have to be considered carefully however. The savings in administrative costs achieved by having only one salesforce may outweigh the potential gains of splitting the sales responsibilities.

All of the solutions which might be offered will probably have some negative effects associated with them. For example, even though limiting the amount by which commissions could be increased appeared to improve the performance of the company in the game, there are potential situations when this constraint could be detrimental. If there is a shortage of experienced salespeople in the marketplace as a whole, other companies may be paying their salesmen substantially more money. Salesmen from our imaginary company would probably be lured away by these higher salaries and commissions. Since our compensation planners would only be able to increase commissions very slowly, we could lose most of our saleforce and revenues would plummet. Players should consider these negative effects as well as the benefits when trying to decide how the organization and its decisionmaking could be improved.

Summary

The role-playing game is intended to expose players to several concepts:

- Decisions are not made in a vacuum. A manager's actions may have profound impact on other parts of an organization. These impacts should be considered when making decisions. What may seem to be a logical decision from one manager's perspective may be detrimental to the company as a whole.
- Goals and incentives should be designed carefully, as they can have a great impact on they way decisions are made. Too much emphasis can be placed on short-term measures.
- Changes in conditions may only be "noise" or one-time occurrences. Patience and restraint in response to such situations may improve company performance.

Chapter Four

Field Testing of the Game

The role-playing game has been used in informal workshops at both Data General Corporation and AT & T. Brief descriptions of these workshops are presented in this chapter. Results of the games played by managers in both companies are also presented.

4.1 Data General Corporation

An early version of the game was tested at Data General (DG). Two DG representatives participated. One was an internal consultant for the company; the other participant was a manager in the corporate sales and marketing department.

A workshop similar to that described in Chapter 3 was conducted. The version of the role-playing game used in the workshop at Data General was slightly different than the final version described in this document however. In the earlier version, both divisions had identical characteristics. The initial sales rates, sales objectives, and commissions were the same for each division in the game. The behavior of the system and the role-players was very similar to that found in the final version of the game however.

The results of the game played by the DG managers are shown in Figures 4-1 through 4-4. The internal consultant assumed the role of the Division A compensation planner. The marketing manager acted as the compensation planner in Division B. Figure 4-1 is a graph showing sales of Divisions A and B over the course of the game. Large oscillations are apparent. In fact, the fluctuations grew in magnitude as the game progressed.

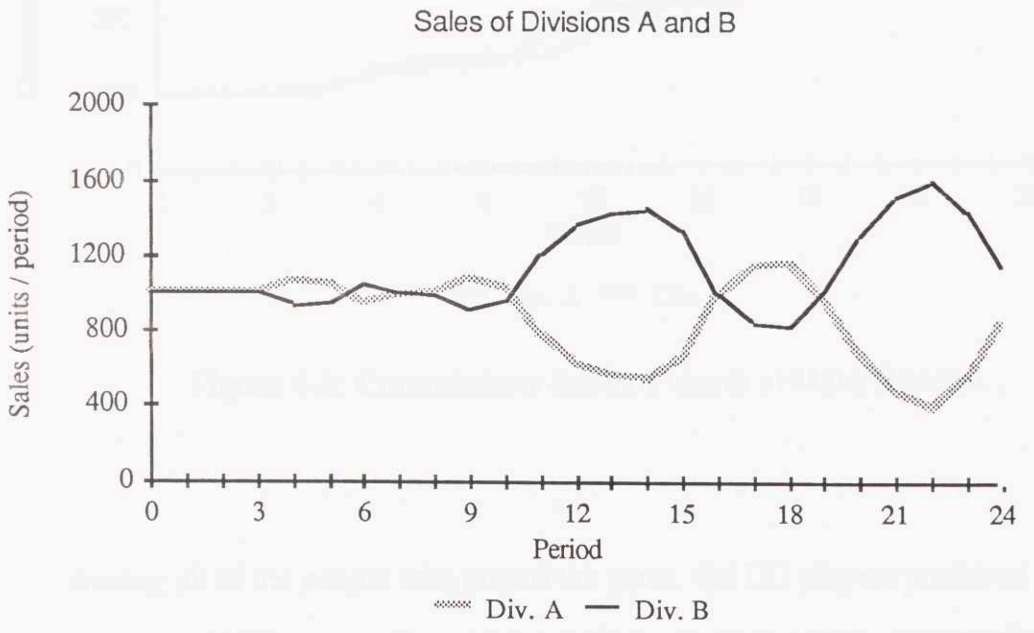

Figure 4-1: Sales of Both Divisions in Game Played at Data General

The cause of the increasing oscillations in sales can be seen in Figure 4-2, which shows the commissions set by the two players over the course of the game. A very active bidding war erupted which pushed each division's commission rate to 4 or 5 times its original value by the end of the game.

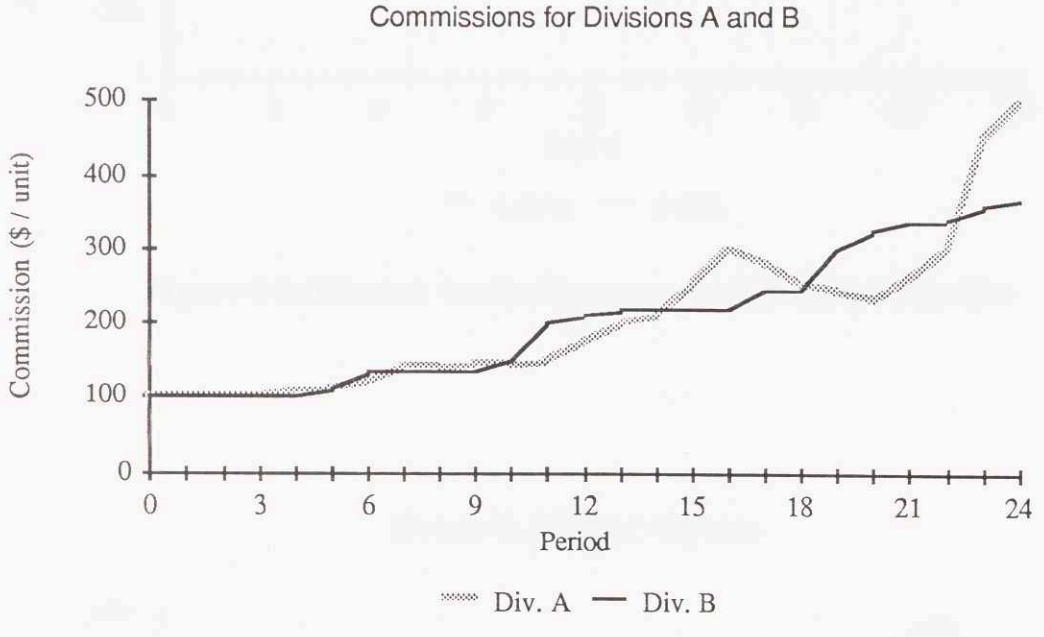

Figure 4-2: Commissions Set by Players at Data General

Among all of the people who played the game, the DG players produced one of the most extreme bidding wars for salesforce time. In most games, commissions tend to level off and the size of the oscillations in sales decrease by the end of the game. Figures 4-3 and 4-4 show that both DG players had difficulty in keeping their division's sales rates close to their objectives.

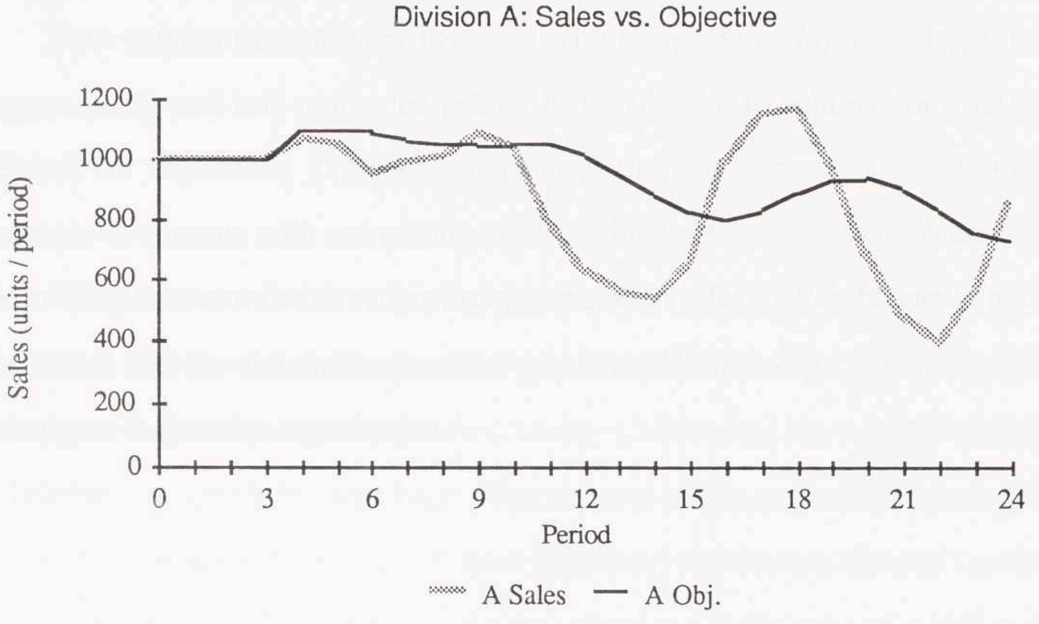

Figure 4-3: Division A's Performance Against Sales Objective

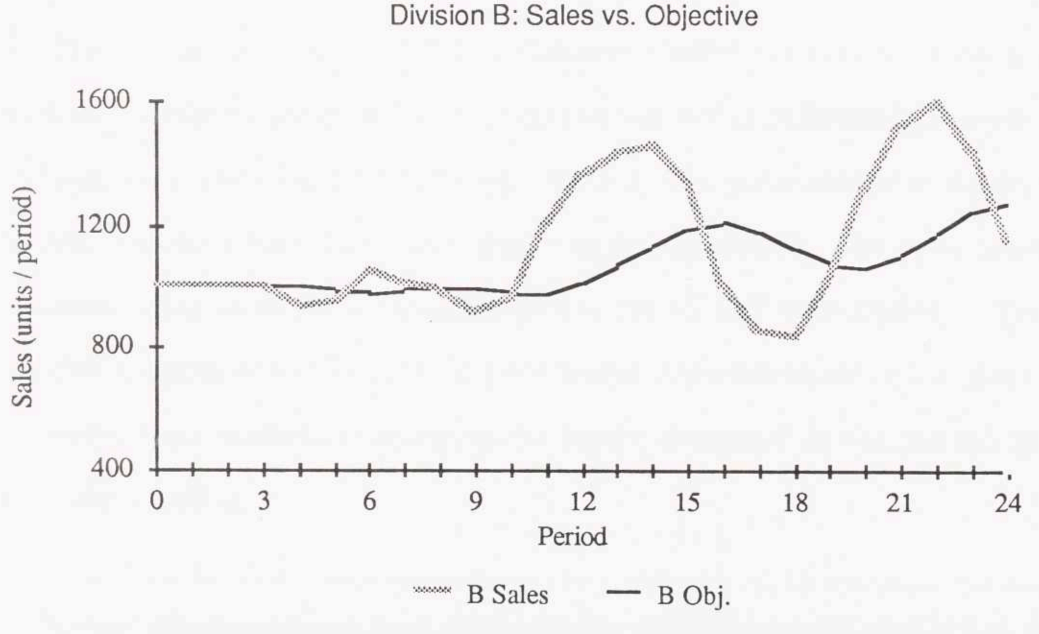

Figure 4-4: Division B's Performance Against Sales Objective

Both players became very involved with the game. Player B played extremely aggressively and was motivated primarily by a desire to achieve high sales figures. Player A expressed feelings of frustration and worried that Division A's expense-to-revenue ratio was getting much too high. However, player A could not resist increasing the commission rate in order to maintain sales. After the game, both players indicated that the simulation provided a better understanding of the pressures felt by managers in the sales organization.

4.2 AT & T

The final version of the role-playing game was used in the workshop at AT & T. As previously mentioned, the final version gives the two divisions different characteristics. Because of these differences, the final model is better than the original version used at Data General since it bears a closer resemblance to reality and makes it more difficult for players to estimate the impact of their decisions on the other division's performance. The primary difference between the two divisions is the type of product they sell. Division B produces a product which is more expensive and takes more time to sell than Division A's product. In addition, at the start of the game, Division B has a larger fraction of the total salesforce effort than Division A.

The demonstration at AT & T involved over a half-dozen people. These individuals were from different groups within the organization and included compensation planners and marketing managers from different divisions. The game itself was played by teams of two, with the other individuals observing the simulation. The game scenario was described using some actual characteristics of the AT & T organization.[1] Describing a relevant scenario seemed to get the participants more interested in the game and also increased their motivation to apply the issues discussed in the workshop to their particular situation.

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1. The specific characteristics used to model the AT & T situation are not described here in order to maintain confidentiality. No significant structural changes were made to the game to incorporate these characteristics.

The game results produced by the AT & T managers are typical of those produced by most players. As Figure 4-5 indicates, fluctuating sales rates were experienced by both divisions.

Note that the size of the fluctuations in the Division B sales rate appear smaller than those of Division A. As mentioned in Chapter 3, the difference in amplitude is the result of the game scenario and is not due to differences in the skill of the players. Since total sales effort is constant and it takes much more time to sell a product from Division B, small changes in Division B's sales rate will result in large changes in Division A's sales rate.

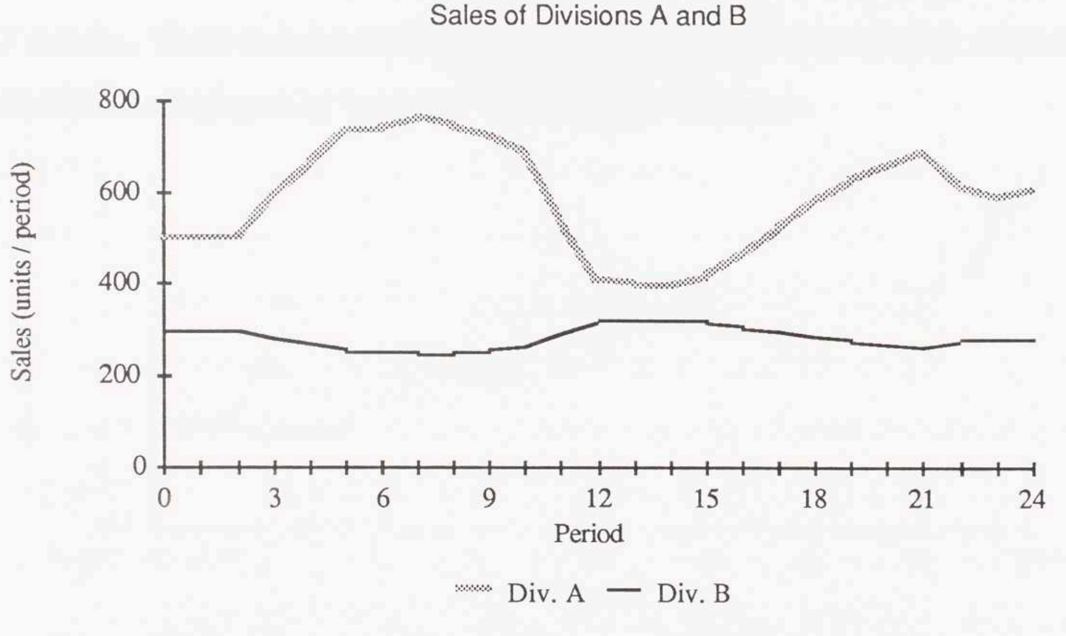

Figure 4-5: Sales of Both Divisions in Game Played at AT & T

The behavior of Division B is therefore inherently more stable. This has interesting implications as far as real-life performance evaluations are concerned. The manager of a division like B will have an easier time making his division look like it is performing consistently. The more volatile nature of Division A puts its manager at a disadvantage in this regard.

The graphs of commission rates are shown in Figures 4-6 and 4-7. The graph of normalized commissions (Figure 4-7) clearly indicates a bidding war for salesforce time between divisions. The final commission rates were almost twice their original level. The decisions of the Division B compensation planners are especially noteworthy. As an indication that they viewed the game as a realistic simulation, they felt compelled to give the salesforce "year-end-bonuses" in the form of much higher commission rates for 2 to 3 months. These bonuses started in periods 11 and 22 and were actually announced by the Division B players as "year-end" or "Christmas" bonuses.

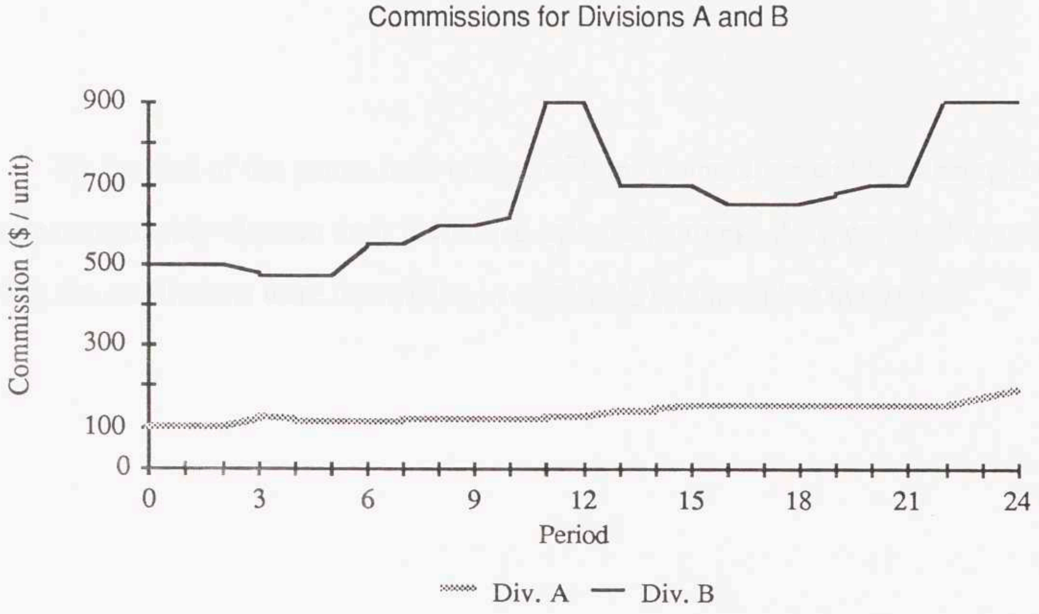

Figure 4-6: Commissions Set by Players at AT & T

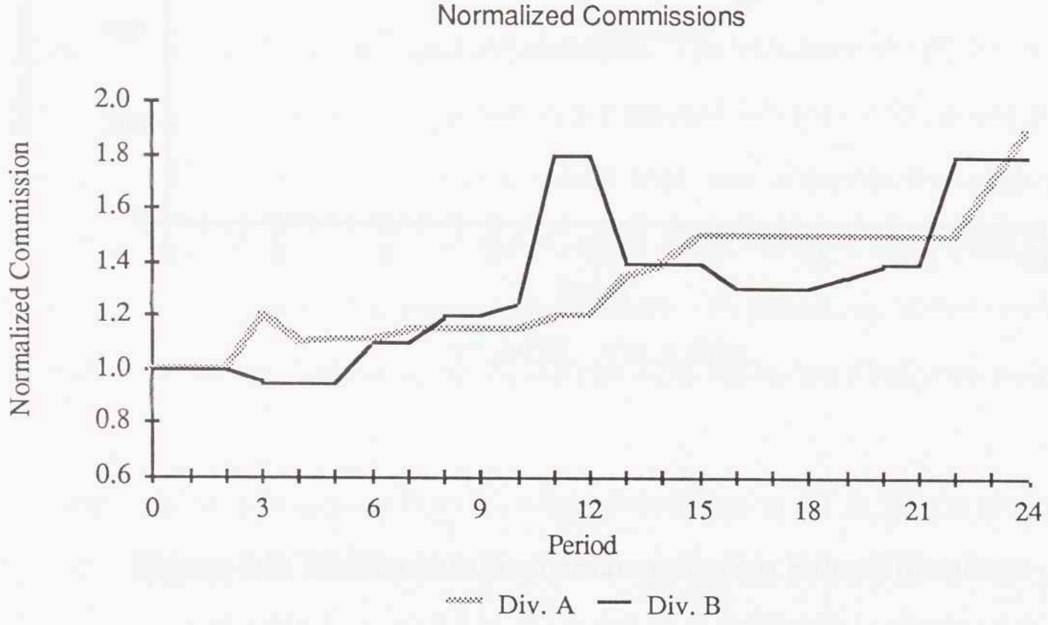

Figure 4-7: Normalized Commissions in Game Played at AT & T

By the end of the game, both compensation planners were able to bring their sales rates reasonably close to their divisional sales objectives. As shown in Figures 4-8 and 4-9, the oscillations were decreasing in amplitude by the end of the game.

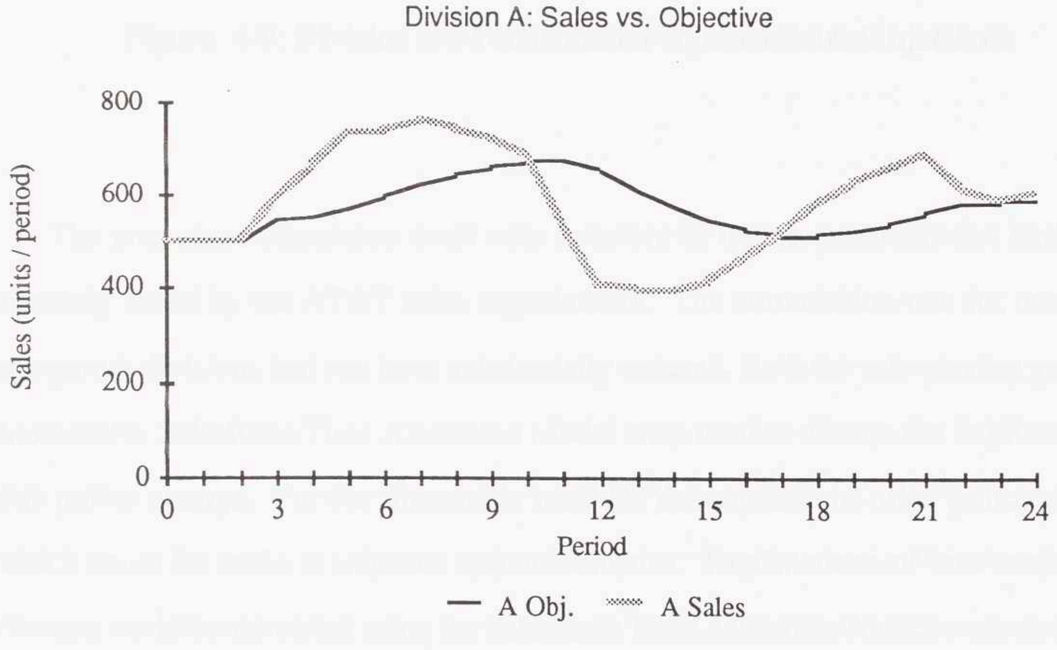

Figure 4-8: Division A's Performance Against Sales Objectives

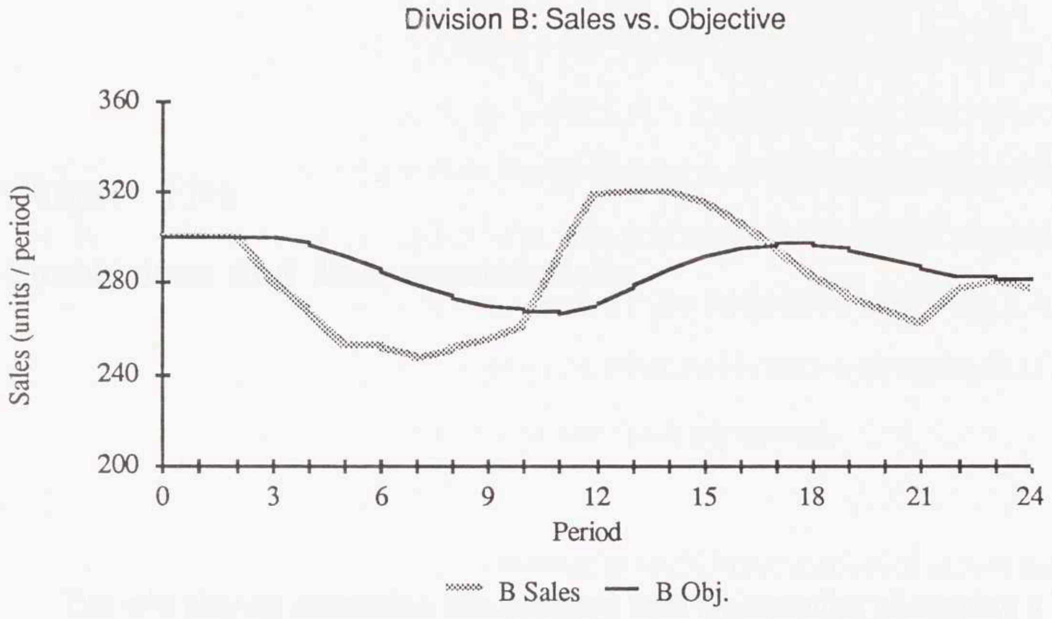

Figure 4-9: Division B's Performance Against Sales Objectives

The post-game discussion dealt with a variety of issues, problems and challenges currently faced by the AT&T sales organization. The commission rate for one of the company's divisions had just been substantially reduced. Both the role-playing game and Morecroft's Salesforce Time Allocation Model were used to discuss the implications of this policy change. Further discussion included descriptions of other policy changes which could be made to improve system behavior. Explanations of how such policy changes could be simulated using the Salesforce Time Allocation Model were also given.

Several of the participants from the original workshop at AT & T have demonstrated the role-playing game to other managers and executives in the company. The game is being used as both a learning tool and as an aid in considering the effects of changes in policy design.

Chapter Five

Conclusions and Recommendations

The role-playing simulation was designed with the intention of creating a learning tool to investigate decisionmaking in an organization with a multiple-product salesforce. The work of Katona [1] and others has indicated that learning retention is improved by the type of direct, interactive experience which the game offers. The classical decisionmaking models which define the optimal solution to a static situation do not offer such a direct learning opportunity.

The role-playing game also differs from classical models in the way decisionmaking is modeled. Decision rules in the role-playing game are based on the concept of bounded rationality. The classical optimization models assume objectively rational behavior. Morecroft and Paich [2] have defined a modeling framework incorporating the concepts of

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1. Katona, George, Organizing and Memorizing, New York: Hafner Publishing Co., 1967, Chapter 4.
2. Morecroft, John D. W., and Mark Paich, "System Dynamics for Reasoning About Business Policy and Strategy," Working Paper WP-1606-84, Alfred P. Sloan School of Management, MIT, Cambridge, MA, Revised April 1986.

bounded rationality and information feedback theory. In their paper, the authors show how their framework can be used to help managers understand whether the policies and programs comprising their company's strategy are capable of producing the desired corporate objectives. The role-playing game described herein is an example of a model which was designed within the Morecroft and Paich framework.

Field tests of the role-playing simulation in workshops conducted at two companies indicated that the game did provide a worthwhile learning experience. The game proved useful in capturing the interest and involvement of workshop participants. The field tests also indicated that such a simulation is most effective if it directly resembles the actual situation faced by managers and their organization.

Creating an environment which approximates reality as closely as possible is one recommendation for other potential modelers. Another suggestion is to build a simple model at first; one which is only complex enough to capture the interactions among the managers and groups which are of interest for a given problem. For example, it would not have been beneficial to include decision rules modeling the production department or the actions of competitors in the basic version of the role-playing game. By keeping the model focused on the area of concern (compensation of the salesforce), it is easier for players to develop an initial understanding of the issues which are important. After players have gained experience with the basic simulation game however, it might be worthwhile to broaden the model to include other groups within the organization.

Participants in the workshops at Data General and AT & T suggested expanding the role-playing game to include the hiring and firing of salesforce personnel. Other possible additions include modeling changes in salesforce productivity over time. These changes in productivity could result from changes in motivation (related to the salesforce satisfaction variable included in the game) and from newly hired salesmen gaining more experience the longer they are on the job. It might also be useful to differentiate between types of customers in the model. The salesforce probably views first-time customers and repeat customers very differently. One additional variable which could be included in a more complicated game would be the pricing decision for each product. These additions would allow the role-playing game to simulate an even greater number of decisionmaking scenarios.

Appendix A: The Game Introduction

After the game spreadsheet is loaded into the Lotus 1-2-3 environment, the game introduction appears on the computer monitor. The screens making up the introduction are reproduced on the following pages.

The upper left cell of the first screen of the introduction is Z1. The succeeding screens are located directly below the first and are accessed by pushing the "Pg Dn" key.

SALESFORCE TIME ALLOCATION MODEL - ROLE-PLAYING GAME

by

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Press "Pg Dn" key to continue

This game models a company with two divisions: A and B. Each division has a single product line. The divisions share a common salesforce capable of devoting a fixed number of hours to selling products. Division A produces "small systems" selling for $1000 each, while B produces "large systems" selling for $5000 each.

The game is designed for two players. One will be the compensation planner for Division A, the other will fill the same role in Division B.

The game will last 24 periods (months). Each period, both players will be provided with both division's monthly sales and sales objectives for the past two months. By comparing these figures, each player can see if his division is meeting its sales goals. The commission per unit sold for each of the last two months (which each player sets for his division) will also be displayed. In addition, the division sales objective for the coming period will be listed.

Press the "Pg Dn" key to continue
Press the "Pg Up" key to review the previous screen

Based on this information, each player is responsible for determining the commission per unit sold for his division's product in the coming month. Each player should review the sales data for both divisions, then secretly write down the commission rate for their division in the coming month. The written values may then be revealed to both players and entered as prompted (A, then B).

The monthly table of data for each division will also include a measure of salesforce satisfaction. A "+" indicates a happy and motivated salesforce. This is the result of an increase (or no change) in the division's commission between last month and this month. A "-" indicates that the compensation planner decreased the commission a salesman would receive for selling that division's product. Naturally, this cut in pay will hurt salesforce morale. Therefore, it is best to avoid decreasing your commission rate if possible.

Press the "Pg Dn" key to continue
Press the "Pg Up" key to review the previous screen

The relative performance of each player can be compared using the two scores which are also listed with the monthly sales data. The two performance measures are sales expense as a percentage of revenue and sales as a percentage of sales objective. Both measures are based on performance over the last six months. Each player should be trying to achieve a lower expense rate and a higher sales-to-sales objective ratio for his division.

Each period's sales are determined by the relative commission per unit sold offered by the two divisions. For example, if Div. A offers a higher relative commission than does B, salesmen will start allocating more of their time to selling Division A's product line. A's sales will increase while B's will fall. The salesforce can only sell a limited number of items each period.

Press the "Pg Dn" key to continue
Press the "Pg Up" key to review the previous screen

The sales objective is simply an average of division sales over the past six months. However, the objective for each division may be modified by the corporate office from time to time. For example, corporate may increase the objective for Division B by 10% in an effort to spur sales growth in that division.

If your division is not meeting its sales objective, increasing the commission rate should motivate the salesforce to spend more of their time selling your division's product.

Press the "Home" key to continue
Press the "Pg Up" key to review the previous screen

Press the "Home" key to continue

Appendix B: The Player Interface

During the role-playing game, the status of each division is shown on a separate screen. At the beginning of the game, the screens appear as shown on the next page. The instruction to start the simulation, "Press Alt-Q to start the game," is listed in the upper left corner of Division A's status screen (cell A1).

On the page following these initial screens, the status screens at the end of Period 7 from a hypothetical game are shown. Note that the command to "Enter next period's commission and press the 'Return' key" is given at the bottom of the screen. After the commissions for both divisions are entered, the status screens will be updated. Division B's status screen will then appear with the following message at the bottom of the screen: "Review Div. B data, then press 'Return' to view A." Upon executing this command, Division A's screen will appear, asking Player A to enter his commission.

The last page of Appendix B shows the graph menu presented to players at the end of the game. This screen also shows the final performance measures for both players.

Press Alt-Q to start the game.

DIVISION A - Small Systems

Score:
Sales Exp./Rev. --.%
Sales/Objective --.%

	PERIOD		
	0	0	0
S ALES	500	500	
SALES OBJECTIVE	500	500	500
COMMISSION / UNIT SOLD	100	100	100
SALESFORCE SATISFACTION	+	+	+

DIVISION B - Large Systems

Score:
Sales Exp./Rev. --.%
Sales/Objective --.%

	PERIOD		
	0	0	0
S ALES	300	300	
SALES OBJECTIVE	300	300	300
COMMISSION / UNIT SOLD	500	500	500
SALESFORCE SATISFACTION	+	+	+

DIVISION A - Small Systems

Score:
Sales Exp./Rev. 10.8%
Sales/Objective 112.8%

	PERIOD 6	7	8
S ALES	744	765	
SALES OBJECTIVE	603	627	650
COMMISSION / UNIT SOLD	111	115	?
SALESFORCE SATISFACTION	+	+	

Enter next period's commission and press the "Return" key

DIVISION B - Large Systems

Score:
Sales Exp./Rev. 10.2%
Sales/Objective 93.3%

	PERIOD 6	7	8
S ALES	251	247	
SALES OBJECTIVE	285	279	274
COMMISSION / UNIT SOLD	550	550	?
SALESFORCE SATISFACTION	+	+	

Enter next period's commission and press the "Return" key

SCORES:	A	B
Sales Exp./ Rev.	15.5%	15.4%
Sales / Obj.	104.3%	98.2%

To Graph:	Press:
Sales (A & B)	Alt-S
Commissions (A & B)	Alt-C
Normalized Commissions (A & B)	Alt-N
A Sales vs. Obj.	Alt-A
B Sales vs. Obj.	Alt-B

Appendix C: The Calculation Table

The monthly sales, sales objectives, and performance measures for each division are calculated and stored in tabular form. The equations for the first several periods are presented on the following pages. The table in the spreadsheet extends to 24 periods. For those individuals who are unfamiliar with Lotus 1-2-3 notation, the terms in the equations such as "K61" or "U63" refer to entries stored in various cells of the spreadsheet. The letter refers to the column and the number refers to the row in which the entry is stored. The relevant column letters are shown above the variable names on the following pages. The row numbers are shown to the left. The abbreviated variable names stand for the following:

COMM_A	Division A commission
COMM_B	Division B commission
ATTR_A	Relative attractiveness of Div. A product to salesmen
SEA	Fraction of sales effort devoted to Div. A
CSEA	Change in fraction of sales effort devoted to Div. A
OBJ_A	Division A sales objective
OBJ_B	Division B sales objective
COBJA	Change in Div. A sales objective
COBJB	Change in Div. B sales objective
A%OBJMET	Div. A sales-to-objective ratio
B%OBJMET	Div. B sales-to-objective ratio
AExp/Rev	Div. A sales expense-to-revenue ratio
BExp/Rev	Div. B sales expense-to-revenue ratio

In general, the calculations proceed as follows: After the commission rates for the coming period are entered by the players, the change in the total fraction of sales effort devoted to product line A (CSEA) is calculated. For example, if Division A's new commission is higher relative to Division B's (ATTR_A>1), there will be a shift in sales effort from B to A. This change in the fraction of sales effort is added to a running total of the fraction of sales effort devoted to selling Division A's product line (SEA).

In the game, the total salesforce capability remains constant over time. A total of 2000 units of product A would be sold if all of the sales effort was devoted to this product. Since it takes five times as many hours to sell a product from Division B, 400 units would be sold if all sales time was devoted to B's product line. Using these values and the fraction of sales effort devoted to each division calculated above, the sales for each division in the current period (SALES_A and SALES_B) are determined.

The sales figures are then used to update the sales objective. This objective is simply a six-month moving average of sales. The updated performance measures are also calculated using a six-month average.

	J	K	L	M
	PERIOD	COMM_A	COMM_B	ATTR_A
60	0	100	500	1
61	1	0	0	(5*K61)/L61
62	2	0	0	(5*K62)/L62
63	3	0	0	(5*K63)/L63
64	.	.	.	.
65	.	.	.	.
66	.	.	.	.

	N	O
	SEA	CSEA
60	0.25	0
61	+N60+O61	+N60*(1-N60)*(M61-1)*1
62	+N61+O62	+N61*(1-N61)*(M62-1)*1
63	+N62+O63	+N62*(1-N62)*(M63-1)*1
64	.	.
65	.	.
66	.	.

	P	Q	R	S
	OBJ_A	OBJ_B	COBJA	COBJB
60	500	300	0	0
61	+$P$60+$R$61	+$Q$60+$S$61	(T60-P60)/6	(U60-Q60)/6
62	+$P$61+$R$62	+$Q$61+$S$62	(T61-P61)/6	(U61-Q61)/6
63	550	+$Q$62+$S$63	(T62-P62)/6	(U62-Q62)/6
64	+$P$63+$R$64	+$Q$63+$S$64	.	.
65	+$P$64+$R$65	+$Q$64+$S$65	.	.
66	.	.	.	.
	.	.		
	.	.		

	T	U
	SALES_A	SALES_B
60	500	300
61	+$N$61*2000	(1-$N$61)*400
62	+$N$62*2000	(1-$N$62)*400
63	+$N$63*2000	(1-$N$63)*400
64	.	.
65	.	.
66	.	.

	V	W
	A%OBJMET	B%OBJMET
60	1	1
61	(5*$V$60+($T$61/$P$61))/6	(5*$W$60+($U$61/$Q$61))/6
62	(5*$V$61+($T$62/$P$62))/6	(5*$W$61+($U$62/$Q$62))/6
63	(5*$V$62+($T$63/$P$63))/6	(5*$W$62+($U$63/$Q$63))/6
64	.	.
65	.	.
66	.	.

	X	Y
	AExp/Rev	BExp/Rev
60	0.1	0.1
61	(5*$X$60+($K$61/1000))/6	(5*$Y$60+($L$61/5000))/6
62	(5*$X$61+($K$62/1000))/6	(5*$Y$61+($L$62/5000))/6
63	(5*$X$62+($K$63/1000))/6	(5*$Y$62+($L$63/5000))/6
64	.	.
65	.	.
66	.	.

Appendix D: The Spreadsheet Macro

The macro which controls the operation of the game is shown on the next two pages. Range names are shown in capital letters (e.g. LOOP) to the left of the cells to which they apply. The game macro is invoked by pressing "Alt-Q". The starting point of this macro is denoted by the range name "\Q". The first line of code shown on the next page is denoted by the range name "\0". This command is carried out automatically when the spreadsheet is loaded into memory and simply initializes the spreadsheet. The commands which create the graphs at the end of the game are also shown. These macros are invoked by pressing "Alt" simultaneously with the proper letter key.

```
                     GAME MACRO:
\0                   {calc}/XQ
\Q                   /real~/wgri3~{goto}a19~
                     /wwh/wwu{goto}a21~{window}{goto}j60~
                     /rndPeriod~/rncPeriod~~
LOOP   ---           /cg6..g15~f6..f15~
                     /ch6..h15~g6..g15~
                     /cg26..g35~f26..f35~
                     /ch26..h35~g26..g35~
                     /reh13~/reh33~/reh15~/reh35~
                     {right}{right}
                     {right}{right}{right}{right}{down}/c~h11~
                     {right}/c~h31~{up}
                     {right}{right}{right}/c~g9~
                     {right}/c~g29~
                     {right}/c~c6~{right}/c~c26~
                     {right}/c~c5~{right}/c~c25~
                     {goto}period~/rndPeriod~
                     {down}/rncPeriod~~/c~h6~/c~h26~{window}{goto}b37~
                     Review Div. B data, then press "Return" to view A.
                     {left}~{?}~{home}{goto}b17~Enter next period's
                     commission and press the "Return" key.~{goto}h13~
                     "?~/XNEnter next period's commission:~h13~/cb17~b37~
                     {goto}a21~{goto}h33~"?~
                     /XNEnter next period's commission:~h33~/reb37~/reb17~
                     {window}{goto}h15~/xih13<g13~"-~/xgSATIS~
                     "+~
SATIS                {goto}h35~/xih33<g33~"-~/xgCALC~
                     "+~
CALC                 {goto}period~{right}/ch13~~
                     {right}/ch33~~
                     {calc}{goto}Period~
End of Loop --       /xiPeriod<24~/xgLOOP~
                     {window}{home}/wwc{PgDn}{PgDn}{PgDn}
                     /cv84~c63~/cw84~d63~
                     /cx84~c62~/cy84~d62~


Graphs:
Comm.  \C            /grgtxxJ60..J83~
                     aK60..K83~
                     bL60..L83~
                     otxTime (mos.)~
                     tyCommission ($/unit)~
                     laA~lbB~
                     cqq{graph}
```

```
Sales  \S        /grgtxxJ60..J83~
                 aT60..T83~
                 bU60..U83~
                 otxTime (mos.)~
                 tySales (units/mo.)~
                 laA~lbB~
                 cqq{graph}

Sls/Obj A        /grgtxxJ60..J83~
\A               aP60..P83~
                 bT60..T83~
                 otxTime (mos.)~
                 tyA Sales & Obj. (units/mo.)~
                 laA Obj~lbA Sales~
                 cqq{graph}

Sls/Obj B        /grgtxxJ60..J83~
\B               aQ60..Q83~
                 bU60..U83~
                 otxTime (mos.)~
                 tyB Sales & Obj. (units/mo.)~
                 laB Obj~lbB Sales~
                 cqq{graph}

Norm. Comm.      /grgtxxJ60..J83~
\N               aK88..K112~
                 bL88..L112~
                 otxTime (mos.)~
                 tyNormalized Commission~
                 laA~lbB~
                 cqq{graph}
```

Appendix E: Cell-by-Cell Listing

With the exception of the intorductory text, the initial entries of all cells in the game spreadsheet are listed on the following pages. The text is shown in Appendix A and occupies the area of the spreadsheet starting in cell Z1. This is the cell where the 1-2-3 cursor is initially located after the game spreadsheet is loaded into memory. In addition, the following range names are assigned to the cells listed:

RANGE NAME:	CELL:
\0	L2
\Q	L3
\S	L48
\N	W40
\C	L40
\A	Q40
\B	Q48
SATIS	L28
CALC	L30
LOOP	L6
PERIOD	J60

```
A1: 'Press Alt-Q to start the game.
D2: U 'DIVISION A - Small Systems
D3: U '__________
A4: U ' Score:
G4: U '  PERIOD
A5: '  Sales Exp./Rev.
C5: "--.%
A6: '  Sales/Objective
C6: "--.%
F6: 0
G6: 0
H6: 0
F7: U '_______
G7: U '_______
H7: U '_______
B9: U 'SALES
F9: 500
G9: (F0) 500
B11: U 'SALES OBJECTIVE
F11: 500
G11: 500
H11: (F0) 500
B13: U 'COMMISSION / UNIT SOLD
F13: 100
G13: 100
H13: 100
B15: U 'SALESFORCE SATISFACTION
F15: "+
G15: "+
H15: "+
D22: 'DIVISION B - Large Systems
D23: '__________
A24: U ' Score:
G24: '  PERIOD
A25: '  Sales Exp./Rev.
C25: "--.%
A26: '  Sales/Objective
C26: "--.%
F26: 0
G26: 0
H26: 0
F27: '_______
G27: '_______
H27: '_______
B29: 'SALES
F29: 300
```

```
G29: (F0) 300
B31: 'SALES OBJECTIVE
F31: 300
G31: 300
H31: 300
B33: 'COMMISSION / UNIT SOLD
F33: 500
G33: 500
H33: 500
B35: 'SALESFORCE SATISFACTION
F35: "+
G35: "+
H35: "+
A61: 'SCORES:
C61: "A
D61: "B
A62: '  Sales Exp./Rev.
A63: '  Sales/Obj.
C67: 'To Graph:
F67: 'Press:
C68: '_________
F68: '______
B70: 'Sales (A & B)
F70: 'Alt-S
B72: 'Commissions (A & B)
F72: 'Alt-C
B74: 'Normalized Commissions (A & B)
F74: 'Alt-N
B76: 'A Sales vs Obj.
F76: 'Alt-A
B78: 'B Sales vs Obj.
F78: 'Alt-B
```

```
L1: U 'GAME MACRO:
J2: U '\O
L2: '{calc}/XQ
J3: U '\Q
L3: '/real~/wgri3~{goto}a19~
L4: '/wwh/wwu{goto}a21~{window}{goto}j60~
L5: '/rndPeriod~/rncPeriod~~
J6: U 'LOOP   ---
L6: '/cg6..g15~f6..f15~
L7: '/ch6..h15~g6..g15~
L8: '/cg26..g35~f26..f35~
L9: '/ch26..h35~g26..g35~
L10: '/reh13~/reh33~/reh15~/reh35~
L11: '{right}{right}
L12: '{right}{right}{right}{right}{down}/c~h11~
L13: '{right}/c~h31~{up}
L14: '{right}{right}{right}/c~g9~
L15: '{right}/c~g29~
L16: '{right}/c~c6~{right}/c~c26~
L17: '{right}/c~c5~{right}/c~c25~
L18: '{goto}period~/rndPeriod~
L19: '{down}/rncPeriod~~/c~h6~/c~h26~{window}{goto}b37~
L20: 'Review Div. B data, then press "Return" to view A.
L21: '{left}~{?}~{home}{goto}b17~Enter next period's
L22: 'commission and press the "Return" key.~{goto}h13~
L23: '"?~/XNEnter next period's commission:~h13~/cb17~b37~
L24: '{goto}a21~{goto}h33~"?~
L25: '/XNEnter next period's commission:~h33~/reb37~/reb17~
L26: '{window}{goto}h15~/xih13<g13~"-~/xgSATIS~
L27: '"+~
J28: U 'SATIS
L28: '{goto}h35~/xih33<g33~"-~/xgCALC~
L29: '"+~
J30: U 'CALC
L30: '{goto}period~{right}/ch13~~
L31: '{right}/ch33~~
L32: '{calc}{goto}Period~
J33: U 'End of Loop --
L33: '/xiPeriod<24~/xgLOOP~
L34: '{window}{home}/wwc{PgDn}{PgDn}{PgDn}
L35: '/cv84~c63~/cw84~d63~
L36: '/cx84~c62~/cy84~d62~
J39: U 'Graphs:
J40: U 'Comm.  \C
L40: '/grgtxxJ60..J83~
L41: 'aK60..K83~
```

```
L42: 'bL60..L83~
L43: 'otxTime (mos.)~
L44: 'tyCommission ($/unit)~
L45: 'laA~lbB~
L46: 'cqq{graph}
J48: U 'Sales  \S
L48: '/grgtxxJ60..J83~
L49: 'aT60..T83~
L50: 'bU60..U83~
L51: 'otxTime (mos.)~
L52: 'tySales (units/mo.)~
L53: 'laA~lbB~
L54: 'cqq{graph}
O40: U 'Sls/Obj A
Q40: '/grgtxxJ60..J83~
O41: U '\A
Q41: 'aP60..P83~
Q42: 'bT60..T83~
Q43: 'otxTime (mos.)~
Q44: 'tyA Sales & Obj. (units/mo.)~
Q45: 'laA Obj~lbA Sales~
Q46: 'cqq{graph}
O48: U 'Sls/Obj B
Q48: '/grgtxxJ60..J83~
O49: U '\B
Q49: 'aQ60..Q83~
Q50: 'bU60..U83~
Q51: 'otxTime (mos.)~
Q52: 'tyB Sales & Obj. (units/mo.)~
Q53: 'laB Obj~lbB Sales~
Q54: 'cqq{graph}
U40: U 'Norm. Comm.
W40: '/grgtxxJ60..J83~
U41: U '\N
W41: 'aK88..K112~
W42: 'bL88..L112~
W43: 'otxTime (mos.)~
W44: 'tyNormalized Commission~
W45: 'laA~lbB~
W46: 'cqq{graph}
```

```
J58: 'PERIOD
K58: "COMM_A
L58: "COMM_B
M58: "ATTR_A
N58: "SEA
O58: "CSEA
P58: "OBJ_A
Q58: "OBJ_B
R58: "COBJA
S58: "COBJB
T58: "SALES_A
U58: "SALES_B
V58: 'A%OBJMET
W58: 'B%OBJMET
X58: 'AExp/Rev
Y58: 'BExp/Rev
J59: \_
K59: \_
L59: \_
M59: \_
N59: \_
O59: \_
P59: \_
Q59: \_
R59: \_
S59: \_
T59: \_
U59: \_
V59: \_
W59: \_
X59: \_
Y59: \_
J60: 0
K60: 100
L60: 500
M60: (F3) 1
N60: (F2) 0.25
O60: (F2) 0
P60: (F0) 500
Q60: (F0) 300
R60: (F0) 0
S60: (F0) 0
T60: (F0) 500
U60: (F0) 300
V60: (P1) 1
W60: (P1) 1
```

```
X60: (P1) 0.1
Y60: (P1) 0.1
J61: 1
K61: 0
L61: 0
M61: (F3) (5*K61)/L61
N61: (F2) +N60+O61
O61: (F2) +N60*(1-N60)*(M61-1)*1
P61: (F0) +$P$60+$R$61
Q61: (F0) +$Q$60+$S$61
R61: (F0) (T60-P60)/6
S61: (F0) (U60-Q60)/6
T61: (F0) +$N$61*2000
U61: (F0) (1-$N$61)*400
V61: (P1) (5*$V$60+($T$61/$P$61))/6
W61: (P1) (5*$W$60+($U$61/$Q$61))/6
X61: (P1) (5*$X$60+($K$61/1000))/6
Y61: (P1) (5*$Y$60+($L$61/5000))/6
J62: 2
K62: 0
L62: 0
M62: (F3) (5*K62)/L62
N62: (F2) +N61+O62
O62: (F2) +N61*(1-N61)*(M62-1)*1
P62: (F0) +$P$61+$R$62
Q62: (F0) +$Q$61+$S$62
R62: (F0) (T61-P61)/6
S62: (F0) (U61-Q61)/6
T62: (F0) +$N$62*2000
U62: (F0) (1-$N$62)*400
V62: (P1) (5*$V$61+($T$62/$P$62))/6
W62: (P1) (5*$W$61+($U$62/$Q$62))/6
X62: (P1) (5*$X$61+($K$62/1000))/6
Y62: (P1) (5*$Y$61+($L$62/5000))/6
J63: 3
K63: 0
L63: 0
M63: (F3) (5*K63)/L63
N63: (F2) +N62+O63
O63: (F2) +N62*(1-N62)*(M63-1)*1
P63: (F0) 550
Q63: (F0) +$Q$62+$S$63
R63: (F0) (T62-P62)/6
S63: (F0) (U62-Q62)/6
T63: (F0) +$N$63*2000
U63: (F0) (1-$N$63)*400
```

```
V63: (P1) (5*$V$62+($T$63/$P$63))/6
W63: (P1) (5*$W$62+($U$63/$Q$63))/6
X63: (P1) (5*$X$62+($K$63/1000))/6
Y63: (P1) (5*$Y$62+($L$63/5000))/6
J64: 4
K64: 0
L64: 0
M64: (F3) (5*K64)/L64
N64: (F2) +N63+O64
O64: (F2) +N63*(1-N63)*(M64-1)*1
P64: (F0) +$P$63+$R$64
Q64: (F0) +$Q$63+$S$64
R64: (F0) (T63-P63)/6
S64: (F0) (U63-Q63)/6
T64: (F0) +$N$64*2000
U64: (F0) (1-$N$64)*400
V64: (P1) (5*$V$63+($T$64/$P$64))/6
W64: (P1) (5*$W$63+($U$64/$Q$64))/6
X64: (P1) (5*$X$63+($K$64/1000))/6
Y64: (P1) (5*$Y$63+($L$64/5000))/6
J65: 5
K65: 0
L65: 0
M65: (F3) (5*K65)/L65
N65: (F2) +N64+O65
O65: (F2) +N64*(1-N64)*(M65-1)*1
P65: (F0) +$P$64+$R$65
Q65: (F0) +$Q$64+$S$65
R65: (F0) (T64-P64)/6
S65: (F0) (U64-Q64)/6
T65: (F0) +$N$65*2000
U65: (F0) (1-$N$65)*400
V65: (P1) (5*$V$64+($T$65/$P$65))/6
W65: (P1) (5*$W$64+($U$65/$Q$65))/6
X65: (P1) (5*$X$64+($K$65/1000))/6
Y65: (P1) (5*$Y$64+($L$65/5000))/6
J66: 6
K66: 0
L66: 0
M66: (F3) (5*K66)/L66
N66: (F2) +N65+O66
O66: (F2) +N65*(1-N65)*(M66-1)*1
P66: (F0) +$P$65+$R$66
Q66: (F0) +$Q$65+$S$66
R66: (F0) (T65-P65)/6
S66: (F0) (U65-Q65)/6
```

```
T66: (F0) +$N$66*2000
U66: (F0) (1-$N$66)*400
V66: (P1) (5*$V$65+($T$66/$P$66))/6
W66: (P1) (5*$W$65+($U$66/$Q$66))/6
X66: (P1) (5*$X$65+($K$66/1000))/6
Y66: (P1) (5*$Y$65+($L$66/5000))/6
J67: 7
K67: 0
L67: 0
M67: (F3) (5*K67)/L67
N67: (F2) +N66+O67
O67: (F2) +N66*(1-N66)*(M67-1)*1
P67: (F0) +$P$66+$R$67
Q67: (F0) +$Q$66+$S$67
R67: (F0) (T66-P66)/6
S67: (F0) (U66-Q66)/6
T67: (F0) +$N$67*2000
U67: (F0) (1-$N$67)*400
V67: (P1) (5*$V$66+($T$67/$P$67))/6
W67: (P1) (5*$W$66+($U$67/$Q$67))/6
X67: (P1) (5*$X$66+($K$67/1000))/6
Y67: (P1) (5*$Y$66+($L$67/5000))/6
J68: 8
K68: 0
L68: 0
M68: (F3) (5*K68)/L68
N68: (F2) +N67+O68
O68: (F2) +N67*(1-N67)*(M68-1)*1
P68: (F0) +$P$67+$R$68
Q68: (F0) +$Q$67+$S$68
R68: (F0) (T67-P67)/6
S68: (F0) (U67-Q67)/6
T68: (F0) +$N$68*2000
U68: (F0) (1-$N$68)*400
V68: (P1) (5*$V$67+($T$68/$P$68))/6
W68: (P1) (5*$W$67+($U$68/$Q$68))/6
X68: (P1) (5*$X$67+($K$68/1000))/6
Y68: (P1) (5*$Y$67+($L$68/5000))/6
J69: 9
K69: 0
L69: 0
M69: (F3) (5*K69)/L69
N69: (F2) +N68+O69
O69: (F2) +N68*(1-N68)*(M69-1)*1
P69: (F0) +$P$68+$R$69
Q69: (F0) +$Q$68+$S$69
```

```
R69: (F0) (T68-P68)/6
S69: (F0) (U68-Q68)/6
T69: (F0) +$N$69*2000
U69: (F0) (1-$N$69)*400
V69: (P1) (5*$V$68+($T$69/$P$69))/6
W69: (P1) (5*$W$68+($U$69/$Q$69))/6
X69: (P1) (5*$X$68+($K$69/1000))/6
Y69: (P1) (5*$Y$68+($L$69/5000))/6
J70: 10
K70: 0
L70: 0
M70: (F3) (5*K70)/L70
N70: (F2) +N69+O70
O70: (F2) +N69*(1-N69)*(M70-1)*1
P70: (F0) +$P$69+$R$70
Q70: (F0) +$Q$69+$S$70
R70: (F0) (T69-P69)/6
S70: (F0) (U69-Q69)/6
T70: (F0) +$N$70*2000
U70: (F0) (1-$N$70)*400
V70: (P1) (5*$V$69+($T$70/$P$70))/6
W70: (P1) (5*$W$69+($U$70/$Q$70))/6
X70: (P1) (5*$X$69+($K$70/1000))/6
Y70: (P1) (5*$Y$69+($L$70/5000))/6
J71: 11
K71: 0
L71: 0
M71: (F3) (5*K71)/L71
N71: (F2) +N70+O71
O71: (F2) +N70*(1-N70)*(M71-1)*1
P71: (F0) +$P$70+$R$71
Q71: (F0) +$Q$70+$S$71
R71: (F0) (T70-P70)/6
S71: (F0) (U70-Q70)/6
T71: (F0) +$N$71*2000
U71: (F0) (1-$N$71)*400
V71: (P1) (5*$V$70+($T$71/$P$71))/6
W71: (P1) (5*$W$70+($U$71/$Q$71))/6
X71: (P1) (5*$X$70+($K$71/1000))/6
Y71: (P1) (5*$Y$70+($L$71/5000))/6
J72: 12
K72: 0
L72: 0
M72: (F3) (5*K72)/L72
N72: (F2) +N71+O72
O72: (F2) +N71*(1-N71)*(M72-1)*1
```

```
P72: (F0) +$P$71+$R$72
Q72: (F0) +$Q$71+$S$72
R72: (F0) (T71-P71)/6
S72: (F0) (U71-Q71)/6
T72: (F0) +$N$72*2000
U72: (F0) (1-$N$72)*400
V72: (P1) (5*$V$71+($T$72/$P$72))/6
W72: (P1) (5*$W$71+($U$72/$Q$72))/6
X72: (P1) (5*$X$71+($K$72/1000))/6
Y72: (P1) (5*$Y$71+($L$72/5000))/6
J73: 13
K73: 0
L73: 0
M73: (F3) (5*K73)/L73
N73: (F2) +N72+O73
O73: (F2) +N72*(1-N72)*(M73-1)*1
P73: (F0) +$P$72+$R$73
Q73: (F0) +$Q$72+$S$73
R73: (F0) (T72-P72)/6
S73: (F0) (U72-Q72)/6
T73: (F0) +$N$73*2000
U73: (F0) (1-$N$73)*400
V73: (P1) (5*$V$72+($T$73/$P$73))/6
W73: (P1) (5*$W$72+($U$73/$Q$73))/6
X73: (P1) (5*$X$72+($K$73/1000))/6
Y73: (P1) (5*$Y$72+($L$73/5000))/6
J74: 14
K74: 0
L74: 0
M74: (F3) (5*K74)/L74
N74: (F2) +N73+O74
O74: (F2) +N73*(1-N73)*(M74-1)*1
P74: (F0) +$P$73+$R$74
Q74: (F0) +$Q$73+$S$74
R74: (F0) (T73-P73)/6
S74: (F0) (U73-Q73)/6
T74: (F0) +$N$74*2000
U74: (F0) (1-$N$74)*400
V74: (P1) (5*$V$73+($T$74/$P$74))/6
W74: (P1) (5*$W$73+($U$74/$Q$74))/6
X74: (P1) (5*$X$73+($K$74/1000))/6
Y74: (P1) (5*$Y$73+($L$74/5000))/6
J75: 15
K75: 0
L75: 0
M75: (F3) (5*K75)/L75
```

```
N75: (F2) +N74+O75
O75: (F2) +N74*(1-N74)*(M75-1)*1
P75: (F0) +$P$74+$R$75
Q75: (F0) +$Q$74+$S$75
R75: (F0) (T74-P74)/6
S75: (F0) (U74-Q74)/6
T75: (F0) +$N$75*2000
U75: (F0) (1-$N$75)*400
V75: (P1) (5*$V$74+($T$75/$P$75))/6
W75: (P1) (5*$W$74+($U$75/$Q$75))/6
X75: (P1) (5*$X$74+($K$75/1000))/6
Y75: (P1) (5*$Y$74+($L$75/5000))/6
J76: 16
K76: 0
L76: 0
M76: (F3) (5*K76)/L76
N76: (F2) +N75+O76
O76: (F2) +N75*(1-N75)*(M76-1)*1
P76: (F0) +$P$75+$R$76
Q76: (F0) +$Q$75+$S$76
R76: (F0) (T75-P75)/6
S76: (F0) (U75-Q75)/6
T76: (F0) +$N$76*2000
U76: (F0) (1-$N$76)*400
V76: (P1) (5*$V$75+($T$76/$P$76))/6
W76: (P1) (5*$W$75+($U$76/$Q$76))/6
X76: (P1) (5*$X$75+($K$76/1000))/6
Y76: (P1) (5*$Y$75+($L$76/5000))/6
J77: 17
K77: 0
L77: 0
M77: (F3) (5*K77)/L77
N77: (F2) +N76+O77
O77: (F2) +N76*(1-N76)*(M77-1)*1
P77: (F0) +$P$76+$R$77
Q77: (F0) +$Q$76+$S$77
R77: (F0) (T76-P76)/6
S77: (F0) (U76-Q76)/6
T77: (F0) +$N$77*2000
U77: (F0) (1-$N$77)*400
V77: (P1) (5*$V$76+($T$77/$P$77))/6
W77: (P1) (5*$W$76+($U$77/$Q$77))/6
X77: (P1) (5*$X$76+($K$77/1000))/6
Y77: (P1) (5*$Y$76+($L$77/5000))/6
J78: 18
K78: 0
```

```
L78: 0
M78: (F3) (5*K78)/L78
N78: (F2) +N77+O78
O78: (F2) +N77*(1-N77)*(M78-1)*1
P78: (F0) +$P$77+$R$78
Q78: (F0) +$Q$77+$S$78
R78: (F0) (T77-P77)/6
S78: (F0) (U77-Q77)/6
T78: (F0) +$N$78*2000
U78: (F0) (1-$N$78)*400
V78: (P1) (5*$V$77+($T$78/$P$78))/6
W78: (P1) (5*$W$77+($U$78/$Q$78))/6
X78: (P1) (5*$X$77+($K$78/1000))/6
Y78: (P1) (5*$Y$77+($L$78/5000))/6
J79: 19
K79: 0
L79: 0
M79: (F3) (5*K79)/L79
N79: (F2) +N78+O79
O79: (F2) +N78*(1-N78)*(M79-1)*1
P79: (F0) +$P$78+$R$79
Q79: (F0) +$Q$78+$S$79
R79: (F0) (T78-P78)/6
S79: (F0) (U78-Q78)/6
T79: (F0) +$N$79*2000
U79: (F0) (1-$N$79)*400
V79: (P1) (5*$V$78+($T$79/$P$79))/6
W79: (P1) (5*$W$78+($U$79/$Q$79))/6
X79: (P1) (5*$X$78+($K$79/1000))/6
Y79: (P1) (5*$Y$78+($L$79/5000))/6
J80: 20
K80: 0
L80: 0
M80: (F3) (5*K80)/L80
N80: (F2) +N79+O80
O80: (F2) +N79*(1-N79)*(M80-1)*1
P80: (F0) +$P$79+$R$80
Q80: (F0) +$Q$79+$S$80
R80: (F0) (T79-P79)/6
S80: (F0) (U79-Q79)/6
T80: (F0) +$N$80*2000
U80: (F0) (1-$N$80)*400
V80: (P1) (5*$V$79+($T$80/$P$80))/6
W80: (P1) (5*$W$79+($U$80/$Q$80))/6
X80: (P1) (5*$X$79+($K$80/1000))/6
Y80: (P1) (5*$Y$79+($L$80/5000))/6
```

```
J81: 21
K81: 0
L81: 0
M81: (F3) (5*K81)/L81
N81: (F2) +N80+O81
O81: (F2) +N80*(1-N80)*(M81-1)*1
P81: (F0) +$P$80+$R$81
Q81: (F0) +$Q$80+$S$81
R81: (F0) (T80-P80)/6
S81: (F0) (U80-Q80)/6
T81: (F0) +$N$81*2000
U81: (F0) (1-$N$81)*400
V81: (P1) (5*$V$80+($T$81/$P$81))/6
W81: (P1) (5*$W$80+($U$81/$Q$81))/6
X81: (P1) (5*$X$80+($K$81/1000))/6
Y81: (P1) (5*$Y$80+($L$81/5000))/6
J82: 22
K82: 0
L82: 0
M82: (F3) (5*K82)/L82
N82: (F2) +N81+O82
O82: (F2) +N81*(1-N81)*(M82-1)*1
P82: (F0) +$P$81+$R$82
Q82: (F0) +$Q$81+$S$82
R82: (F0) (T81-P81)/6
S82: (F0) (U81-Q81)/6
T82: (F0) +$N$82*2000
U82: (F0) (1-$N$82)*400
V82: (P1) (5*$V$81+($T$82/$P$82))/6
W82: (P1) (5*$W$81+($U$82/$Q$82))/6
X82: (P1) (5*$X$81+($K$82/1000))/6
Y82: (P1) (5*$Y$81+($L$82/5000))/6
J83: 23
K83: 0
L83: 0
M83: (F3) (5*K83)/L83
N83: (F2) +N82+O83
O83: (F2) +N82*(1-N82)*(M83-1)*1
P83: (F0) +$P$82+$R$83
Q83: (F0) +$Q$82+$S$83
R83: (F0) (T82-P82)/6
S83: (F0) (U82-Q82)/6
T83: (F0) +$N$83*2000
U83: (F0) (1-$N$83)*400
V83: (P1) (5*$V$82+($T$83/$P$83))/6
W83: (P1) (5*$W$82+($U$83/$Q$83))/6
```

```
X83: (P1) (5*$X$82+($K$83/1000))/6
Y83: (P1) (5*$Y$82+($L$83/5000))/6
J84: 24
K84: 0
L84: 0
M84: (F3) (5*K84)/L84
N84: (F2) +N83+O84
O84: (F2) +N83*(1-N83)*(M84-1)*1
P84: (F0) +$P$83+$R$84
Q84: (F0) +$Q$83+$S$84
R84: (F0) (T83-P83)/6
S84: (F0) (U83-Q83)/6
T84: (F0) +$N$84*2000
U84: (F0) (1-$N$84)*400
V84: (P1) (5*$V$83+($T$84/$P$84))/6
W84: (P1) (5*$W$83+($U$84/$Q$84))/6
X84: (P1) (5*$X$83+($K$84/1000))/6
Y84: (P1) (5*$Y$83+($L$84/5000))/6
K87: 'NorCommA
L87: "NorCommB
K88: +K60/100
L88: +L60/500
K89: +K61/100
L89: +L61/500
K90: +K62/100
L90: +L62/500
K91: +K63/100
L91: +L63/500
K92: +K64/100
L92: +L64/500
K93: +K65/100
L93: +L65/500
K94: +K66/100
L94: +L66/500
K95: +K67/100
L95: +L67/500
K96: +K68/100
L96: +L68/500
K97: +K69/100
L97: +L69/500
K98: +K70/100
L98: +L70/500
K99: +K71/100
L99: +L71/500
K100: +K72/100
L100: +L72/500
```

K101: +K73/100
L101: +L73/500
K102: +K74/100
L102: +L74/500
K103: +K75/100
L103: +L75/500
K104: +K76/100
L104: +L76/500
K105: +K77/100
L105: +L77/500
K106: +K78/100
L106: +L78/500
K107: +K79/100
L107: +L79/500
K108: +K80/100
L108: +L80/500
K109: +K81/100
L109: +L81/500
K110: +K82/100
L110: +L82/500
K111: +K83/100
L111: +L83/500
K112: +K84/100
L112: +L84/500

Selected Bibliography

Chonko, Lawrence B. and Ben M. Enis, Selling and Sales Management: A Bibliography, American Marketing Association: Chicago, 1980.

Cyert, R. M., and J. G. March, A Behavioral Theory of the Firm, New Jersey: Prentice Hall, 1963.

Darmon, Rene, "Salesman Behavior and Compensation Structure," New Marketing for Social and Economic Processes and Marketing's Contribution to the Firm and to the Society, 1974 Combined Proceedings, Chicago: American Marketing Association, pp. 503-508.

Darmon, Rene, "Alternative Models of Salesmen's Response to Financial Incentives," Operational Research Quarterly, Vol. 28, No. 1, i 1977, pp. 37-49.

Davis, Otto, and John Farley, " Allocating Sales Force Effort with Commissions and Quotas," Management Science, Vol. 18, No. 4, Part II, December 1971, pp. 55-63.

Farley, John, "An Optimal Plan for Salesmen's Compensation," Journal of Marketing Research, Vol. 1, May 1964, pp. 39-43.

Forrester, Jay, Industrial Dynamics, Cambridge, Ma: The MIT Press, 1961.

Katona, George, Organizing and Memorizing, New York: Hafner Publishing Co., 1967.

Kreutzer, David P., "A Microcomputer Workshop Exploring the Dynamics of Arms Races," System Dynamics Group Memo D-3689-1, MIT, Cambridge, MA, 1985.

Lyneis, James M., Corporate Planning and Policy Design: A System Dynamics Approach, Cambridge, Ma: The MIT Press, 1980.

Meadows, Dennis, "STRATAGEM-1: A Resource Planning Game," Environmental Education Report and Newsletter, Vol. 14, No. 2, 1985, pp. 9-13.

Meadows, Dennis and John D. Sterman, "Stratagem-2: A Microcomputer Simulation Game of the Kondratiev Cycle," Simulation and Games, Vol. 16, No. 2, June 1985, pp. 174-202.

Montgomery, David B., Alvin Silk, and Carlos Zaragoza, "A Multiple-Product Sales Force Allocation Model," Management Science, Vol. 18, No. 4, Part II, December 1971, pp. 3-24.

Morecroft, John D. W., "A Behavioral Simulation Model of Sales Planning and Control in a Datacommunications Company," Working Paper WP-1761-86, Alfred P. Sloan School of Management, MIT, Cambridge, MA, March 1986.

Morecroft, John D.W., "System Dynamics: Portraying Bounded Rationality," OMEGA: The International Journal of Management Science, Vol. 11, No. 2, 1983. pp. 131-142.

Morecroft, John D. W., and Mark Paich, "System Dynamics for Reasoning About Business Policy and Strategy," Working Paper WP-1606-84, Alfred P. Sloan School of Management, MIT, Cambridge, MA, revised April 1986.

Simon, H. A., "Rationality and Decision Making," Models of Man, New York: John Wiley, 1957.

Sterman, John D., "Behavioral Modeling of the Economic Long Wave," Journal of Economic Behavior and Organization, Vol. 6, 1985, pp. 17-53.

Sterman, John D., "Instructions for Running the Beer Distribution Game," System Dynamics Group Memo D3679, MIT, Cambridge, MA, Oct. 1984.

Vancil, Richard F.,"What Kind of Management Control Do You Need?" Harvard Business Review, March-April 1973, pp. 75-86.

Weisberg, Edward J., "Sales Force Decision Models: Analysis and Review of the Recent Literature," MIT Master's Thesis, 1981.

Winer, Leon, "The Effect of Product Sales Quotas on Sales Force Productivity," Journal of Marketing Research, Vol. 10, May 1973, pp. 180-183.