

THE RATIONALE, DESIGN, IMPLEMENTATION,
AND EVALUATION OF BUSINESS SIMULATION
GAMING AS A TOOL FOR MANAGEMENT LEARNING.

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RESUME

The concept of Business Simulation Gaming is a relatively new term in the vocabulary of Business educators.

This study adopts a Systems Approach to Business Simulation Gaming for the purpose of :

- (i) creating an overall awareness of the Enlarged Gaming System beyond the mere Implementation phase; and
- (ii) demonstrating its role as a valuable tool of learning.

The four major components of this thesis, namely, the Rationale of Gaming, the Design Process, the Implementation Process and the Evaluation Process, combine to form an integrative whole - the Enlarged Gaming System - in contributing to the stated objectives.

The Rationale of Business Simulation Gaming

Management Development needs are those identified as requiring technical knowledge, a spectrum of management skills, and appropriate behavioural attributes. Further, a set of learning principles considered most conducive to effective learning, are identified.

Each method of learning, in particular, the lecture, the case study and the Simulation Gaming approaches, is evaluated with respect to the degree to which they satisfy the identified

management development needs and conform to the stated principles of learning.

The conclusion drawn is that no other method of instruction can singularly contribute as much to the learning process as the Simulation Gaming Approach.

The term 'Business Simulation Games' is a global term which can be divided into an array of classifications. This demonstrates how Business Games can be adapted to suit different management learning requirements.

The Design Process

Every Business Simulation Game (computerised, that is) whatever its purpose, has a basic configuration (structure) consisting of the following components : the programmed instructions, the Game parameters, the history file, the decision variables, and the performance reports.

In addition, there are peripheral Game Design elements which enhance the learning potential of the media. These elements are, inter alia, work sheets, player's manuals, course-game integrative assignments, forecasting and optimisation tools, and sensitivity analysis facilities.

As a pointer to the future in Game Design, consideration could be given to the following points :

- (i) incorporation of company objectives and policies into the formal Model,
- (ii) multi-period processing, and
- (iii) inter-industry gaming models.

The Implementation Process

The implementation of a Business Simulation Game should be viewed as an Integrated Training System.

The first two subprocesses are those of needs assessment and objective setting for the group under consideration.

The third subprocess, that of the design of the Simulation Training program, consists of several parameters which define general conditions and trends which would need to exist and develop respectively if the objectives were to be met. These parameters are, inter alia, the selection of training media, choice of Simulation Model, duration of play, frequency of contact sessions, group structure, the physical gaming environment, and the role of group advisors.

The implementation (execution) phase - the fourth subprocess in the Simulation Training program - is perhaps best discussed with regard to the chronological order of events.

- (i) The preparations prior to the initial meeting involve the preparation of a time schedule for the Game, a pre-test of the computer model, the initialisation of history and parameter values, familiarisation with the Game rules, and a compilation of supplementary learning material.
- (ii) The introduction to the Gaming process may be seen as consisting of 3 phases - each contributing to the preparation of the participant for the approaching Gaming experience. These phases are : the orientation session, the trial decision period, and the post-trial-decision period.
- (iii) The actual operation of the Game involves the co-ordinator in a number of activities aimed at creating that environment most conducive to effective learning. These activities include : counselling of teams, manipulation of the Game environment, a broadening of the educational experience, accumulation of performance data, and an array of procedural matters pertaining to the collection, processing and return of Company data.

The fifth and final subprocess in the Simulation Training program is that of Evaluation of participant's performance. This subprocess runs concurrently with the final review session which is the fourth and final chronological event of the Implementation subprocess. (For ease of understanding, the final review session's contribution is discussed under the Evaluation of

participant's performance subprocess).

The overall evaluation of participants in a Gaming experience can be divided into two parts : the first involves the participant in a general post-play discussion critique, while the second part is a more formal attempt at evaluating the benefit to each individual participant. This latter function involves : an evaluation of the economic performance of each team, an assessment of the quality of related assignments, and an analysis of the individual's behaviour within the group.

The Evaluation Process

The Evaluation of Games can be interpreted in three ways :

- (i) the assessment of Games as a teaching device, particularly in comparison with other teaching methods,
- (ii) judgement of a particular Game in relation to specified teaching objectives; and
- (iii) the evaluation of the performance of participants involved in the operation of the Game chosen by the co-ordinator.

The last interpretation was discussed in the previous section (the Implementation process) as it forms an integral part of the Simulation Training program. The remaining two interpretations are discussed in this section.

A literature survey of studies conducted in the sphere of the Evaluation of Business Simulation Gaming as a tool of learning produced two major conclusions :

- (i) research findings were generally inconclusive, and upon comparison with similar studies, conclusions drawn were in parts contradictory; and
- (ii) there is a general lack of generalisability of empirical findings.

Possible reasons for this state of nature could be found in

- (i) the research methodology and design of each experiment, and
- (ii) for the collective findings, in an array of exogenous factors such as the type of Gaming Model used, the physical environment, the Game administration, the natural biases within the courses, the different value or goal systems operational, and differences among researchers as to exactly what to study.

As a prelude to future research there is a great need to standardise on certain variables in the research design. For without agreement among researchers on a defined array of variables, conclusions will continue to remain localised to that set of circumstances only.

Conclusion

Business Simulation Gaming is still a relatively new and exciting tool to many, but unless its purpose is properly understood and carefully used, its full benefit will not be felt.

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PART ONE

THE RATIONALE OF BUSINESS GAMING

CHAPTER 1

ESTABLISHING MANAGEMENT DEVELOPMENT NEEDS

1.1 Introduction

This chapter provides firstly, a background to the need for management education through outlining the complex nature of management.

Secondly, the attributes necessary for a manager to cope with his work environment are identified.

Such a discussion is necessary since the contribution of simulation gaming to management development can only be shown in relation to established training needs. The extent to which the simulation approach is able to fulfill these needs will be discussed in Chapter 2.

1.2 The Complex Nature of Management

The problems of leadership and management have increased in complexity during the centuries and particularly in recent decades.¹ The reasons for this occurrence are to be found in the environment in which our business leaders have to operate. Demands are continually being made on this limited resource of management from a multitude of directions as illustrated by Steiner's² conceptual model of the major societal areas of interrelationship with business. (See Exhibit 1.1).

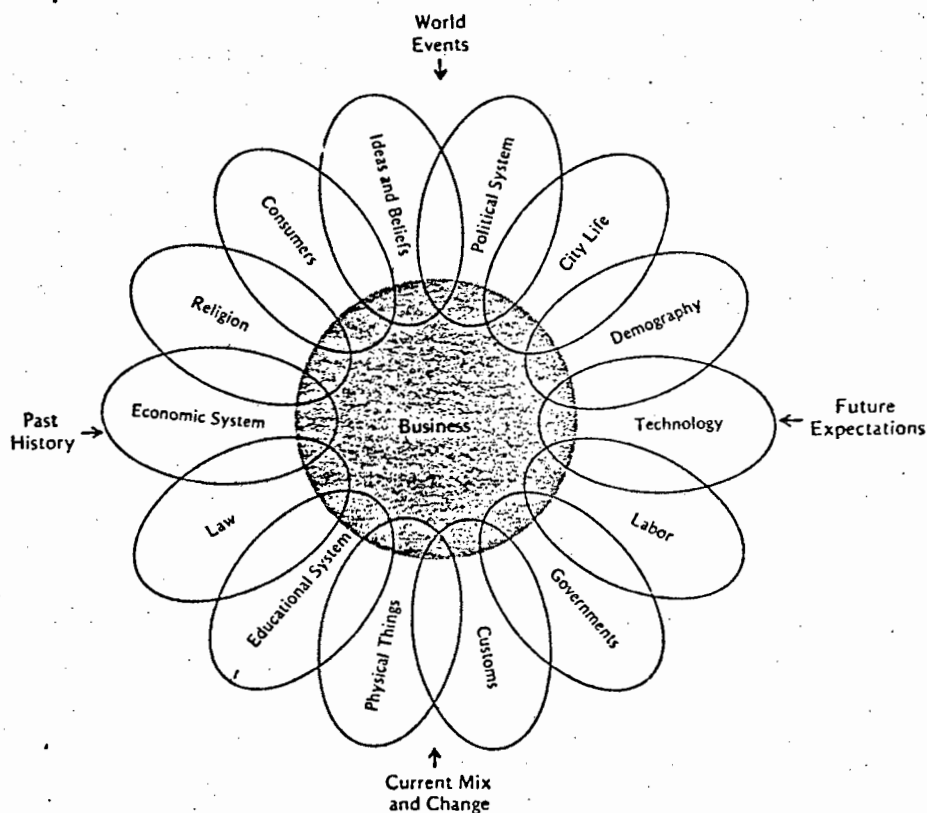
This illustration shows that past history has an impact on the current mix of relationships in society. The mix of factors and direction of change are also influenced by current world events and by what is going on in society at the present time. The changes are influenced as well by future expectations.³

The business environment has never been static, but today it is changing in scope and depth to a degree not encountered for several hundred years.⁴

One of the environmental pressures on management is the growing criticism of business from the general public.⁵ Allegations range from misuse of political power and the exploitation of consumers and workers to the degrading of the environment and a lowering of the quality of life.⁶

EXHIBIT 1.1²

Business and Its Major Societal Areas of Interrelationship



A different dimension of attack lumps together alleged shortcomings of the economic system.⁷ The economic environment is a source of opportunity as well as a threat to management.⁸ There has been, in a very broad sense, a constant encroachment on business freedom of decision making in the market place because of growing government regulations.⁹ The legal environment is also having its impact on business. Not only have legal actions in all areas increased rapidly, but exposure and potential liability for business also have risen explosively.¹⁰ Even within the organization, management pressures have mounted. Employees are demanding that their interests be considered in the managerial decision-making process.¹¹

This discussion, though far from complete, is intended to illustrate the complex environment in which today's managers must still exercise their basic function (which has not altered at all over the decades) of combining the factors of production.¹²

Drucker observes that economic change has made his (the manager's) life more complicated and concludes that increased complexity requires a greater degree of sophistication.¹³

In the accompanying table, Steiner indicates a few of the major managerial practices which are undergoing change and the direction in which they point. See Exhibit 1.2.

Taken together, the synergistic effect of all the environmental influences are having a great impact on the decision making process. Unless the manager is aware and familiar with the appropriate knowledge and methods, the quality of decisions will suffer. Further, managers will end up reacting to crises instead of controlling and shaping their environment.

This increasing complexity and uncertainty of the manager's environment, both inside and outside the organization, argues Morris,¹⁴ places a premium on the development of resourcefulness.¹⁵ (See Note 1.)

Note 1.

Morris outlines the anatomy of the resourceful manager as: flexible intelligence, technical abilities, social abilities, emotional resilience, drive for continued effectiveness, effective judgements in situations of uncertainty, commitment to fundamental values.

EXHIBIT 1.2

Recent Past Versus Future Managerial Practices		
RECENT PAST	TOWARD	FUTURE
Assumption that a business manager's sole responsibility is to optimize stockholder wealth		Profit still dominant but modified by the assumption that a business manager has other social responsibilities
Business performance measured only by economic standards		Application of both an economic and social measure of performance
Emphasis on quantity of production		Emphasis on quantity <i>and</i> quality
Authoritarian management		Permissive/democratic management
Short-term intuitive planning		Long-range comprehensive structured planning
Entrepreneur		Renaissance manager
Control		Creativity
People subordinate		People dominant
Financial accounting		Financial and human resources accounting
Caveat emptor		Ombudsman
Centralized decision-making		Decentralized and small group decision-making
Concentration in internal functioning		Concentration on external ingredients to company success
Dominance of solely economic forecasts in decision-making		Major use of social, technical, and political forecasts as well as economic forecasts
Business viewed as a single system		Business viewed as a system of systems within a larger social system
Business ideology calls for aloofness from government		Business-government cooperation and convergence of planning
Business has little concern for social costs of production		Increasing concern for internalizing social costs of production

SOURCE: Steiner, 1972(B): 4.

1.3 Qualities of Executive Leadership

If a manager is to make an effective contribution toward the achievement of company objectives, he must have a capacity for analysing problems and making the right decision.¹⁶ It is only through the quality of leadership that the firm's potential is eventually realized.¹⁷ Three categories have been identified in which there is a need for managers to be proficient in order to fulfil their role.^{18, 19, 20, 21.} They are, broadly, technical knowledge, skills (analytic and decision making), and behavioural attributes.

1.3.1 Technical Knowledge

Knowledge consists of retained observations, facts and interrelationships and the ability to manipulate the various elements.²²

The area of substantive knowledge consists of the things which intellectually and rationally managers need to know about. This can range from the most recent textbook in management theory to techniques of management like network analysis or professional or vocational skills like those of accounting.²³

The acquisition of knowledge must not be limited only to the manager's specific field, for example, marketing, personnel; but must also embrace related areas. Such knowledge will provide the manager with a deeper understanding of the variables - both controllable and uncontrollable - involved when taking a decision. It could introduce the manager to variables of which he was not aware or serve to illustrate the relative importance of each variable. Each variable interacts with one or more other variables, and the acquisition of technical knowledge, in the writer's opinion, would form the basis for understanding the nature of these interactions.

The acquisition of knowledge is also important to enable managers to function effectively in a variety of situations with different rules of the game.²⁴

This need for flexibility can be accomplished by giving managers, at the knowledge level, a broad understanding of differences in the business environment.²⁵

This conceptual knowledge will allow the manager to see the whole organization, including how the parts are dependent on one another.²⁶ With this background, managers should be able to show greater appreciation of another's point of view.

At the functional level, this exposure to areas other than their own, should in the writer's opinion, improve a manager's understanding of how his function fits into the larger system. This should serve to unify managerial efforts toward achieving overall company objectives rather than suboptimizing the system through compartmentalized thinking.

Thorough knowledge, even if it were possible, is far from being enough.²⁷

1.3.2 Skills in Managing

Skills are the ability to do things, to use the knowledge, to mobilize personality resources in order to carry out certain activities to accomplish certain tasks.²⁸

There are 7 skills which Markwell and Roberts²⁹ identify as being important for managers. The first of these is

- i. observing to take note of a situation.
- ii. Secondly, with the increasing volume of information termed the "information explosion",³⁰ the ability to obtain and process the right information for the right decision is vital.³¹
- iii. This need for selecting the pertinent data and information presupposes the third skill of diagnosing the problems. The importance of a manager's ability to find problems that need to be solved before it is too late is illustrated by the unexpected decline in profits of a number of multimarket companies in 1968 and 1969 in the U.S.A.³² The sharp drop in the earnings of one of these companies - Litton Industries - was caused, its chief executive explained, by earlier management deficiencies arising from the failure of those responsible to foresee problems that arose from changes in products, prices and methods of doing business.
- iv. The fourth requirement is that of formulating alternative solutions. This involves organizing the information at his disposal as well as making reasonable assumptions when data is not available. In most real life decision situations, the alternative actions are far from obvious and a great deal of effort may be required to generate feasible alternatives.³³ Generating creative alternatives is not easy; hence, the decision maker needs general guidance and specific techniques to assist him in this part

of the decision process.³⁴

- v. The actual making of decisions constitutes a fifth identifiable skill sought in managers. Decision making can be defined as the process by which a course of action is consciously chosen from available alternatives to achieve a desired result.³⁵ Numerous techniques for aiding decisions have been developed and improved considerably, though a large element of "art" remains in making good decisions.³⁶ A desired attribute in the "art" is decisiveness. This involves a willingness on the part of a manager to come to a decision without the support of scientific knowledge and without complete information.³⁷
- vi. Sixth, the skill of communicating effectively is required. The fact that a large part of management work involves oral and written communication emphasises the importance of communication skills.³⁸ The nature of good communication is the preparation and presentation of written reports, letters and memoranda; getting the best out of a meeting, either as its chairman or as a member; and effective speaking to groups and individuals.³⁹ Some successful managers undoubtedly develop effective communication skills on an intuitive basis, while others would probably be more successful with a better understanding of the objective content of the communication problem.⁴⁰
- What ever the method used, the end result must be a manager with effective communication skills.
- vii. The final skill as identified by Markwell and Roberts is the ability to motivate people. The manager's primary interest is in that segment of motivated behaviour affecting the organization member's job performance, level of effectiveness, interest in work, and participation in company responsibilities. The manager also benefits from understanding motivation through improved self-insight.⁴¹ That a manager has an obligation to his organization to influence the behaviour of subordinates along the lines deemed appropriate to organizational goals, emphasises the need to develop motivational attributes.⁴² This subject of employee motivation is extensively covered in the literature,^{43, 44} and it is suffice to say, for our purposes, that managers can benefit greatly by attempting to understand and apply the findings from numerous behavioural and organization studies undertaken.⁴⁵

The list of skills reviewed are not complete, but at least these are some of the principal ones that a business can expect its management to employ.⁴⁶ In each instance, the basis of the attribute is knowledge, but its successful implementation is a matter of practice and experience.⁴⁷

1.3.3 Behavioural Attributes

Until very recently, Markwell and Roberts⁴⁸ assert, the most neglected area of management education was that of modifying and developing the attitudes, values and behaviour of managers. Further, they feel it is these which motivate or constrain the manager in his actions and convert his knowledge, skills and experience into an efficient management operation which will seek to achieve and establish the goals of a business. They believe that if a manager is not committed to achieving the optimization of his operation, all his knowledge and experience is likely to be of little use. This emphasises the extreme importance they attach to favourable management attitudes towards the work situation.

Miner,⁴⁹ when discussing motivational levels in management, identifies six attitudes and motives most likely to contribute to success in a given managerial position at any level, and to rapid promotion up the managerial ladder. They are:

- i. a favourable attitude toward authority,
- ii. the desire to compete,
- iii. assertive motivation,
- iv. the desire to exercise power,
- v. a desire to capture the attention of others through distinctive kinds of behaviour, and
- vi. a sense of responsibility.

Concerning values, Markwell and Roberts state that if a manager does not share the values of the concern within which he is working, or at least the norms of the subsystem of which he is a part, he is unlikely to be a motivated manager or an efficient one. In addition his behaviour toward his colleagues, supervisors and subordinates determines the extent to which he will make an effective contribution to the achievement of organizational goals.

1.4 Conclusion

The increased importance attached to the management role nowadays has made it almost impossible for the needs of management to be obtained from on-the-job experience alone. A formal education preceding or during the holding of a management position has become almost obligatory if the keyword is to be "success".

This tripartite division into knowledge, skills and experience, and attitudes, values and behaviour provides a basis on which to build up a management education programme, the purpose of which is to produce managers who are efficient by being knowledgeable, experienced, perceptive and adaptable.⁵⁰

CHAPTER 1

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CHAPTER 2

LEARNING PRINCIPLES AND METHODS IN MANAGEMENT DEVELOPMENT

2.1 Introduction

This chapter will comment on some aspects of the field of methodology in management education. It will deal with factors which have an influence on the learning process in general, as well as considering the teaching methods available in management education. In particular, the place of simulation gaming in the teaching spectrum will be emphasised. Also a discussion will be given on the relationship between the principles of effective learning and teaching methods.

2.2 Factors Influencing the Learning Process

Learning can be described as a relatively permanent change in attitude, and consequently, behaviour.¹ Learning may involve an addition of new information, an unlearning of incorrect information, or a modification of knowledge in terms of adjusting the old to the new.²

To facilitate learning, it is necessary to understand the various factors which bear upon the learning process. Garry and Kingsley³ group the many variables under three headings:

- i. Variables associated with the individual learner. Variables of this nature which they feel will affect the outcome of learning include maturation, readiness, capacity, motivation and personality traits.
- ii. Variables associated with the task to be performed. The meaningfulness of the task to be learned, its difficulty, its similarity to previously performed tasks, its pleasantness, and the manner in which it is organized or presented are variables which affect the speed of learning and the amount of retention obtained.
- iii. Environmental variables. These are too numerous to mention all, but include variables such as frequency of response practice, knowledge of results, the type of incentives and the relationship³ between incentives and the motives characterising the individual learner, as well as factors of a social nature

(attitudes, values, social restraints).

Hounsell et al⁴ have identified six factors thought to be important to promote learning.

i. Motivation

Both the attitude of the student (in terms of his motivation to learn) and the extent to which the instructor can motivate his students, play a leading role in the learning process. Motivation has many forms,⁵ some of which are relevant to learning and others which are not. It is therefore important that instructors should have an adequate understanding of the part that "need satisfaction"⁶ can play in effective learning. It should be emphasized that establishing motivation does not itself complete the learning, instead it simply prepares the way for the learning that is to follow.⁷

ii. Stimulus, Response and Reinforcement

Attention has to be given to the particular stimulus, to the checking of the accuracy of the response and to an appropriate reward (reinforcement). The effectiveness of this stimulus - response mechanism can be further enhanced if it can be repeated regularly and supplemented by some form of reward. Evidence seems to indicate that the more frequent and prompt reinforcement is, the more effective learning will be.

iii. Feedback

In order to learn effectively, the student needs to know how successful he has been. This can only be achieved through feedback of results which is probably the single most important source of reinforcement for the student.

Also, for feedback to be effective it must be given as soon as possible. If feedback is delayed, it is difficult for a student to determine whether his approach is acceptable.

The effect of this learning principle on the learning process would tend towards maximization if the learning situation could be arranged so that the student is given a series of intermediate goals, and is provided with constant, precise feedback as to his progress.

iv. Participation and Practice

It has been shown in experiments that the more a student participates in the learning situation, the more effective will be the learning, particularly where he is learning a skill.

Participation also means practice or repetition of the concept and behaviour to be learned which is necessary for use in the real life situation.

v. Transfer or Application of Knowledge

A lesson from the learning process is simply that one tends to forget what one has learnt if it cannot be applied. It has been shown that learning is easier and of greater value if the student can see its relevance and applicability to his own situation. Also, to promote greater understanding, attention should be called to those aspects that are common to other topics and to the various activities in which elements of the topic are employed.⁸

vi. Perception

Perception may be defined as the ability to recognize significant features of stimulus situations and select appropriate courses of action.⁹ According to Garry and Kingsley,¹⁰ perception is an activity upon which much of our learning depends. At the same time, it is modified and developed through learning. Sensory thresholds, discrimination skills, and meaning and interpretations can all be improved through training.

An instructor relies on the perception of the student when he arranges the course material so that it makes sense to him (the student) and allows him to build up a coherent structure without difficulty.

To influence the perceptions of the students, on the other hand, an instructor must attempt to understand their perceptions and relate the material to their understanding. Learning will be to no avail if the instructor is not realistic in discussing his subject in relation to the students' background and experience. Learning will not be effective unless it is a meaningful experience in terms of their needs and aspirations.

The above discussion provides some insight into the kinds of factors that must be borne in mind by educators if learning, in general, and management education

in particular, is to make any significant impact on the development of the individual.

2.3 Methods of Instruction

As a rule, training objectives of educational programmes in management must be defined in terms of changes to be effected in knowledge, skills and experience, and attitudes and behaviour (see chapter 1.3). This should afterwards lead to improved managerial action.¹¹ The methods of instruction, as will be seen from the discussion, differ in their ability to impart new knowledge, influence attitudes and develop practical skills.

Hawrylyshyn¹² has developed a simple but interesting model of instruction methods based on the experience of the Centre d'Études Industrielles in Geneva. In this model six participative methods of instruction namely, field studies, incident method, case method, decision simulations, role playing and group projects, are related to the general skills which a manager should possess (see exhibit 2.1).

According to Hawrylyshyn, a method reaches its peak of effectiveness only in connection with a specific purpose. Hence, the purpose of any management training programme must be clearly spelt out in order that the appropriate method or combination of methods of instruction may be employed.

It is interesting to note that Hawrylyshyn¹³ uses the identical management skills in his model as those identified by Markwell and Roberts.¹⁴

The various methods of instruction will now be discussed. The emphasis will be on the merits of each to achieve the training needs of managers.

2.3.1 The Lecture Method

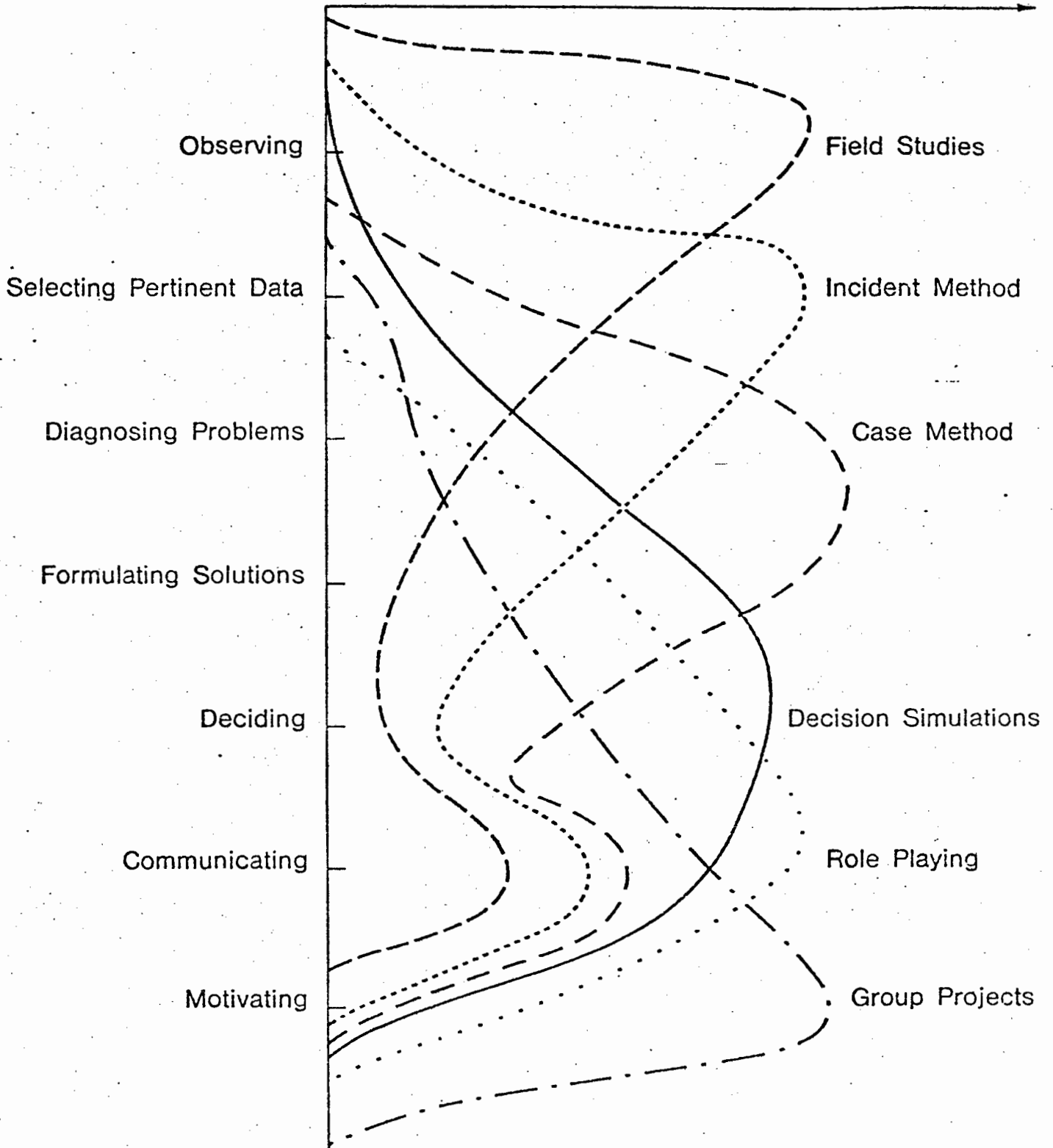
The formal lecture has long been the main teaching method for imparting theoretical knowledge and because it is an economical method, it is likely to continue to be the main method of instruction.¹⁵ Further, the instruction of large classes can only be effectively achieved through the lecture method.

Bligh¹⁶ considered three main kinds of objectives attributed to the lecture

EXHIBIT 2.1¹²

Management Skills:

Effectiveness:



Effectiveness of Participative Methods

method by the Hale report on University Teaching Methods (1964) and commented on each as follows:

Objective 1: The acquisition of information which includes knowledge of principles, knowledge of facts and simple comprehension. A survey of 91 studies¹⁷ comparing teaching methods allowed Bligh to conclude that the lecture is as effective as any other method for transmitting information, but not more effective.¹⁸

Objective 2: The promotion of thought. The Hale Report regards the lecture as a means of awakening critical skills - the emphasis being on 'awakening'. It does not claim that critical thinking can be taught by lecturing, nor that lectures are the best way of developing it. Bligh's hypothesis that "most lectures are not as effective as active methods for the promotion of thought"¹⁹ is accepted and concludes as follows: "I am not denying that lectures can provide the necessary information for students to think about later, but the instructor must do something to make sure that they do think about it, and this requires something more than the traditional lecture."²⁰

Objective 3: Changes in Attitude which include (a) interest and enthusiasm for a subject and (b) the acquisition of values associated with the subject and (c) changes in personality such as personal adjustment to a professional role, self awareness and sociability. Bligh's survey of research literature produced the following conclusions:

- i. stimulating student interest in a subject should not normally be the major objective of a lecture, because the method is usually ineffective for this purpose,²¹
- ii. lectures are ineffective in changing people's values, but they may reinforce those that are already accepted,²² and,
- iii. because lectures are situations in which the student is expected to be relatively passive, they are not situations in which his personality is exercised, or in which he is expected to 'socialize'. The focus of attention is on the lecturer and what he says, not on the student.²³

To summarize, Bligh states that although it is sometimes believed that the lecture method can fulfill three kinds of functions, the available evidence

suggests that it can only effectively achieve one - the student's acquisition of information.

Often the argument is put forward that a student can acquire the same amount of knowledge, if not more, through reading text rather than attending lectures.

This may pertain to certain students, but the lecture does offer certain advantages to the student. These include²⁴

- i. helping the student to find his way, especially when dealing with complex material;
- ii. offering a framework and overview of a topic which will facilitate understanding through receiving direction, and seeing the topic in perspective; and
- iii. imparting aspects of recent research.

A lecture also serves to clarify points of difficulty and confusion encountered in texts by students. Moreover, the personal contact of a lecture can go beyond merely imparting knowledge and clarifying points of confusion - the lecturer has it within his power to motivate, inspire and develop worthy attitudes to the study of a subject.²⁵ But this is greatly dependent upon the personality and enthusiasm of the lecturer. Bligh comments that some acting ability may be advantageous to a lecturer who wishes to enthuse his audience.²⁶

One of the main drawbacks of the lecture method is that it is largely a one-way communication process.²⁷ The lecturer has little, if any immediate feedback on the extent to which he has achieved any of the objectives he may have set. A student too, lacks immediate feedback - one of the requirements of the learning process - which could test his understanding of the knowledge acquired.

Attempts to promote feedback and participation through asking questions, through posing problems requiring audience response or through evaluation forms are made, but none of the responses, which are direct replies and shortlived, are spontaneous nor meaningful for the development of the student.

Since the lecture method does not demand active involvement of participants, it is largely unsuited to the teaching of the necessary management skills which require practice.²⁸ Also, as seen above, it is of little value in promoting behavioural and attitudinal changes, which is a large part of management

development. But, however, management development does depend upon the acquisition of certain basic theoretical knowledge for which the lecture method is well suited.²⁹

Thus, although learning is an active process and a lecture requires the participant to play a passive role, the lecture method is one important facet in the education spectrum which contributes toward the development of a manager. Alone it cannot do it.

2.3.2 The Case Study Method

The acquisition of knowledge is only one aspect of the education of a potential manager.³⁰ The development of analytic and decision making skills is another.

Unlike the lecture, which is a heavily passive, receptive mode of learning, the case study is an active, involving mode of learning.³¹ A case study may be defined as a history of some event or set of circumstances from a business environment.³² It requires of participants the synthesis of a large amount of different kinds of information, the diagnosis of the causes of a particular problem and the making of recommendations or decisions to rectify the situation.³³

Rarely is the amount of information required for decision making unlimited and often a manager has to make decisions on the basis of incomplete information and under conditions of uncertainty.³⁴ The case study method through providing such facts and other information as may be available, offers a participant the opportunity to improve his ability to take wise decisions and make plans for their successful implementation. Thus the prime purpose of the case study method in management education is to help participants develop their skill in discovering and defining the vital questions that need to be answered and then to learn how to set about finding the answers.³⁵

The ILO handbook also identifies two subsidiary benefits which flow from the use of the case study: (i) it helps participants accumulate a store of knowledge and (ii) it acquaints them with current business practice.

The case study technique is based on the belief that a participant can best attain managerial understanding and competence through the study, contemplation and discussion of actual situations. The rigorous analysis required, especially

in the longer cases, is said to develop habits of logical thinking and a consistent pattern of behaviour toward analysis of business situations. It embodies in a participant the need to search for as complete information as possible before reaching conclusions.

Bligh³⁶ comments that a case study has value in showing students what they do not know, and in some cases, what they cannot know. In this way it may teach students to reserve their judgement and to recognize the need to seek further information.

Rockart and Morton³⁷ see case studies as developing what may be termed "attentive reading" skills - the ability to carefully read and analyse material presented to him. They also identify two further advantages of case studies.³⁸ Firstly in the preparation of the case material with other members, the student is exposed to the assumptions, biases, and predispositions of others toward a particular set of facts. As a result, they argue, the student often gets greater insight into himself, as well as into the content of the material. Secondly, the need for a student to present his ideas on the case, adds skill to his repertoire. This forces the participant to organize case facts to back up his views and more importantly, provides practice in the presentation and defence of his views against those of his peers. Thus the participant is provided with an opportunity to develop confidence as well as the ability to communicate clearly.

One limitation of the case approach however, is its inability to allow participants to follow through with their decisions and observe the full consequence of them. A case study leads the student to the point of decision making and there it stops. In this sense, the participant learns to make decisions in a static environment.³⁹ He has no way of knowing whether his decisions are 'good' or 'bad'.

A second limitation is described by Rockart and Morton as follows: "if the case study method is strong with regard to analysis and presentation, it is weaker from the view point of rapid assimilation of facts and concepts."⁴⁰ Because general principles are derived from the detail of numerous specific

instances, a fairly large number of cases must be studied. This requires a lengthy course programme if real benefits are to be attained.

Apart from the criticism of being a time consuming method of instruction there is the problem of student frustration as a result of having no "right" answer to the case problem or there may even be a question as to just what the problem is.⁴¹ This latter criticism is applicable mainly to those participants who have not had previous experience with this method. Most participants pass through this stage successfully; they learn that management situations are often ambiguous and that there frequently is no single best solution.

These limitations aside, the case study method has an invaluable role to play in reinforcing theoretical knowledge, developing communication skills and providing experience in the analysis of business situations in preparation for decision making.

2.3.3 The Simulation Method

In the lecture, the student's role is passive. In the case study method the student is involved in discussion of action. In the simulation method the emphasis is on "doing".⁴² For the first time, the student is actively involved in, and responsible for, implementing the entire decision making process.

The context in which the simulation method is used here is in terms of simulation gaming as it applies to the business environment.

Loveluck⁴³ defines management simulation gaming as a "dynamic teaching device which uses the sequential nature of decisions, within a scenario simulating selected features of a management environment, as an integral feature of its construction and operation."

Through attempting to bring the elements of practical decision making into the classroom, a business simulation game warrants the description of a dynamic sequential management decision making exercise. This is achieved by requiring the student to make repeated decisions in a changing environment created and influenced partially by his actions.⁴⁴

According to the "pragmatic school of thought"⁴⁵ on management, the key activity of managers is decision making. This they believe can only be developed through experience. They do however recognize that simulation gaming can go a long way to developing the necessary decision making skills in managers.

Different simulation games have different specific objectives, but there appears to be general agreement among game proponents as to the basic objectives of the simulation method of instruction. To illustrate, the ILO Management Training and Research team⁴⁶ identify four major aims of management games. They are designed to increase a person's understanding of

- i. specific organizational problems (marketing, production, etc.),
- ii. the inter-relatedness of the functions of an organization and its relation to its environment,
- iii. the problems of organizing policy and decision making, and
- iv. the problems of working in a team.

Herron⁴⁷ describes the aims of a management game as follows;

- i. to condense a large amount of decision making experience,
- ii. to integrate knowledge from the different functional areas and produce a balanced overview of the organization,
- iii. to make clear the necessity of reaching decisions with incomplete data,
- iv. to provide experience of "role playing" in each of the different functional areas,
- v. to allow participants to make decisions, see the effects thereof, and live with the consequences,
- vi. to make experimentation possible,
- vii. to directing attention to the importance of determining the significant factors and relating these properly to long range planning, and
- viii. to allow participants to become personally "involved" in a realistic situation.

Schriesheim,⁴⁸ in an attempt to identify what management games teach, clustered the numerous objectives put forward by various proponents into learning attributes. The following are what business games are claimed to foster:

- i. decision making skills,
- ii. planning and forecasting skills,
- iii. recognition of the interrelationships in business,
- iv. high participant interest and motivation,
- v. knowledge of facts and use of specific techniques,
- vi. interpersonal skills,
- vii. bearing of the consequences of decisions,
- viii. organizing ability,
- ix. communication skills, and
- x. acceptance of the computer.

The simulation method offers certain advantages over the lecture method and the case study approach to management education by virtue of:

- i. the act of commitment to a set of decisions and having to live with their consequences is unique to the gaming process;
- ii. repetitive decision making reinforces concepts and principles more readily than do the other two methods;
- iii. feedback - an important principle of effective learning - is an inherent feature of the simulation method;
- iv. it stimulates great interest and involvement by virtue of its dynamic nature. This has a greater bearing on attitudes and behaviour patterns which, according to Hawrylyshyn,⁴⁹ are acquired through experiential conditioning, i.e. through a more affective, emotional process. The simulation process offers a greater opportunity for this than do the other two methods.
- v. like the case study, but unlike the lecture, the emphasis is on self-discovery, and
- vi. the dynamics of group behaviour are more pronounced than in the case approach.

In summary, the simulation method can contribute significantly to satisfying the needs of managers in the three areas broadly defined as knowledge, skills and attitudes. But simulation is not intended - and should never be considered - to replace the lecture and the case approach. Rather, it has a vital complementary role to play in management development.

Its place in the teaching spectrum alongside the established methods of the

lecture and the case study is now unassailable.

2.3.4 Other Methods of Instruction

Until recently the armoury of teaching and training methods suitable for management education was quite modest. However, during the last fifteen years more than any other previous time, many new methods have been developed, tested, combined and adapted to different learning situations.⁵⁰ Some of the methods are entirely new; others are more or less imaginative adaptations of older methods. Some are simple and can be used by virtually any instructor without any special training; others are fairly sophisticated, and it is not advisable to use them without extensive preparation of both instructor and course participant.

The author does not intend to discuss these other methods in detail.

These methods may be classified either as participative or non-participative in nature.

2.3.4.1 Non Participative Methods

The non participative methods are to a large extent concerned with imparting knowledge and to a lesser degree involved in developing certain management skills as defined by Markwell and Roberts.

The exercise⁵¹ requires participants to undertake a particular task, leading to a required result, following lines laid down by the instructors. It is usually a practice or a test of knowledge put over prior to the exercise.

The project⁵² or fieldwork is an extension of the exercise and gives participants much greater opportunity for the display of initiative and creative ideas.

The particular task is defined but the approach is left to the choice of the participant. Projects may be posed for individuals as well as for groups which then makes it participative.

In-basket training⁵³ can be classed as a simulation method. The participant is presented with an in-tray of files, incoming letters, memos, staff studies, letters prepared for his signature by subordinates, and other similar material they will be required to deal with at the place of work.

The instructions are to work through the contents of the tray and take action on each piece of work.

Programmed Instruction⁵⁴ usually involves a printed paragraph of information closely followed by a question (or questions) to which the student must respond - usually through multiple choice or through fill-in-the-blank. Feedback on the accuracy of his answer(s) and hence on his ability to assimilate the material is instantaneous. This instruction method may be paper based or computer based.

2.3.4.2 Participative Methods

Through group interaction the participative teaching methods are more suited to re-inforcing knowledge (as opposed to imparting it) and developing a wider variety of management skills. Also they are more likely to influence attitudes and behaviour patterns.

The Incident method⁵⁵ is a variant of the case study approach. The material of the case is limited to only a single incident. The emphasis is on participants to decide what additional information is needed and to find it. This additional information relevant to the incident is known only to the discussion leader and will only be made available to a group upon request for it specifically. If no one is astute enough to ask the proper questions, key information is withheld. A case study, on the other hand, presents all the necessary facts and requires participants to recognize its importance.

Role play⁵⁶ requires participants to enact, in the training situation, the role they could be called upon to play in their work environment. This method is used mainly for the practice of dealing with face-to-face situations. In role playing each participant is free to develop the characterization of the role as he sees fit.

Consequently the outcome cannot be predetermined.⁵⁷ Problems tackled using this approach require not only the display of knowledge and skills, but also attitudes which adds a new dimension of experience to the learning process.⁵⁸

Sensitivity Training⁵⁹ (group dynamics) puts participants into situations in which

- i. the behaviour of each individual in the group is subject to examination and comment by the other participants;
- ii. the behaviour of the group as a whole is examined.

Sensitivity training attempts to influence the attitudes, values, judgements, perceptions and emotional awareness of managers.⁶⁰ Through this, it aims to increase knowledge of how and why people at work behave as they do. Also it aims to increase the skills of working with other people and getting work done through them.⁶¹

Other more discussion type participative methods include the panel discussion, the symposium, the plenary session and the study group.

It is important to remember that each method of instruction is capable of achieving certain objectives and will fail with respect to others. It is the responsibility of the instructor to decide upon his course objectives and then select those methods of instruction most likely to achieve the stated objectives.

2.4 Relationship between the Principles of Effective Learning and Teaching Methods

The objective of any education and training for management is only fulfilled by creating situations which are favourable to learning and in which learning actually takes place.⁶² That is why all management education programmes must be developed with careful consideration given to the principles of human learning.⁶³

This section will cover selected aspects of the relationship between principles of learning and teaching methods. Of course, principles of learning are not put into effect through the teaching method alone. Numerous other factors, such as the instructor, the participant's own "achievement motivation quotient", the stimulation provided by the environment and others can also have a bearing on the learning process. However, the methods used in training can influence the learning process significantly and should be examined.

Exhibit 2.2 succinctly illustrates the application of some principles of learning in teaching methods. The matrix is self-explanatory.

The rating is based on the personal assessment of Kubr.⁶⁴ Two observations can be made from the matrix:

EXHIBIT 2.2⁶⁴

APPLICATION OF SOME PRINCIPLES OF LEARNING IN TEACHING METHODS

Principle	Method	Training on the job	Lecture	Group Discussion	Case Study	Business Game	Role Playing	Application Project	Reading Assignment
Motivation		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Active involvement		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Individual approach		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sequencing and structuring		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Feedback		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Transfer		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Rating: Good Average Weak

- i. those teaching methods which involve direct and actual contact with the business environment - namely on-the-job-training and projects - come closest to incorporating the principles of effective learning;
- ii. of those teaching methods which can be exercised in the classroom, the simulation gaming approach rates the best on the six principles of effective learning.

2.5 Conclusion

Management training needs are essentially threefold: appropriate theoretical knowledge, the development of a spectrum of managerial skills, and the promotion of desirable attitudes and behaviour patterns toward the work situation.

Further, these needs can best be satisfied by adopting methods of instruction that actively apply the principles of effective learning.

From the preceding discussion it will be seen that the simulation gaming approach, apart from incorporating all the learning principles discussed in chapter 2.2, also shows itself, by virtue of its dynamic nature, capable of contributing to the fulfillment of the multidimensional needs of management. It is the author's opinion that no other method can singularly contribute as much to the learning process as the simulation gaming approach.

However, this does not mean it must be used to the exclusion of all other methods. On the contrary, this approach can reach its full potential only when supplemented by other training methods, usually lectures and case-studies.

Thus, Simulation Gaming should now be considered a cornerstone in management development programmes.

CHAPTER 2

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CHAPTER 3

THE VERSATILITY OF SIMULATION GAMES IN MANAGEMENT LEARNING

3.1 Introduction

Until this point in the study, the term "Business Simulation Games" has remained an amorphous entity. This chapter will expand on this term to show how Business Games can be adapted to suit different management learning requirements. This will involve considering both the area of coverage of games and those features of games that dictate the choice of a given model.

3.2 Classification of Business Simulation Games by Coverage

A Business Game is a mathematical representation of a business environment.¹ The elements and relationships in the actual situation are represented by symbols and functions in the model.

It is possible to construct numerous mathematical functions for the same situation. This representation can vary in depth, scope and/or emphasis. Similarly, it is possible to develop mathematical functions for a wide spectrum of business activities.²

Consequently, a business game can be devised for almost any business situation. However, not every business game is appropriate for every learning situation. Hence, to assist in the selection of a suitable model for a given learning situation, it is useful to classify business games initially according to their coverage of organizational activity.

3.2.1 Business Policy Simulations

These may be known as alternatively 'top management', 'total enterprise',³ 'management',⁴ or 'general management',⁵ games.

Such simulations are a representation of the organization as a whole, and include all major functions of the firm.⁶ Participants are required to make decisions at the top management level.

The integration of the different functional areas, such as marketing, finance, production and personnel, allows participants the opportunity of observing both the direction and magnitude of their decisions on total company operations.⁷ Apart from this overview provided, participants also become aware of the nature of the functional interrelationships in terms of the effect that a decision in a given functional area has upon related areas.

The model is structured in such a way that competition between companies in the simulated industry is an integral feature.⁸ This requires participants to take cognisance of competitors' behaviours in planning their own course of action. Thus the difficulties which the participants must resolve, when involved in a Business Policy Game, refer both to i. the consequences of the decisions upon their company structure, and ii. the overall competitive effects of their decisions upon industry performance.⁹

The majority of management games used for educational purposes are of this type. Appendix 1 identifies a selection of Business Policy Games.¹⁰

3.2.2 Functional Business Simulation Models

In functional management games, the emphasis is on a particular function of the organization.¹¹ Detailed interrelationships which are obscured through aggregation in Business Policy Games are exposed.

The use of these functional games is to provide indepth study into the workings of a particular functional area, for example, marketing, finance, personnel or production. They are also aimed at teaching better decision-making at the middle and lower levels of management.¹²

The influences of the related functions in an organization are held constant or reduced to a minimum to allow maximum concentration by participants on the behaviour of the particular area of interest.¹³

The element of competition in functional games still exists between companies, but differs in nature to that found in Business Policy Games. Participants are only concerned with the internal operations and consequences of decisions. The performance of each company is independent of the behaviour of competitors,

and competition is on the same basis as that of athletes in a track event.¹⁴

Without the need to consider competitors' actions, the decision-making process lends itself to greater objective analysis, and in some of these games, optimum solutions can be calculated.

Appendix 2 illustrates a selection of functional management games.

3.2.3 Specific Aspect Models

The degree of specialization in subject matter is greater in these simulation types than in the two types mentioned above. Games in this category are used to represent subfunctional or specific aspect systems. These include simulations of inventory systems, scheduling patterns, pricing strategies, investment appraisals and many others.

Again, the interrelationships highlighted at this level are likely to have been obscured through aggregation at the functional and business policy levels.

As with functional games, the major purpose of subfunctional modelling is to expose participants to the more detailed workings of the particular subsystem and so train them in a specific problem solving technique. Unlike the other two types of business games which operate according to a predetermined number of decision periods, there is no fixed period of simulation over which performance is evaluated.

Specific aspect simulation gaming is conducive to a real time approach where input, in the form of a few decisions, at a computer terminal produces an immediate response which in turn requires another input. Each participant operates the model on his own and for as long as he feels it necessary for him to fully understand the ramifications of the subsystem under study. Hence, possibly the greatest potential in these games is their ability to provide individualized instruction, not only in terms of self-pacing but also variation in content, difficulty of problems, style and mode of presentation.¹⁵

Such simulation games are appropriate for use by students of management as well as practicing managers at the middle and junior management levels in particular.

Appendix 3 shows a selection of specific aspect simulations in the field of operations management.¹⁶

3.3 Additional Classification of Business Simulation Games

Apart from differentiating between business games on the basis of their subject matter, there are other dimensions of classification which must also be considered by the training officer or lecturer when selecting a particular game. Each business simulation model will possess every attribute discussed below and can be identified in terms of these attributes.

Certain of these attributes can assume only one of two possible states of nature (for example, a game is either interactive or non-interactive); while others can be classified as being at some point along a continuum (for example, a game possesses a certain degree of complexity).

3.3.1 Classification One: Level of Management

The level of management where decisions are being simulated is closely linked to the classification of models by area of coverage. By and large it is true that Business Policy games are geared for top management, while functional games aim at middle management.¹⁷ The more specialized subfunctional games are used primarily to train middle and junior management. However, the latter, depending on its subject matter, may also be of value at the top management level.

3.3.2 Classification Two: Individual versus Group Decision-making

Many games, notably at the functional and, more especially, at the subfunctional levels, are designed for each participant to represent an individual decision-making unit. In what is probably a majority of games, however, group decision-making is the rule.¹⁸

The rationale of group decision-making, in the writer's opinion, is based on two considerations:

- i. The sheer volume of work involved makes it impractical for an individual participant to handle it alone; and
- ii. at the equivalent levels of management in practice, group decision-making is more the rule than the exception. Hence group involvement in a gaming situation is in line with the approach adopted in practice.^{19,20}

Despite the great emphasis on involvement within a group, an individual must also be prepared to make decisions on his own.²¹ Practice in this field is provided to a certain degree by the functional management simulations and definitely by the specific aspect simulation models. Also, depending on the internal structure of the group in Business Policy games, individual decision-making can take place. This could happen, for example, if each individual member of a group was assigned a specific area of responsibility. Then, although group discussion may cover each area of responsibility, the final decision rests with that area head. In this manner individual decision-making within the framework of group involvement can be developed.

3.3.3 Classification Three: Interactive versus Non-interactive Simulation Models

A simulation game is interactive if the performance of one group is affected not only by its own decisions, but also by the decisions of the other groups²² - as in a game of tennis where a player's performance is directly affected by the actions of his opponent.

A non-interactive game on the other hand involves no direct or even indirect influence of one group on another's behaviour. In this type of game each team is largely in command of its own performance; or at least its performance is the result only of its own decisions²³ - as is the case of competing athletes in a track event.

Interactiveness is a feature of inter-company (between companies) as well as intra-company (within a company) relations. Thus its incorporation in top management games is justified.

Functional games are more often non-interactive.²⁴ However marketing orientated functional games, such as COMPETE,²⁵ which attempt to reproduce the dynamics of a market are almost always interactive.²⁶ COMPETE involves only marketing decisions - hence its classification as functional. Since groups are competing for a common resource, market share, the model is fully interactive. In the words of the authors of COMPETE: "each team's results for that period depend on its own decisions, the decisions of its competitors, and the market environment for that period."²⁷

An example of a non-interactive functional game is PROSIM V²⁸ - a production game. Here groups (or individuals) are working to minimize costs through efficient operation. They are not competing with one another in the market, but are striving for the highest possible score relative to a perfect operation.²⁹

Subfunctional simulation models are, almost without exception, non-interactive. As discussed in chapter 3.2.3 the model is activated by an individual's decisions only.

The competitive element can exist in both interactive as well as non-interactive simulation environments. In the former, competitive behaviour is the result of competing for a common resource. In the case of the latter, participants vie for the best score independently of each other.³⁰ A machinist, for example, in a non-interactive situation, can attempt to beat his/her own best prior output level or strive to achieve or exceed some standard set by the planners.

Competition is a useful device for generating motivation. Whether the model be interactive or non-interactive, competition - inherent in both - tends to elicit greater intensity of effort and application than is usual in non-competitive situations.³¹ In the simulated business environment, this improves productivity and promotes the learning process.

3.3.4 Classification Four: Manual versus Computerized Simulation Models

The prime distinction between a manually operated game and a computer-based game is that in the former the computations are performed by the participants or coordinator while in the latter a computer performs the calculations necessary for the game to advance.

The use of a computer for calculation purposes however, opens the door to a higher level of sophistication in gaming development.

A manual game can handle only a few variables. Further, the functions linking the variables are primarily linear due to the considerable effort involved in computing the results of dynamic interactions among even a limited number of variables.³²

Thus the main drawback on manual simulations appears to be the volume of

'figure-pushing' that can be achieved by participants in an allotted time period. Obviously it could never match the time taken by a computer to generate an equal volume of output. The results of these time consuming manual operations as opposed to computer-based games may be summarised as follows:

- i. fewer periods of simulated operations for a given time period can be performed, and
- ii. the degree of realism in a hand simulation model is reduced.

Greater realism is achieved by including additional variables into the underlying mathematical model. Consequently the nature of the relationships become more complex.³³

It would appear from the above discussion that manual simulations are undesirable. However, within the framework of manually manageable simulations, there are conditions under which they are acceptable - if not preferable to computer-based simulations.

- i. There are many specialised purposes where the type of interaction simulated is reasonably unsophisticated. In these instances, hand calculations are quicker and more economical³⁴ than setting up and executing a computerized model, particularly if the simulation will only be used once.

An illustration of a hand simulation of practical relevance can be found in appendix 4.³⁵

- ii. By manually working through the relationships, participants are able to get a better grasp of the interrelationships involved. This can be achieved in a shorter period of play than by using a computer-based model. The proviso at all times is, however, that the relationships are simple, the variables are few and the computations are manually manageable.
- iii. If no computer facilities are available, simulation gaming can still take place. Even if the coordinator has access to a computer, development and running costs may not make it a viable proposition. Manual games are definitely less costly to run.³⁶ Although the lack of and/or high cost of computing facilities may impose some limitations on the application of simulation, it by no means prevents the use of this technique in the

learning situation.

- iv. A customary representation by proponents of manual games is that these games can be made to incorporate a certain sensitivity, a degree of personal judgement and an adaptation to the particular circumstances of a given game play (i.e. greater flexibility) something which they say computerised games can never aspire to. This is a claim made for MATRIX, the plant manager game developed by the Procter and Gamble Company (U.S.A.).³⁷
- v. In many cases the purposes of game play can also be achieved with but modest degrees of realism, making the use of a manual game natural.³⁸ According to Carson³⁹ games can be quite simple and still be used to illustrate management principles.

The major virtues of computerised games on the other hand are:

- i. More decision periods for a given actual time period can be simulated.
- ii. Computers can handle data extremely rapidly. This reduces the time between making decisions and receiving details of the consequences. This has great pedagogical virtue of retaining interest by keeping a fast pace throughout the game.⁴⁰
- iii. A game developed for computer operation can be very much more realistic and complex than a hand-operated game, by virtue of (ii).⁴¹
- iv. Many games that can be scored by hand are converted to computer scoring where one is available because of the speed with which it produces results (see ii. above), less chance of error and neater reports.⁴²

3.3.5 Classification Five: Degree of Complexity

Business simulation games may be categorized according to the degree of complexity they incorporate.⁴³ They range from the single product, single market game with only a few decisions to make, to the multiple products, multiple markets, highly dynamic games with hundreds of decision variables to be decided each period.⁴⁴

INTOP⁴⁵ - International Operations Simulation - is an example of the latter type.

To illustrate, in the Carnegie game, a team may make as many as 300 decisions in a given period - although a viable operation may frequently be conducted on the basis of a third (or less) as many. The INTOP simulation goes one step further,

in that there is actually no limit on the number of decisions a company may make in any one period.

There is no connection, in the writer's view, between complexity and the level of management at which a game is aimed. It does not follow that Business Policy games are the most complex and that the complexity decreases as one moves toward subfunctional simulations. To illustrate, the games 'Integrated Simulations'⁴⁶ and 'Business Policy'⁴⁷ are both top management simulations. However, the former can be classified as 'relatively simplistic' while the latter as 'reasonably complex'.

Complexity may evidence itself in game rules, in the structure of decision forms, in the simulation model itself and/or in the number of decisions to be made.⁴⁸

An intensely complex simulation model can obscure the core relationships and variables which allow participants to understand the primary workings of the system under study.

Complexity has a trade-off with playability.⁴⁹ Playability refers to the ease with which a game can be implemented and operated by participants. If participants find they can make no headway in the simulation, brought about by a high degree of complexity, unfavourable attitudes toward gaming can develop.

However, both playability and complexity are relative concepts.⁵⁰ The terms take on more relevance when considered in the light of the level of advancement of the participants. What one group of students at a certain level may find too complex to play, may be considered too simple to play by students at another level. In the Carnegie and Chicago simulations each team may settle for the degree of complexity, hence playability, in its operations which seems most suitable or challenging to it.⁵¹

(This subject is revisited in chapter 4.3.1.2.1.)

3.3.6 Classification Six: Quantitative versus Qualitative Factors in Simulation Models

Games may also be classified according to the extent to which they incorporate qualitative elements. These include technological developments, consumer resistance, worker productivity, machine failures, company goodwill, product

differentiation and many others.

Computerised simulation models - which comprise the bulk of simulation games in business⁵² - are constructed using mathematical symbols and functions. As a result inputs in the form of decisions and outputs in the form of financial statements are primarily quantitative in nature.

However methods have been devised to simulate the behaviour of qualitative elements for inclusion in business game models. Each model must be assessed in terms of the type and amount of qualitative influence incorporated.

Two methods of involving qualitative elements in business simulation games will be illustrated.

3.3.6.1 The Inclusion of Uncertainty⁵³

This is achieved through the use of a (pseudo) random number generator. Again, in the writer's view, there are two ways in which such random number generators may be used:

- i. The behaviour of a particular element is dependent entirely upon the performance of the random number generator. This is the case with Research and Development. The development of a new process and/or product is primarily the result of technological know-how,⁵⁴ - a qualitative factor - and financial resources available. To simulate the development of a new product and/or process, recognition must be taken of both financial and technological resources. The value from a random number generator, when compared with the level of financial investment in R & D, according to a given criteria, determines the success or otherwise of the R & D function. The occurrence of strikes and bad debts can be simulated in a similar way.
- ii. The random number generator plays a modifying role. Here the basic value of a given function, for example plant output, is deterministic. A generated random number is then used to modify this initial value (by say 5 to 10%), to incorporate the element of uncertainty. In the plant output example, the modification is a reflection of variability in worker productivity.

3.3.6.2 The Effectiveness Factor⁵⁵

Several modern games include this effectiveness (carry-over) factor which will vary the response of functions to a set of decisions. This factor is not a random number; rather it is under the full control of the decision makers.

It is calculated on the basis of a company's decisions relative to the decisions taken by competitors. Depending on the final value of this factor, it could have a booster or depressing effect upon the company's results. There is thus an incentive for participating management groups to make consistently high quality decisions which will favourably effect the carry-over factor. It is also termed the carry-over factor since its value is carried over to the following decision period to promote continuity.

Thus although simulation models can only be presented mathematically, it is no real hindrance to the incorporation of qualitative factors.

Instructors in management training programmes, when selecting a business game, must be aware of the level of qualitative influence that any particular game can offer.

3.3.7 Classification Seven: The Degree of Role Play Involved in Business Simulation Models

Role playing according to Garvey⁵⁶ is where a participant assumes an identity, other than his own, for the purpose of acquiring experience in a set of activities in which he seeks competence. In the business game context the participant is involved in a management role requiring interaction within groups. This interaction revolves around the preparation of company decisions. In this respect every business simulation game using group decision making is a role playing experience. Participants assume the identity of company managements and undertake to act out behaviour patterns characteristic of these decision making roles.⁵⁷

However, the role playing experience can be developed beyond mere discussion within a group (the level of role playing achieved in most business simulation games) to permit intergroup involvement.

This extended role play allows participants to deal with hypothetically created

human relations problems or other conflict situations which must be satisfactorily resolved for the healthy continuation of business operations.

Two examples of this extended role play in business games is

- i. collective bargaining for the settlement of wage disputes,⁵⁸ and
- ii. negotiation of loans between companies and banks.⁵⁹

Some of the advantages which accrue from these extended role play exercises within the framework of a business game can be noted as follows:⁶⁰

- i. they provide practice in interpersonal skills,
- ii. they provide for testing ideas and hypotheses,
- iii. they provide training in emotional control, and
- iv. they provide training in communication skills.

The degree of role play in a business game is a function of:

- i. game design, in that the developer must provide for those variables over which conflict or discussion between appropriate groups can arise; and
- ii. the game coordinator, in terms of the number of conflict situations he will permit.

The implication for the instructor using a business game in a management training programme is clear. He must be aware of the opportunities for role play in a given game as well as being able to promote and regulate the occurrence of such situations.

3.3.8 Conclusion

Managers, who are living in a world of rapid change and extensive interaction, must continually improve their own decision making skills or end up reacting to crises instead of controlling activity. Apprenticeships and experience are not enough; a formal and efficient technique is needed to augment the manager's experience.

The technique must be formal - that is, capable of precise documentation - so that it can be learned quickly and applied directly to new situations. The technique must also be efficient so that its cost does not increase in proportion

to the complexity of the situation.⁶¹

The central theme of this dissertation thus far has been to demonstrate that business simulation gaming is just such a technique.

The attributes necessary for today's managers to operate effectively and efficiently were identified in Chapter One. The extent to which business games can contribute to their fulfillment is described in Chapter Two. However, this latter chapter also shows that business games alone cannot satisfy all management needs but it does show that business simulation games forms an important integral part in any management training programme. Chapter Three explores the versatility of business games to demonstrate the multiplicity of learning situations to which they can be adapted.

All of these chapters are "rationales" for the use of business simulation games in the sense that, combined, they suggest that games can profitably be utilized in an educational context.

CHAPTER 3

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PART TWO

THE DESIGN PROCESS

CHAPTER 4

THE STRUCTURE OF A BUSINESS SIMULATION GAME

4.1 Introduction

This section on "Game Design" aims to identify the important design elements necessary to produce a workable model capable of contributing toward the learning process in management.

This discussion will emphasise the systems approach to the design process.

In this chapter the basic structural components of a Business Game are isolated and discussed in detail.

4.2 The Systems Approach

The systems approach looks at the way in which parts and subsystems of a system interrelate.¹ Generally the objective is to examine the parts to see how they can contribute to the optimization of the entire system.

Game design can be considered a system with interrelated components. The effectiveness of the finished product is a function not only of the quality of the individual components, but also of the manner in which they link up.

The design process, in the writer's view, is itself a subsystem of a larger system, namely that of management training. Unless the simulation model used in a management training programme is appropriately designed to meet the training objectives, the system will be suboptimized.

As Churchman² observes: "We seem forced to conclude that anyone who actually believes in the possibility of improving systems, is faced with the problem of understanding the properties of the whole system, and that he cannot concentrate his attention merely on one sector. The problem of system improvement is the problem of the 'ethics of the whole system'".

4.3 A Basic Form for Organizing Business Simulation Games

Formulating business simulation models is, in one respect, more difficult than formulating other quantitative models. If, for example, a system can be

described in a way that meets the assumptions of linear programming, the theory of linear programming itself forms a guide to subsequent model building. It defines the organization of the data and the way the data are used to solve the problem. However, when building a simulation model the designer will find very few guidelines for representing the system because there is no well developed 'situation - independent' theory of simulation analogous to that of linear programming.³

Since computerised business simulation games are more predominant and used more frequently than hand simulations, this discussion will focus only on computer-based models.

The term 'business simulation game' refers not only to the set of programmed instructions which defines the characteristics of the simulated environment, but also the peripheral elements which are as essential as the program itself for the game to operate.

Figure 4.1 presents the overall configuration of a business simulation game. As seen from the diagram, the system is a recursive input-output process.⁴ Inputs occur in the form of the decisions that participants take, the parameter values which determine the behaviour of certain functions within the simulated environment⁵ and finally, the history data which records the past performance of each group in the simulation. The values from these three sources combine to shape the environment of the system being simulated.

The programmed instructions or computer program merely define the nature of the relationships which must exist in the system.⁶ In this sense, it forms the framework of the system which must then be filled out and shaped by the behaviour of the participants as well as the simulation coordinator. Participants control the 'decisions' input and the coordinator the 'parameters' input. The history data are initially established by the coordinator, but thereafter are determined by group decisions.

The input values are processed according to the set of programmed instructions. The resultant output shows the present status of the system. The output consists firstly of statements usually of a financial nature, and reports covering non-financial information for the attention of the participants (see appendix 5 for

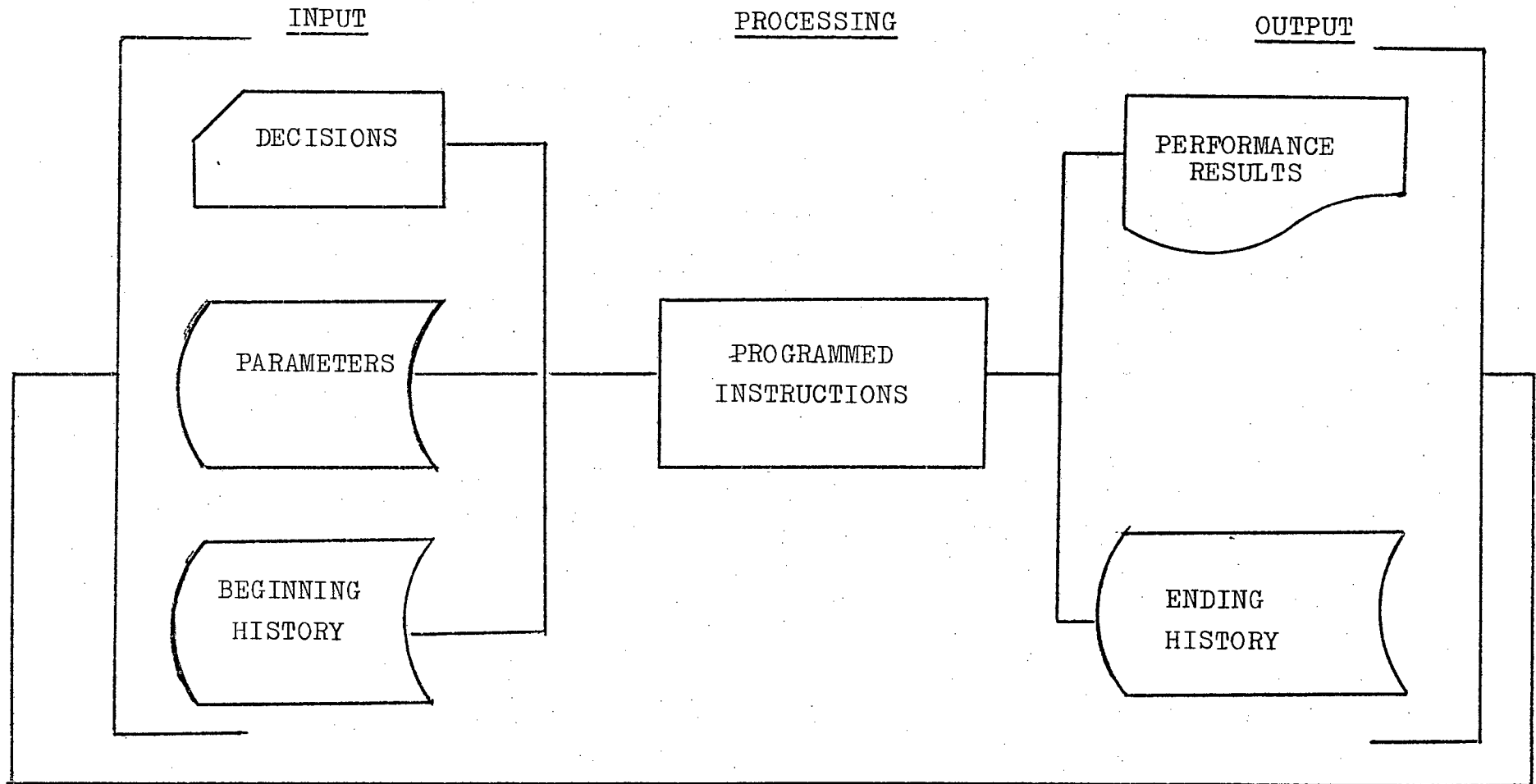


EXHIBIT 4.1 : CONFIGURATION OF A BUSINESS SIMULATION GAME

an illustration⁷) and secondly, of a new set of history data which is an updated version of the past performance of each competing team.

The parameter values are not classed as output as they remain constant throughout the simulation run.⁸

The dynamic nature of a simulation model is obtained through continual repetition of this input-output process⁹ where each period's history output and performance results respectively form the history data and basis for decisions of the next period's input. Every iteration of the system corresponds to one simulated period of operation. Each of these structural elements of the Business Simulation Model will now be considered in detail and emphasis will be placed on their design features.

The order of discussion will be:

- i. the programmed instructions,
- ii. the parameters,
- iii. the history file,
- iv. the decision variables,
- v. the performance reports, and
- vi. the new history file.

4.3.1 The Programmed Instructions

It is true to say that a Business Simulation Game revolves around the computer program which processes the decisions and generates the results of performance.

It is the writer's experience that the success of the simulation technique as a tool of learning is dependent upon every element of the system being above criticism from participants. Among the most prone of these elements to criticism is the computer program. Great care must therefore be taken to ensure the correctness of the relationships as defined by the program. Poor functional structures, if exposed, can destroy the credibility of business simulation games in the eyes of participants. Also if the game does not allow participants to have reasonable control over their destiny through their decisions and/or if it imposes unreasonable restrictions upon their actions, it is likely to be a failure. The accompanying learning impact is likely to be minimal.¹⁰

There are several important factors of game design relating to program construction which must be considered by a game developer to ensure an acceptable model.

They are:

- i. the purpose of the Game,
- ii. the formulation of the functional relationships,
- iii. mechanical decision making,
- iv. the use of random effects,
- v. the inclusion of theoretical concepts, and
- vi. model stability and sensitivity.

4.3.1.1 The Purpose of the Game

Every game should have a purpose. The purpose of the game should be that it fulfils some training goal.¹¹

Meurs¹² emphasis very strongly the links between design and objectives. He states: "It should be clear that what can be taught with a game depends largely on the characteristics of that game. This means that a game can only meet its objectives if these objectives serve as a basis for the design. The kind of game, its scope, the elements that are or are not incorporated, should be determined by reference to the purposes of its use. Different objectives lead to different types of games. Too many people, up to now, have failed to recognize that necessary link between objectives and design."

Thus before a game designer starts delving into mathematical formulation he should have a clear idea of

- i. the objective(s) to be achieved through the use of the game, and
- ii. the target market of the game.

Both these conditions, the writer has found from developing the INTERACT model,¹³ dictate the scope of the model, the level of detail and the spread of emphasis that will be built into the computer program.

To illustrate, if the simulation game is to be used as an introduction to the concepts of management and for providing an overview of the organization for students in their first semester of management studies, then only major functional

relationships should be included. Aggregation of numerous variables should eliminate unnecessary detail. Also equal weighting to the different functional areas should be given to provide a balanced, simplistic general management business game. If, on the other hand, the purpose broadly is to deepen understanding in a particular functional area and the target market is middle management, then the model must reflect, in depth, the direction and intensity of relationships in that functional area. The scope is narrower, the detail is greater and the emphasis is heavily biased in favour of the given functional area. Appendix 6 reproduces the purpose of INTOP as an illustration.

The importance of objectives in guiding the construction of a game program is clearly indicated by McKenney¹⁵ who coordinated the design of the Harvard Business School Management Simulation Game over the 5 year period of its development (1961-66) when he stated: "This committee spent long hours in developing an appropriate set of teaching objectives, how these objectives might be implemented, and the resultant changes in the model."¹⁶ Later he continues: "It has been an iterative process of selecting learning goals, creating a game design and evaluating the results in order to reselect goals."¹⁷

4.3.1.2 The Formulation of the Functional Relationships

As was previously stated, simulation models represent abstractions of reality and are generally designed to provide understanding of key relationships among variables. The nature of the relationships to be used however, require careful thought prior to formulation.

Carlson and Misshauk¹⁸ specify two aspects concerning relationships:

- i. what relationships are to be demonstrated, and
- ii. what information is needed in order to establish these relationships.

4.3.1.2.1 What Relationships to Demonstrate

This aspect requires careful consideration of the scope, depth and emphasis to be reflected by the model. It is at this point that the orientation is developed which will carry through the model design. Within this framework, two determining factors are:

- i. the reality-complexity trade-off, and
- ii. the nature of the potential participants.

The first problem involves an analysis of the trade-off between designing a game that represents reality and its complexities versus a game that is relatively easy to understand and requires a minimum of participant computation.¹⁹

Realism, complexity and playability are three closely interrelated concepts and a discussion on realism must involve the other two as well.²⁰

Thorelli and Graves distinguish between objective realism and subjective realism.²¹

Objective realism refers to the degree and manner to which the actual situation (object system²²) is portrayed by the model. They maintain that the degree of objective realism need be no greater than called for by the purpose of the game.

This belief is supported by Carlson and Misshauk²³ who state that "the degree of realism is determined by the purpose of the game". If the purpose is to demonstrate competitive interaction, or group interaction for example, then a high level of objective realism is of lesser importance. The participants then need only a rational background of facts and data. If, on the other hand, the game is to illustrate the dynamic interaction and behaviour of a system such as a specific product, in a particular environment, which is subject to various states of nature, then the game must be considerably more realistic and complex. All the possible interactions between the variables such as price, lead times, seasonality and/or product quality must be carefully and accurately represented.²⁴

This raises a further issue concerning objective realism, namely, that the variables and problems selected from the object system must be linked in a meaningful manner and that they represent the types of functions, data and situations encountered in real life. A game designer must avoid what is clearly unrealistic.²⁵ The relationships that are set up must possess acceptable characteristics that could reasonably be expected to occur in practice. The writer has experienced a number of such cases. Only one example will be cited:²⁶

This particular simulation model allowed overtime production to take place only through the acquisition of additional plant capacity. This defeats the purpose of overtime and blurs the distinction between extending the use of existing facilities (overtime) and the acquisition of additional facilities (expansion).

Objective realism can also be preserved through the avoidance of blatant errors in logic. Two examples from past experience include:

- i. depreciation being considered as a cash outflow, and
- ii. the 'cost of goods sold' function was based on the number of units produced and not - as should have been - the number of units sold.

Closely linked to objective realism and to a great degree dependent upon it, is subjective realism. Since the model represents to participants aspect of object system reality, it must give to them the appearance of or the effect of reality. Simulation does not always require reproduction of reality in every detail. But it does require capturing the relevant aspects as the participants see them. This effect is called verisimilitude, which means that, while the simulation is obviously an artificial representation, it has the quality of being true to life or to human experience.²⁷ "If the players are not subjectively convinced that the simulation is reasonably realistic," Thorelli and Graves state, "they are apt to believe - rightly or wrongly that nothing good can come out of it."²⁸

Higher levels of objective realism frequently call for greater degrees of complexity.²⁹ Increased complexity meanwhile (in terms of the number of decision variables and the degree to which they are interrelated), according to the Cohen-Rhenman hypothesis,³⁰ increases the degree of subjective realism. However, Thorelli and Graves note that sooner or later the designer will run into diminishing returns along the complexity axis. This is caused by

- i. the increasing scarcity of knowledge concerning the nature of interactions in a system as complexity increases, and
- ii. the limitation of playability.³¹

(The trade-off between playability and complexity was discussed in chapter 3.3.5.)

In a research study into the educational value of management games by Raia³² (referred to again in chapter 8) he was able to conclude on the basis of empirical findings that relatively simple games will provide essentially the same benefits as one that is more complex.

Wikstrom,³³ in his discussion of the decision making process, warns of excessive gam

reality. He indicates that too much realism permits the trainees to perform on the basis of their normal operating procedures which they have developed on the job, instead of forcing recognition of the importance of constant analysis, and gaining experience in the decision making process.

On the other hand, when there is too little reality, involvement and interest wane rapidly, and participants view the business game merely as a game. Such attitudes can reduce the learning effectiveness.³⁴

Thus, given that there is no formula for trading off realism and complexity, the designer is faced with the problems of determining the degree of complexity to provide the realism deemed necessary.³⁵ Too complex a model does not permit identification of the underlying structural or causal relationships and the impact of the decisions cannot be determined. As a result, the learning experience is reduced to merely trying to understand and play a complex game.

The second factor bearing upon the choice of the functional relationships should be the capabilities of those to be participating in the game.³⁶ (This relates back to the definition of purpose which required a statement of the target market of the proposed game). Those with little business background may have difficulty in recognizing complex or involved relationships since they may not have been exposed to the principles that govern these relationships. For this category of participant, less sophisticated models may provide a more useful learning experience.

4.3.1.2.2 Information Needed to Establish the Relationships

The second major aspect requiring the designer's attention according to Carlson and Misshauk, is to determine how to provide, through the use of the models, a vehicle for understanding the relationships. This involves a decision on what information is needed by the participant in order to provide insight into the relationships.

The designer must provide the necessary information which, if properly processed or evaluated by the participant, will lead to improved game performance, implying that the participant has recognized a relationship among certain variables.³⁷

A useful approach, the writer has found, is to provide more information than is really necessary for the identification of certain variables and relationships. This so-called "noise" provides an opportunity to gain invaluable experience in determining relevant from irrelevant information - a problem most assuredly faced in the real life business environment.

As a final pointer in determining the type of information to be provided, Carlson and Misshauk advise the designer to keep in mind how he anticipates the information will be utilized. The information could either be used directly or may require further processing such as setting up probability distributions, using linear programming or economic order quantity formulae before yielding the required information for proper decision making.

4.3.1.3 Stimulation in Decision Making

Although the 'Decisions' element of the Model will be discussed fully in chapter 4.3.4, an important aspect of decision variables, namely the level of mechanisation, has a direct bearing on model design and hence will be dealt with here.

Since a business game is a man-model simulation,³⁸ the design of the model determines the nature of the response from the participants. The decision variables form the link between the model and the human element.

It is the writer's experience that wherever optimum values for the array of

decision variables in a particular game can be arrived at through purely mechanical operations, the simulation is of little value in developing skills involved in critical analysis of data and in decision making.

A production-orientated functional game³⁹ once used by the writer was found, by the general consensus of participants, to be "too mechanical". The decision variables, once processed using known analytic techniques such as Linear Programming, yielded optimum values which required no exercise of discretion on the part of participants. Such model behaviour unfortunately lead to a rapid fall-off of interest and involvement among participants.

To avoid such undesirable consequences, the designer must give careful thought not only to the manner in which he desires decision values to be derived but also to the structure of the functions which will process the decision variable values. The latter involves a careful evaluation of the ease with which participants can identify the exact behaviour of the functions involved.

Although one of the objectives in playing a game is to discover what makes the underlying model react the way it does,⁴⁰ the task, in the writer's opinion, should be accomplished - over the duration of the game - by decisions based on subjective appraisals of the situations guided by the results of relevant computations.

4.3.1.4 The Imaginative Use of Random Effects

In practice, few, if any, events can be predicted with absolute certainty.⁴¹ There are always one or more exogenous one-off type factors operating at any one time which can alter the expected outcome of a system.

The incorporation of these random elements into a simulation model can significantly enhance the realism of the game. This requires an understanding on the part of the designer of some basic probability theory and statistical concepts that can be incorporated into mathematical models of object systems.⁴²

The use of random numbers as a means of including qualitative factors in the model is one application of random effects. This was discussed in chapter 3.3.6.

To summarize briefly the discussion in chapter 3.3.6, there are essentially two roles that random effects can assume in any model:

- i. they can be used to modify the value of a mathematical function, for example, the demand function, a machine or worker output function.
- ii. they can be used to decide upon the occurrence of a particular situation, for example a law suit, bad debts, a wage dispute.

Judicious use by the game developer of these random effects can promote and maintain great interest on the part of participants through an effort to understand, and possibly, harness these 'unpredictable' factors. But it has also been the writer's unfortunate experience that ill-contrived usage of random effects can have a negative effect on participant motivation in the game. This can happen in two ways:

- i. when the random value used to modify a predetermined value completely overshadows the latter. This has the effect of obscuring any understanding of the underlying relationships involved.
- ii. when the random occurrences such as machine breakdowns, damage or loss of raw materials in transit, strikes, material cost increases, occur with monotonous regularity. Participants feel helpless through not being able to exercise some control through their decisions, over these forces and end up fighting a losing battle against random elements. In addition, the resultant lack of continuity justifies their grievance that they feel they have little chance of seeing out their planning process and consequently can never hope to achieve set objectives.

Carlson and Misshauk⁴³ state that if participants do not have reasonable control over their destiny, the game as a learning device is likely to be a failure. They feel that participants will tolerate the need for taking risks at times (known variability of a variable) and an amount of uncertainty such as occasional contingencies. However, if as a result of excessive uncertainty they are not making a choice among reasonable, rational alternatives, the game has become an exercise.

In practice then Thorelli and Graves⁴⁴ see the game designer as walking a

tightrope between the legitimate demand of the players that they be able to see some cause-effect relationships emerging from their decision-making endeavours and the realities of risk and uncertainty.

The message to any game designer who desires to make a meaningful contribution to the learning process, is to carefully evaluate the effect of each and every random element before it is introduced into the model to ensure "adding enough spice without spoiling the broth".

4.3.1.5 The Inclusion of Theoretical Concepts

Concepts, according to Rockart and Morton,⁴⁵ are perhaps the meat of education. But unlike facts, they are sometimes not intuitively obvious or simple to grasp. It is important for a student to understand the structure and workings of the array of concepts in a given discipline, and quite often, the place of each particular concept within a larger conceptual structure in order for the particular concept to be meaningful.

There is a need for data and data manipulation if a student is really to test his understanding of a concept. Thus a student must have access to an environment that is rich in data to allow him to assess the consequences of the concept.⁴⁶ This environment should also provide for as many configurations of data and contingencies as possible to allow a thorough testing and embedding of the concepts concerned.

Such an environment is adequately provided by a simulation game. However, this process of testing and re-inforcing newly acquired concepts cannot be carried out unless the model actually incorporates a selection of theoretical concepts to which participants have been exposed through other teaching media such as the lecture. This may seem a trivial point, but the writer makes it for two reasons:

- i. there are many business simulation games that do not incorporate any theoretical concepts and therefore do not afford participants the opportunity to improve their understanding of these concepts;
- ii. insofar as the theory provides the guidelines for the practice of management, a business game has an obligation to ensure that participants are familiar with the application and adaptation of the theory to the practical situation.

To illustrate just some of the theoretical concepts and techniques which can be built into business games, there are;

In production:

Line balancing, break-even analysis, critical path methods, statistical forecasting methods, linear programming, and derivative methods, queueing theory, sequencing concepts, the hedging concept, economic order quantity models and statistical quality control analysis.⁴⁷

In Marketing:

Product life cycle, the analysis of distribution channels, the transportation and assignment methods, media selection and promotional effectiveness concepts, the concepts of market segmentation and product differentiation.⁴⁸

In Finance:

Ratio analysis, sources and uses of funds statement, budgeting, present value, D.C.F., annuities, cash flow analysis, cost of capital concept, ageing schedules for accounts receivables, rights issues, the concept of mergers.⁴⁹

It is the writer's experience that participants in a game value the opportunity to implement their newly acquired theoretical knowledge. This presupposes that the business simulation exercise is used in conjunction with other teaching media such as the lecture and case study approach. If the simulation model offers little or no opportunity for testing a selection of theoretical concepts their interest can fast wane to the detriment of the learning process.

Thus the testing of concepts, in a thorough way, is an important piece of learning because it can provide much of the motivation to learn more, as for example, when the test turns up some unexpected results and the learner must seek a reason why.⁵⁰

4.3.1.6 Model Stability and Sensitivity

The writer has come to view every business simulation model as having a domain or set of feasible results and a subset of reasonable results. In every model used by the writer it is possible to find a set of decision values that will generate results that can be regarded as ridiculous and completely unrealistic. Such

would be the case where a company captures the entire market by offering the product(s) at a very low price.

The range of reasonable results is governed by the stability and sensitivity of the model.

Stability refers to the built-in restrictions which prevent wide fluctuations in results due to one or a few extreme decision values taken by participating companies. Apart from the 'market capturing' example quoted above, the design of the model should also prevent companies from early "bankruptcy", which would prevent their further participation.

Sensitivity on the other hand refers to the early detection and evaluation of gross changes in company strategy.⁵¹ Drastic changes in policy may not be realistic and such phenomenon as "end-of-game" strategies should be discouraged through model design and built-in penalties. The aim is to prevent extreme, unrealistic and/or major shifts in policies from being successful by careful design of rational penalties for irrational decision and/or behaviour.

4.3.2 The Game Parameters

The programmed instructions which consists of defined relationships based on certain assumptions and logical business identities is only a skeleton. The actual behaviour and characteristics of the simulated environment is determined by the values of the variables inputted into the system.

Certain of these values are under the control of participants (decision values) while the balance are determined by the designer and/or coordinator. Discussion on the decision and history variables will be deferred till later in this chapter.

A parameter is a characteristic or attribute of the system that remains constant during one run of the simulation, but that can be changed from run to run.⁵²

The parameter values partially describe the environment in which the companies exist.⁵³ They influence the operating environment of the competing companies by regulating, for example, the market structure which determines the level of demand,⁵⁴ the interest rates prevailing in the industry, the prices at which raw materials are available to companies and many others. The INTOP simulation

model has 450 parameter values⁵⁵ and a selection of these is shown in appendix 7.⁵⁶

It is the responsibility of the game designer to delineate these exogenous factors as well as identify permissible ranges within which the parameter values may be altered.

This is an onerous task due to:

i. firstly, the interrelated nature of the elements within the system.

Adjustments to a single parameter value may have undesirable side-effects unless the various interrelationships of that parameter with other parts of the model have been duly considered.⁵⁷

ii. Secondly, the need to avoid dysfunctional behaviour of the model resulting from unsynchronised parameter values.⁵⁸

The parameter variables provide a game coordinator with an invaluable means of manipulating the simulated environment as he sees fit. Thus they allow for considerable flexibility in any simulation game.⁵⁹ Partially as a result of the facility to alter parameter values, no business simulation game need ever be played in the same way twice.

These parameter variables may be classified into three major categories.

They are:

i. parameters of the economy,

ii. parameters dictated by the constraints inherent in the model, and

iii. switch parameters.

Although all parameter values together shape the nature of the simulated environment, each category is distinguished from the others by virtue of the role that the parameters within it play.

4.3.2.1 Parameters of the Economy

The selection process of all parameter values is one of trial and error, which may require continual adjustment if all parameters are to be compatible. These economic parameters include, inter alia, interest rates, price elasticities, depreciation rates, GNP indicators, wage rates, price of raw materials and cost of manufacturing units.

It is with this parameter category in particular that the bias of the designer is demonstrated. Thorelli and Graves suggest a system of assigning relative weights to parameter variables as an initial step to the selection of actual values.⁶⁰ This allows the designer to compare what parameter variables he intends to emphasise and de-emphasise. In this manner, like a sculptor, he can mould his model to achieve his educational objectives.

When selecting these economic parameter values, which have a direct impact on a company's behaviour, a major aim should be to obtain a balanced representation between the level of economic activity and the firm's capabilities.

4.3.2.2 Parameters dictated by the Constraints Inherent in the Model

Certain parameter variables derive their values from constraints inherent in the design of the model. These constraints set upper limits on this category of parameter variables and consequently define a range of coordinator discretion.⁶¹

These parameter variables are orientated more toward defining the physical characteristics of the simulated environment. They include, inter alia, the maximum number of companies that may participate in the industry, the maximum number of lines that may operate in a factory, the frequency of model changes, the size of price and promotion adjustments,⁶² for example, in units of R10 only, and the maximum number of items of market research information that a company may purchase in any one period.

These constraints and the resultant parameter values must be clearly delineated by the designer for the benefit of the coordinator as well as the participants for they impose a restriction on permissible actions.

A second set of parameter variables which can be identified in this category, are the constraints in the model. However, neither their presence nor their values need be disclosed to the game users. Their purpose is to prevent the model from "blowing up" or behaving dysfunctionally.⁶³ These safety valves, as they may be termed, are used for two good reasons:

- i. many equations may lead to unacceptable results at their extreme values. For example, if the manufacturing cost equation has the shape of a parabola, very low or very high rates of production might produce astronomical costs.

- ii. the financial statements may show negative entries where none would normally occur. Two common examples are negative cash balances and negative equity values resulting from operating losses being sustained.

The manner in which these safety valve parameter variables are used involves establishing limits on the appropriate equations. If the 'actual' value which is calculated first, violates the limit in a prescribed way, then the limiting value becomes the 'actual' value.

4.3.2.3 Switch Parameters

Depending upon the designer, a model may contain a selection of alternative options.

- i. At the very least the choice may be between different parameter values. For example the designer may incorporate a number of interest rates and wage rates in a DATA statement (FORTRAN programming language) in the model. By setting appropriate switches in the program a coordinator can select a particular combination of parameter values for use during a simulation run.
- ii. The selection may also be between equations of varying degrees of sophistication. For example a demand forecasting function may be represented by a simple linear equation. At the other extreme a complex time series analysis combined with regression analysis may be used to build a demand function. Switches may be employed to select the appropriate function where the choice exists.
- iii. Highly sophisticated simulation models may offer the coordinator the opportunity of eliminating or incorporating whole areas of the simulation environment. The INTOP simulation model is an example where the swapping in or out of major features of the overall model can take place. The following quote will illustrate the power of this model design: "if a monitoring company were to act as single buyer, substituting for the consumer market function - which may be the case in a production - management simulation, - the administrator need only set the base sales quantity to a diminutive positive number. Similarly, if he were to act as the sole supplier as in some marketing-management orientated simulation, he might eliminate the

production function by setting factory capacity equal to zero. The R & D feature is eliminated for all practical purposes if the minimum useful research expenditure is set arbitrarily high, as is the stock market confidence function if the pay-out ratio is set at zero."⁶⁴

The incorporation of options in a model has an important implication for a game coordinator. He is presented with greater flexibility in tapering the model to meet the educational objectives he has set. It is within his power to alter the emphasis of the elements in the system as well as to adjust the model to the desired degree of complexity.

4.3.3 The History File

The collection of historical values known as the history data or file is the second element of input into the simulation gaming system. While the parameter variables, as discussed above, pertain to the environment within which the companies must operate, the history data refers more specifically to internal company operations.

The history data is created only once by the designer, namely for use at the beginning of a simulation gaming session. Its importance however, lies with the fact that it forms the basis of future company behaviour. The history file contains, for each company in the industry, relevant accounting information such as all balance sheet entries and net profit values and other non-financial company information such as market share, selling price, number of salesmen, plant capacity, and inventory levels. Appendix 8 shows the history variables and initial values for the simulation model Integrated Simulation.

The problems facing the designer when setting up the history file are, in the writer's estimation, threefold.

The first two are identical to those encountered in the choice of parameter values. To recapitulate, they are:

- i. the interrelated nature of the elements within the system require careful follow-through of each history variable to avoid undesirable side-effects.
- ii. the variables must be balanced and synchronised to avoid dysfunctional

behaviour of the model.

The third problem refers to the selection of history variables. It may be stated as follows:

- iii. An appropriate management information system must be designed for each company for the capture of all relevant company data to ensure continuity between decision periods.

Thorelli and Graves present a general approach to the problem of history data selection.⁶⁶ It is not the only approach, but it is one, they feel, that appears reasonable in theory and workable in practice. Their task, as defined by them, is to create a conception of a particular company and its competitive behaviour at a time when it has fully developed its potential in the market place. In particular, this involves constructing the hypothetical balance sheet and income statement for this company and manipulating the values to achieve the desired effect.

The authors justify their approach as follows:

"It should be quite clear that, in creating an ideal company image in order to pick values, we are not trying to predict or determine individual company behaviour in practice. Some companies will do much worse and some much better under actual competitive play. The value of the financial statement construction is that it approximates a middle-ground of company performance and thus provides a rationale for variable value selection in terms of a proper balance between the strategic variables in the model."

Essentially the only other approach to arrive at specific values for the history variables, the writer feels, is by trial and error.

4.3.3.1 History Data for Control and Evaluation Purposes

Although 'control' and 'evaluation' are activated during the 'implementation' phase of business gaming, (see chapter 7.2.3.4) their effectiveness is to a large degree dictated by the management information system set up at the 'design' stage. For this reason these issues will be discussed now and referred to again in the Implementation section.

The history data can be arranged to serve in two capacities:

- i. Primarily it serves as a means to carry over relevant information from one period to the next. In order to do so, the history variables must be stored on file in such a manner that they can be read by the model in the subsequent period.
- ii. As the simulation game is usually a part of a broader education program, it is important that the coordinator be able to follow developments in details. For this, the coordinator needs certain selective information on company performance. Thus, in addition to a carry-over file which is generated each period, a section of the history file must record that data which the coordinator requires for control and evaluation purposes.⁶⁷

Control:

To exercise control over the learning experience, the coordinator must be fully conversant with the performance of each company. This is necessary for two reasons:

- i. to decide whether teams require counselling when it is felt they are losing their grip on their operations; and
- ii. to decide before injecting suitable environmental developments whether the companies can cope with the proposed change without catastrophic consequences.

Evaluation:

The writer feels it is the responsibility of the designer to guide a game coordinator in the choice of game performance evaluation criteria. The involvement of the designer in the evaluation process will ensure that the appropriate evaluation criteria variables, such as rate of return, inventory turnover, debt ratio or any other criteria, are built into the management information system which captures relevant information on the status of each company each decision period. This automatic compilation by the model of a set of well-chosen variables will provide the coordinator with a good insight into each company's performance and at the same time serve as a means for evaluating each respective company.

4.3.4 The Decision Variables

The end purpose of every simulation game is to give participants the opportunity

to make certain decisions in a dynamic and uncertain environment.

This environment is described largely by the parameter- and history - variables interacting with the model while the nature and type of decisions to be taken are defined by the decision variables.

Carlson and Misshauk believe that a guiding principle to the selection of decision variables should be the ability of participants to control the destiny of their firm through their decisions.⁶⁸ If this were not the case and the decision variables did not provide for the making of a choice among reasonable, rational alternatives, then the simulation experience becomes just a game.

The purpose of the simulation model as defined at the outset of the design exercise should predetermine two important decision rules about the selection of decision variables. They are:

- i. what decision areas will be covered, that is, the scope of decision variables; for example, only the marketing function, or marketing, finance and production areas combined; and
- ii. what depth of decision making will be appropriate.

There is an array of additional considerations.

- i. Consideration must be given to the amount of flexibility that will be permissible in the choice of a value for each decision variable. It is not undesirable, in the writer's opinion, to include some structured decision variables in the decision making process. Structured decisions do provide an opportunity for participants to experiment with analytical tools. For example, a product mix decision area could be solved using linear programming, while an inventory control problem could be overcome through implementing scientific inventory methods. But the insistence of the use of a particular decision rule to arrive at a decision is undesirable in general management and functional level simulation games. McKenney - when involved in developing the Harvard Business School Game in 1963 - explains:⁶⁹ "A method which did not prove too successful was to provide in the simulation, adequate data for the implementation of a specific technique. Participants were required to use a linear decision rule in scheduling the production of each firm. Few

firms performed successful analyses, and the assignment created undesirable student reaction. The students became identified with the control of their firm and wanted to manage as they saw fit."

- ii. Linked to this concept of flexibility within a decision variable is the need to strike a balance between highly structured - and unstructured - decision variables in the overall mix. Too much emphasis either way is likely to create the feeling among participants of a lack of control over the destiny of their firm. The set of decision variables, in the writer's opinion, must be challenging without being burdensome.
- iii. In practice, managers are faced with decisions requiring the commitment of company resources for varying durations.⁷⁰ Thus the mix of decision variables must further include a selection of short-, medium- and long-term decisions.

The importance of the systems approach is heavily underlined when one considers that in order to include decision variables of varying time commitment, the model must be designed to accommodate such company behaviour and act appropriately. Further, to ensure continuity of longer term decisions the design of the history file must be considered in order to record the pertinent data.

- iv. Carlson and Misshauk raise a further issue concerning the selection of decision variables. They propose that decision variables be chosen in such a way that would allow or require the information generated to be processed by the decision maker in the desired manner. By the desired manner they mean the best way to demonstrate that a relationship does exist between a given set of variables.⁷¹

Loveluck summarises the influence of the model underlying the game on the decision making process as follows:⁷²

- i. it determines the number of decision variables,
- ii. it determines the kind of decisions to be made; distinguished as programmed and non-programmed decisions and,
- iii. perhaps the most important way in which the model structure affects the decision-making content of a game is in the pattern of time available for formulating and considering policy (the time dimension of decisions).

Appendix 9 shows the decision variables for two business simulation games.^{73, 74}

4.3.5 Performance Reports

The performance reports comprise the first of the two output elements of the business gaming system. In essence they reflect the consequences of the decisions taken by each competing company. Since simulation gaming is an iterative procedure, this feedback, in whatever form it may be, is useful in providing additional information to the participant, which he can then use to revise his assumptions on how certain variables interact or may be related.⁷⁵ It also serves as a basis for further decision making.

Before considering the problem of how much information to disclose to participants, the type of information generally released will be discussed.

4.3.5.1 Type of Information Released

The financial consequences of a company's actions are almost without exception presented in the form of a profit and loss account and a balance sheet. In addition, the designer must decide on the necessity for further management reports which would summarise information relevant to the decision making process.

This may involve a management report that includes information on the status of certain company activities such as production output levels, inventory levels, machine and labour utilization data, financial ratios, share market data, sales force status and the status of R & D efforts. An illustration of two such internal status reports will be found in Appendix 10.^{77, 76}

McKenney and colleagues (developers of the HBS Game) found value in an industry report which summarized industry activity.⁷⁸ In experiments they conducted, industry data had proved to be important to the competitive aspect of the game, since these data gave members of each firm an indication of the marketing strategy and the economic status of their competitors. Such reports, they found, proved very useful in assisting the firms to develop a strategy.

Appendix 11 presents two samples of industry reports.^{79, 80}

Every top management and functional game used by the writer releases, in addition to all or part of the information mentioned above, some form of economic

indicator(s) for use in forecasting. The economy may be described by a single index such as GNP,⁸¹ or may be a function of a host of economic indices. For example, the economic data report of the Top Management Decision Game⁸² presents such data as GNP, Retail Sales (total), FRB Production Index, Bank Debits, CPI, WPI, Standard and Poor 500 Stock Index, Unemployment, Average weekly factory earnings and Population size.

The attempts at realism are illustrated by the (fictional) quarterly Gazette published in the INTOP Simulation Game.⁸³ It contains factual information about the state of the world economy in general and the appliance markets in particular, forecasts, gossips about members of the industry and other news of varying degrees of relevance and reliability.

In addition to all the above reports, special Market Research reports may be made available to companies upon request. Market Research reports may be distinguished from industry reports and economic newsletters through their concentration on marketing mix information only.⁸⁴ Appendix 12 shows two samples of market research reports.^{85, 86}

However there is no strict rule as to how the information deemed necessary for adequate decision making should be presented. In simplistic games, for example, the industry data, economic indicator(s) and market research reports (if any) may be presented in one document.

Not all the above information is usually available free of charge. With the exception of the internal company accounting - and operations - reports, the designer must decide

- i. what additional items of information, if any, must be purchased and
- ii. what the charges will be for each purchased item of information.

The decision of the designer in this regard will have an important influence on the participants' behaviours as they will measure the cost of additional information available.⁸⁷

To illustrate, the Top Management Decision Game⁸⁸ makes competitor's prices available at no cost, since this information could be expected to be readily obtained. Three other items of information must however be purchased: industry sales, sales and market share of competitors; total industry expenditures for

marketing; and total industry expenditures for research and development.

4.3.5.2 How Much Information to Disclose

A problem facing the designer which he would encounter at the stage of preparing the performance reports and again at the point of instruction preparation, is how much information to provide to obtain student momentum and involvement.

Thorelli and Graves discount the theory that mere maximization of data accumulated is beneficial in decision making. They believe that the interests of realism are best served through the generation of a wealth of information. They see this torrential flow of data as having two important effects:

- i. it teaches participants that selectivity is of the essence, and
- ii. when a team has decided what data are most relevant to its activities, it will find that systematic organizing and processing of these raw data is a powerful area of payoff in "professional" management. In fact the systematic handling of data is a powerful stimulus to long-range planning.⁸⁹

However, McKenney warns that too much information can overwhelm a participant (or a company) and inhibit his search and analysis of the feedback data.⁹⁰

The goal should be to create a challenging set of performance reports that will give the student adequate support to meet the challenge of searching for causes of appropriate responses in the simulated environment.

A further consideration which has implications for model design (programmed instructions), parameter variable and history variable development, is the question of varying the rate of information to participants as the game progresses.

There are two schools of thought on this issue.

For want of better words, the writer identifies the two schools of thought as the 'shallow-end' school and the 'deep-end' school respectively.

i. The 'Shallow-end' School

Prof. Albert N. Schrieber believes that complexity should be introduced gradually to avoid overwhelming the student at the beginning of the game. This, he says, corresponds to the way an executive learns his own job.⁹¹ His Top Management Decision Game⁹² is designed to achieve just that by progressing through a series of phases, each enriching the game by adding

complexity. This enrichment is intended to expand the decision variables and performance reports in order to add realism as participants gain experience with the behaviour of the model. Appendix 13 shows the four phases through which Schrieber's Top Management Decision Simulation progresses.

ii. The 'Deep-end' School

Thorelli and Graves, on the other hand, base their argument on the belief that the facts of the situation are there from the outset in all their complexity. They therefore advocate, and practice it in the INTOP model, the introduction of all the complexity in the basic structure of the simulation from the beginning. They defend their approach with the view that decision-makers must learn to be selective and that without all available information at the start, it would make less sense for the teams to engage in serious long range planning from the outset.⁹³

To conclude, although the performance reports are the end product in the simulation gaming system their content and structure has an importance influence on the development of the other system elements, in particular, the basic model.

4.3.6 The New History File

The second element of output generated by the simulation gaming system is the new history data. It is, in effect, the updated version of the previous period's history values.

These values are a function of a company's decision interacting with environmental constraints and competitor's actions. They reflect the status of the company's performance to date.

All the characteristics of the initial history file as discussed in chapter 4.3.3 are still to be found in any updated version of the file. It is primarily the history file and the practice of regular updating that creates the effect of a dynamic on-going process identical to the real world situation.

As noted from exhibit 4.1, this new history data serves as input to the subsequent period of play and the updating procedure is once again repeated.

The only important consideration from the designer's point of view is of a

technical nature. The designer must ensure that the newly created history data is stored in such a way that its values are correctly interpreted in the subsequent input stream.

4.3.7 Conclusion

This discussion was concerned with presenting an insight into the overall configuration of the Business Simulation Gaming System as well as a detailed study of each of the elements of this system.

Two important principles may be distilled from the above discussion:

- i. No one element of the system is relatively more important than any other element. A defect in any one of the elements can diminish the impact of the entire model as a tool of learning.
- ii. No part can be developed successfully in isolation. Instead the influence of the other elements play an integral role in the development of each element.

CHAPTER 4

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CHAPTER 5

COMPLEMENTARY DESIGN FEATURES

5.1 Introduction

Chapter 4 considered the essential elements which must be present in every business simulation gaming system. There are however additional elements which could be linked to the basic configuration to enhance its learning capabilities. Part of this chapter will be devoted to a discussion on these additional elements.

Game design is constantly evolving. As a pointer to what can still be achieved, this chapter will also review possible future developments in game design.

Finally the question of model validation will be discussed.

5.2 Peripheral Gaming Elements: An Aid to Improved Decision Making

Decision making, according to Rhodes,¹ is the way in which we try to influence both the future and other people. Analysis both increases our control and reduces the consequences of error which apply to decisions. This central role, he concludes, of evaluating information in a world of accelerating complexity, and one of larger and larger organizations, is becoming more apparent. This evaluative function has been ably aided by the development of the field of Management Science. These techniques have, according to Hertz,² revolutionized management processes by changing not only the information inputs on which business decisions are based, but also the kinds of decisions made and even the key factors for success in these decisions.

It is the writer's opinion that, in an attempt to provide a better, more rational basis for decision making and at the same time to familiarize participants with the use of the various tools of management, the designer should make available for utilization appropriate decision making aids.

The writer identifies five additional elements which, apart from improving decision making, can also improve a participants' understanding of either a procedure, a concept module of the simulated system or the system itself. These elements may be classified as follows:

- i. Work Sheets
- ii. Players Manual
- iii. Course Game Integrative Assignments
- iv. Forecasting and Optimization Facilities
- v. Sensitivity Analysis.

5.2.1 Work Sheets

A question facing a designer when preparing a simulation game is to determine to what extent the work of the teams should be facilitated. The preparation of prefabricated worksheets is considered by Thorelli and Graves to be a useful exercise for the teams.³

Darden and Lucas who encourage the use of worksheets throughout their game,⁴ believe their value lies in allowing the student to comprehensively determine the courses of action that his firm undertakes. The preparation of such accounting worksheets as proforma income statements and balance sheets also serve a useful purpose in evaluating planned courses of action. Also the logical order in which worksheets are arranged provides a systematic guide to students of the decision making process.⁵ An integrated group of forms and schedules from the Darden and Lucas game will be found in appendix 14.

In conclusion it should be stated that prefabricated worksheets do not restrict the participants to a single method of analysis, nor do they determine the values that the student manager should use.⁶ Participants may supplement the compiled schedules with their own creations. But the designer-prepared worksheets serve only to lead the participant, in an orderly manner, through the decision-making process.

5.2.2 Player's Manual

Every game designer is faced with the problem of establishing the proper boundary for the system he is modeling.⁷ This decision must be taken at the outset in the statement of objectives and is carried over into the design of the model. But a certain proportion of this information must also be conveyed to the participants. This is done through the compilation of a player's manual.

Such a manual from the writer's experience usually introduces the simulation game with a brief discussion on the scope, philosophy and objectives of simulation gaming in general, and of the specific model in particular. This is followed by a description of the general industry environment and a discussion on the internal operations of the company. Appendix 15 reproduces the table of contents of two player's manuals to illustrate the nature of the information disclosed to participants.^{8, 9}

In essence, a player's manual according to Graham and Gray must be both substantive and procedural.¹⁰

The manual also has an important complementary role to play with respect to the basic model (programmed instructions). Not all restrictions on play are built into the basic underlying model. It is therefore the role of the player's manual to convey to participants not only those constraints included in the model, but also those non-permissible behaviour patterns not accommodated in the model.

In compiling the player's manual the designer must bear in mind the purpose for which the game will be used. The rules must be easily learned for a game designed for use in a training situation requiring a short briefing session and rapid decisions, whereas those in a game permitting more learning time may be rather more elaborate.¹¹

However, simply stated instructions do not necessarily imply a simplistic simulation game, nor does an elaborately defined set of rules indicate a complex game. The rules may be simplified while decisions are still permitted that are difficult to make in the sense of choice criteria and strategy. Further, even with simple instructions, the sequence of decisions required can combine to result in a set of very complex interactions.¹² Hence the complexity of a game can only be judged when the elements of model structure, decision making, instruction manual and others interact¹³ and not when each is viewed in isolation.

A universal problem facing game designers is the uncertain quantum of how much information to provide in the instructions. The aim is to obtain student involvement yet not provide so much information that it overwhelms him. A detailed compendium according to McKenney¹⁴ encourages the student to rely too heavily upon the rulebook to understand the simulated environment. This induces habits of

response learning, not data search and analysis, which are most desirable to business gaming experience.

The goal, he concludes, is to create a challenging model and set of instructions that will give the student adequate support to meet the challenge of searching for causes of appropriate responses in the simulated environment.

5.2.3 Course Game Integrative Assignments

It is the conviction of the writer as well as other authors of simulation gaming, inter alia Loveluck,¹⁵ Dickinson,¹⁶ the I.L.O.,¹⁷ Thorelli and Graves¹⁸ that if the full benefit of business games is to be felt, it must be integrated into a broader educational context. The latter authors summarise the general feeling well by saying that all too often management games are staged in splendid isolation - entirely disassociated from any real discussion of underlying theory or principles encountered in lectures, reading and writing assignments.

This question is, in part, the responsibility of the game coordinators, but the designer, in the writer's opinion, can facilitate the process of integration with the broader course or training program through the laying down of guidelines.

In this respect the work of the designer would involve:

- i. the recommendation of selective lecture-discussion topics within the scope of the simulation game,
- ii. the preparation of a list of appropriate case studies,
- iii. the compilation of an appropriate reading list,¹⁹ and
- iv. the development of course assignments relating to the simulation material.²⁰

It must be remembered that the above approach is not binding on the game-coordinator. They act merely as pointers and, as will be discussed in chapter 7.2.3.3, the structure of the course material is a function of the course objectives.

The selection of appropriate lecture topics, case studies and readings is self explanatory and warrants no further discussion. Course assignments, however, need further explanation.

Assignments - written or orally presented - are intended to focus attention upon a particular concept or decision area within the game situation. Their aim is

to encourage the use of the substantive material in the normal course of work to solve the problem and/or to increase understanding.²¹ In essence then, assignments are designed to link the game to the course work.

The following 4 quotations from McKenney²² illustrate the nature of such assignments:

- i. "One assignment that stimulates a good bit of student reflection is to require a written statement identifying the bases for the firm's pricing policy at the end of one year of play."
- ii. "Sales forecasting is an essential aspect of the simulation and has proved to be a very successful subject for an assignment."
- iii. "A follow-up assignment can then be given requiring each firm to defend its financial transactions and how they relate to possible stock market evaluation of the firm's activities."
- iv. "A written assignment was given to each individual to present a plan for introducing a new product in a simulated industry."

The designer, as a result of his intimate knowledge of the simulation model, should develop a collection of pertinent assignment topics to aid game-coordinators in the construction of an integrated training program.

5.2.4 Forecasting and Optimization Facilities

As discussed in chapter 4.3.1.5, the designer should aim to include an appropriate selection of theoretical concepts in the structural relationships of the model. The advantage of such a design feature is to allow participants to see an application of the theory to a practical situation. Although direct applications of certain theory is not always practical and may require certain adaptations, it is nevertheless important that some semblance of the basic principles are preserved.

The inclusion of theoretical concepts within the model offers the designer the opportunity to enhance the potential learning experience still further, namely through providing a package of analytical techniques in the form of precoded computer programs which can be applied to the model.

Apart from the obvious advantage of improving the participant's understanding of the technique and underlying theory through re-enforcement, it would also encourage, in the writer's opinion, a methodical approach to data analysis and decision making. Thorelli and Graves have found from experience that the provision of an external (to the model) stimulus in order to develop effective data processing routines and make use of reasonably sophisticated analytical techniques²³ is oft times needed.

The writer identifies two classes of techniques which can be packaged and made available for use by participants:

- i. forecasting techniques, and
- ii. optimization techniques.

Although the volume of past data in a simulation game available for analysis by a particular technique is seldom large and can be computed manually with relative ease, the use of computerized packages will focus attention on the use of the computer as a problem-solving and data processing tool.²⁴ Also participants will be exposed to the impact of the computer on organization design.²⁵

5.2.4.1 Forecasting Package

Almost without exception every general management and functional management simulation game requires a forecast of at least one variable - usually demand.

Although forecasting will always include elements of guesswork,²⁶ there is scope for improving the basis from which a forecast is made. Redfield²⁷ believes that although guesswork is inescapable, the idea is to reduce the limits of error to a minimum. This can be done by following a procedure for combining mathematical analysis with the best business judgement available. A number of statistical forecasting techniques, among them, time series analysis, regression and correlation analysis, discriminant analysis, spectral analysis²⁸ and the Box-Jenkins method²⁹ have been developed to provide a rational, quantitative foundation on which to base the forecast.

In order that game participants have the opportunity to construct a statistical forecast based on generated past data, a game designer should ensure that the

value(s) to be predicted can be reasonably approximated by one or a number of these techniques. The writer believes that the technique which will give the best approximation must not be disclosed to participants; rather they must attempt various methods and through a process of self-discovery decide upon a method which, to them, generates the best results.

The majority of these forecasting techniques have previously been programmed^{30, 31} and it only leaves the designer to package a select number of them and make it available with the basic model.

The writer has successfully incorporated the regression analysis program called REGAN2,³² of the UNIVAC STATJOB Statistical Package, into the Business Policy Game³³ which is administered to the final year Bachelor of Business Science students at the University of Cape Town.

5.2.4.2 Optimization Techniques Package

As with the forecasting procedures, the designer, in the writer's opinion, has a similar responsibility to participants to encourage the use of theoretical techniques in other decision areas. He should aim to ensure that appropriate model variables follow some pattern which is identifiable through the application of one or a number of available techniques.

Again the use of the computer as a problem solving and data processing tool should be emphasised through making available computerized optimization techniques. Examples of computerised optimization techniques that could be used in this supplementary role can be found in the text by Gillett.³⁴ This text includes computerised models in dynamic programming covering investment problems; general allocation problems; production scheduling and equipment replacement problems; linear and integer programming models; inventory models; sequencing algorithms; Decision Theory and Game theory algorithms; PERT Models; Queueing theory models and a program for Markov Analysis.

The writer has successfully introduced a Linear Programming package for setting optimum production levels in the Decision Making Game³⁵ which is administered to the Business Science III course at the University of Cape Town.

5.2.5 Sensitivity Analysis

Through simulation gaming the participant has the means for observation and experimentation. It permits observation of the dynamic behaviour of the object system, and experiments may be run to test hypotheses about the system under study.³⁶

However, it is the opinion of the writer derived from experience, that an anomalous situation has arisen: the competitive element embodied in an interactive game and the corresponding desire to win has conditioned participants to adopt a conservative approach to decision-making. Competing companies are often reluctant to pursue a strategy or strategies requiring extreme decisions for fear of losing any competitive advantage they may have at the time. Consequently participants do not draw the maximum benefit from a simulation game played in this manner.

To overcome this problem and to encourage experimentation with the object system in order to acquire a better understanding of the nature of relationships in the model, provision should be made for sensitivity analysis to be performed on the model by participants.

Sensitivity analysis, according to Wagner,³⁷ refers to how far the input parameters can vary without causing violent changes in a computed optimal solution. In essence it answers "what...if" type questions.

In the context of a Business Simulation Game sensitivity analysis permits participants to experiment with different strategies given a particular business environment. Through the manipulation of the decision variables between any consecutive periods of play, companies can determine a set of 'optimum' decision values (a strategy) which would allow them to move from their present position to a more favourable one. In this manner, firms can evaluate different strategies without the accompanying commitment of resources or possible failure to achieve objectives and the sanctions which accompany such actions. Thus the use of sensitivity analysis could in fact be referred to as a simulation of a simulation.

5.2.5.1 Method of Construction

The approach mentioned below is distilled from the writer's experience in

developing a model for sensitivity analysis purposes. This model is now linked to and forms an integral part of the Business Policy Game administered to the Business Science IV undergraduates at the University of Cape Town.

The basis of sensitivity analysis in simulation gaming is a model similar in character to that of the real game model. There are essentially 4 features in which it differs from the 'real' simulation model. They are:

- i. the values of certain appropriate parameter variables are modified by a small factor;
- ii. the level of future economic activity which is an internal function in the 'real' simulation model, becomes a decision variable in the sensitivity model;
- iii. competitor's behaviour is assumed constant as of the end of the preceding decision period, except for their collective pricing policy, and
- iv. the sensitivity model is capable of multi-period processing.

An indepth discussion of each feature is to be found in Appendix 27.

5.2.5.2 Justification of the Use of Sensitivity Analysis in Business Simulation Gaming

It is generally recognized that simulation modelling plays an important role in the decision making process. In support, Koontz and O'Donnell explain:⁴⁵

'If a manager can utilize a model to represent reality, he has available a powerful means of testing various alternatives to see how they would work out, without chancing the commitments involved in a typical decision. As a consequence, no modern manager, faced with a difficult or complex decision, should overlook the possibility of simulation. Even with its limitations, it might show results that would follow a decision which a manager had not anticipated, and this is a great deal less risky and less costly a way to experiment than through making decisions which are found later to have been costly mistakes.'

The number of cases where simulation modelling can pay off through inexpensive experimentation are numerous. To mention but a very few:

- i. Starr has developed a computer simulation as a means of assessing risk in investment proposals,⁴⁶

- ii. Oxenfeldt describes a simulation model applicable to advertising problems involving media allocation,⁴⁷ while
- iii. Buffa illustrates the use of simulation modelling to develop alternate maintenance policies.⁴⁸

According to Oxenfeldt,⁴⁹ a concerted movement is underway in all fields of business to extend and to make explicit the models that assist in decision making. This effort, Oxenfeldt continues, is changing the fundamental nature of the study of business and may go far to free the business executive from great dependence on intuition and judgement in his decision making.

Now just as experimentation through modelling is a valuable tool in actual business practice, so too can sensitivity analysis be viewed as modelling for the simulated business practice.

Thus, through sensitivity analysis, the conflicting objectives of experimentation versus the desire to develop stable and consistent strategies are accommodated. In fact, they now become complementary. The knowledge gained through experimentation with the sensitivity model can be used to prepare less conservative decisions without loss of confidence and a better appreciation of the risk involved.

5.3 Possible Future Developments in Game Design in the Training Context

'Only the imagination of the designer limits the possibilities available.'⁵⁰

This statement highlights the singularly most important factor in any game design, namely the designer's imagination.

As long as there are ideas, simulation gaming models can be modified and improved.

There are possibly many areas in which improvements to the simulation gaming techniques as a teaching tool can be made. But it is the writer's intention to consider only three concepts where it is felt from experience that new thinking can benefit this tool of learning. Each of these concepts will be considered separately.

5.3.1 Incorporation of Company Objectives and Policies into the Simulation Model

At present, the objectives set and policies formulated by competing companies appear only as formal statements in the teams' working files. There are management teams who attempt to adhere to their stated policies and strategies, but there are others - the writer has observed - who only pay lip service to their formal plans. Behaviour of the latter type results in those participants forfeiting the learning opportunity of seeing their plans work. According to Drucker, a plan is nothing unless it degenerates into work.⁵¹

Two further consequences are:

- i. that participants, through not implementing their formal plans, have no feedback as to the soundness of them, and
- ii. that participants, under the present system, are not penalized performance-wise for not following their formal plans or for setting objectives that are possibly vague and unrealistic.

An approach which the writer proposes for consideration to overcome this problem and force adherence to defined objectives, policies and strategies, is to incorporate the company's stated intentions into the formal model operations.

This modification in game design would require from participants, prior to game commencement, a set of decisions pertaining to objectives, policies and strategies which, when coded, would be inputted into each company's history file for use by the model during execution of a run.

The writer identifies two immediate benefits resulting from this development in game design.

- i. Teams will be required to be more specific and structured in the statement of their objectives, policies and strategies. If one were to accept Kotler's⁵² approach to defining objectives, the statement must possess the following characteristics:

The objectives must be

- (a) quantifiable,
- (b) hierarchical in nature,
- (c) realistic in terms of resources and time, and

(d) consistent with each other.

ii. It is envisaged that the formalized objectives and plans will play a more direct role in the assessment of company performance through providing criteria by means of which overall company performance can be continually evaluated. This evaluation procedure should emphasise two aspects:

(a) the degree of goal achievement and

(b) the degree of consistency with respect to the stated intentions.

It is the writer's belief that there now exists an incentive to assure the integration of long-range and short-range plans. Also the opportunity exists to introduce the necessary controls to ensure operations (decisions) take place in conformance with plans.⁵³

Further research must still be undertaken to make this concept a practical proposition. The writer believes however that its implementations in future business simulation models is essential in order to provide a more exact method of testing participants' abilities in policy and objective formulation.

5.3.2 Multi-Period Processing

Thorelli and Graves identify the problem as follows:

'In the absence of concerted effort to the contrary, routine matters tend to steal the attention from major policy problems, and short-range planning tends to push out long-range. Valid in real life, this observation is also quite relevant in the game situation.'⁵⁴

This is also the writer's experience and is believed by the latter to be perpetuated through the present practice of having participating teams review their performance after each decision period.

There is a need in management games to highlight and involve participants in the multiple horizon of planning,⁵⁵ since planning is the most basic of all management functions.⁵⁶

If long-range planning is to be emphasised and encouraged, an approach in simulation gaming is needed which will require participants to look not just one

decision period ahead, but many periods.

In an attempt to obtain greater appreciation of the need to think more than one period ahead, the writer proposes that all future simulation gaming models be equipped with the facility for multi-period processing. This would mean that sets of decisions would be evaluated over a defined number of periods (greater than one) without intermediate feedback of results. This telescoping of decisions effectively forces teams to think in terms of policy decisions.⁵⁷

This proposed approach has been the result of the writer's experience with management games and the growing awareness of the need to force participants to focus on longer term performance rather than immediate results. However, it must be noted that Thorelli and Graves - authors of the International Operations Simulation i.e. INTOP - have advocated and implemented an identical approach. But no other management game, to the best of the writer's knowledge, has incorporated this concept into the formal design of the model. Consequently it has not become a standard feature of model design and implementation.

It is envisaged that this approach will be used at intermediate points in the normal execution of a simulation run. To illustrate: In a 16 period simulation run, the first 4 decision periods could be processed individually; the second 4 periods (i.e. periods 5-8) could be processed simultaneously (i.e. without intermediate feedback of results); periods 9-12 could again be processed individually; and periods 13-16 could be multi-processed.

A significant by-product of such an approach could be the awareness of participants to the importance of coordinating short-range with long-range plans. The problem where short-range plans are often made without reference to long-range plans occurs in simulation games as much as it occurs in practice.⁵⁸

Sensitivity analysis as discussed in chapter 5.2.5 has a similar objective of emphasising the importance of long-range planning. It is now the intention however, to incorporate this concept into the formal model so that its implementation becomes standard practice in future management games.

5.3.3 Inter-Industry Models

The social and economic system today is one in which interdependence among

major groups in society is an outstanding characteristic. The economic model now contains three major sectors: the profit-seeking; the non-profit; and the government. Organizations in each are inextricably interrelated with those in other sectors. All influence one another, both as stimulants and as restrictions on the exercise of power. None can exist without the others - or at least, none could be as strong as it now is without the others.⁵⁹

The writer believes that participants in management simulation games must be made aware of this economic interdependence and, where possible, experience it in the simulated environment.

A survey of existing management games⁶⁰ reveal that each of the 182 games considered involve interaction between companies within a single industry only. No computerised management game, to the best of the writer's knowledge, has attempted to simulate an environment in which a company must not only interact with its competitors in its own industry, but also have working relationships with companies in related industries.

The writer identifies 3 benefits which can flow from using inter-industry management games.

- i. They demonstrate economic interdependence. The involvement with sectors of the economy outside direct industry competition should engender a better appreciation of the scope of the management function.
- ii. The nature of the interaction between the related sectors is negotiation - an aspect of management, in the writer's view, that is not well developed by existing computerized simulation gaming practice. The introduction of the negotiation element into the gaming situation offers 2 further benefits in turn:
 - (i) it provides participants with greater opportunity for testing their communication and negotiating skills as they must conduct, and bring to some conclusion, discussions with individuals or groups outside their regular working parties; and
 - (ii) it integrates role playing into the simulation gaming experience. Role playing complements the gaming approach through enabling the participant to:

- (a) acquire understanding of a situation or of relationships among real life participants of a social process, and/or
- (b) gain some perception of the actions, attitudes, and/or situation of another person.⁶¹

iii. Despite the fact that the computer is only a processing tool⁶² in the simulation gaming system, its role is often seen incorrectly, one might add, by participants as the controller of the company's destiny. However, it is the writer's contention that inter-industry models de-emphasises the role of the computer and strongly emphasises the human interaction in the participants' minds.

The following are examples of the type of inter-industry models that can be constructed:

- i. Manufacturer and Supplier or raw materials: negotiations could revolve around the quantity, quality, cost and time of deliveries;
- ii. A Manufacturer - Wholesaler - Retailer System: the scope of human interaction is vast.
- iii. A Manufacturer and a group representing the interests of either the Government, the Shareholders, or the Trade Unions, or a combination of the three.
- iv. An Insurance Company and a Brokerage Firm: negotiations could involve portfolio selection.
- v. A Manufacturer and a Bank. The writer, together with a colleague, has recently developed an inter-industry model, INTERACT.⁶³ The model requires manufacturing companies to compete against each other for sales volume (as normal), while at the same time their financial structure is closely linked to banks in the banking sector. Negotiation must take place between companies and banks to determine the size, cost and term of loans.

The banks in turn compete against each other for company business. Thus each sector is dependent upon the other for its survival.

In conclusion, the writer believes that inter-industry models offer participants the opportunity of managing in an environment more akin to the real situation he may find himself in one day than does an intra-industry game.

5.4 Model Validation

The most vexing question asked about a simulation model is: 'How do you know it is valid?'⁶⁴

Meier, Newell and Pazer⁶⁵ view the validation of a simulation model as a two-step process. This process is initiated upon completion of the design and development of the model, but they do warn that the exercise of care in the early stages of formulation and construction is as important as any more specific procedures that can be suggested for validating a model.

Step 1: To determine whether the model is internally correct in a logical and programming sense.

This first step can be accomplished by a systematic series of runs designed to uncover defects in the model.⁶⁶ The sort of test runs that can be made are dependent on specific characteristics of the model, but the following are some possibilities:

- i. Run the model for a short time period so that the results can be compared with hand calculations.
- ii. Run separate segments of complicated models alone so that results can be verified.
- iii. Eliminate random elements from stochastic models and run them as deterministic models.
- iv. Replace complex probability distributions (if used) with elementary ones so that results are more easily verified.
- v. Construct simple test situations that test as many combinations of circumstances in the model as is feasible.

Required in all of these test runs is appropriate historical input data which can be compared with recorded historical output data of the object system itself.⁶⁷

Programming errors can usually be identified at execution time and eliminated but logical errors are generally harder to isolate. Often the program may be run successfully - through to termination time - outputting results which appear feasible, but upon closer scrutiny, they turn out to be completely wrong.⁶⁸ This has been experienced by the writer during the development of the INTERACT model.

The validity of the final results, therefore, need to be checked carefully before the program becomes operational.

One way of checking results is to put additional print statements into the program to print results at intermediate stages which can be checked manually.

If, and when, the intermediate results are satisfactory, the 'diagnostic statements' can be removed.⁶⁹

Step 2: To verify that the simulation model represents the real-world phenomena it is supposed to represent.

Where the model is designed to be descriptive of an existing system, output from the model can be compared with known data from the real world.

However, when the model is intended to simulate a new or proposed system for which no actual data is available, there is no good way to verify that the model, in fact, represents the system. Under these circumstances, Meier et al argue, there is little alternative but to test the model thoroughly for logical and programming errors and to be alert for any discrepancies or unusual characteristics in the results obtained from the model.

Hermann,⁷⁰ as another researcher on the topic of model validation, presents five preliminary approaches to validation appropriate to gaming models.

These are:

- i. Internal Validity. This refers to whether the simulation model has a low variance of outputs when replicated with all exogenous inputs held constant. This question is especially significant, Hermann argues, for game-type simulation in which there are uncontrolled internal elements; that is, the players.
- ii. Face Validity. This is the initial impression of a game's realism and is obtained by asking people who know the real system (e.g. managers) to judge whether the model is reasonable. This, in fact, is really a test of the reasonableness or credibility of the model.
- iii. Variable-parameter Validity. Do the simulation's variables and parameters compare with their assumed counterparts in the observable universe? Hermann proposes sensitivity testing as a form of variable-parameter

validity. In a sensitivity test one or more factors are changed to determine (i) if they affect the output, and (ii) if they help make the model produce results that match historical data more closely.

- iv. Hypothesis Validity. The question asked here is: Do pairwise relationships in the model correspond to similar relationships in the observable universe? Hermann notes that 'an operating model (a simulation) would be increasingly valid as its operation was distinguishable from systems which it was not intended to represent, as well as by evidence of its convergence with the performance of the intended reference system.'
- v. Event or Time-Series Validity. Since the model is never perfect nor completely detailed, an important question is: How close do simulated and real events have to match? In most situations, Hermann argues, effective models need not be detailed and only distributions of events (such as the distribution of sales) need be compared.

In conclusion Carter and Huzan hold the view that a simulation model is accepted as being correct only because all the cross checking carried out has failed to show the model as being incorrect.⁷¹ Also it is never possible to completely validate a simulation model since there is never real data about the alternatives not implemented. In the final analysis, Emshoff and Sisson argue, if the target market believes the model is useful and uses it, the analyst has done his job.⁷²

CHAPTER 5

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PART THREE

THE IMPLEMENTATION PROCESS

CHAPTER 6

A SYSTEMS CONCEPT OF TRAINING USING BUSINESS SIMULATION GAMING: THE NEEDS ASSESSMENT, OBJECTIVE SETTING AND DESIGN SUBPROCESSES.

6.1 Introduction

The entire process of Business Simulation Gaming can be viewed in the Systems context. The Design Process, as discussed in chapters 4 and 5 forms but one element of the enlarged Gaming System. A second major element is that of Implementation.

This section will present a systems approach to the implementation of Business Simulation Gaming in a learning environment.

In particular the essential subprocesses involved in organizing a training program around a Business Game will be discussed. Within each subprocess attention will be focused on a number of factors to be considered by a game coordinator to ensure the success of the Business Gaming experience.

Throughout, reference will be made to the use of business games within the Business Science degree curricula as an illustration.

6.2 Conception of the Simulation Training Model as an Integrated Process

The implementation of a business game in a learning environment consists, in the writer's opinion, of an entire process ranging from needs assessment through to evaluation. Exhibit 6.1 illustrates clearly the component parts as well as the nature of the relationships within the Implementation process.

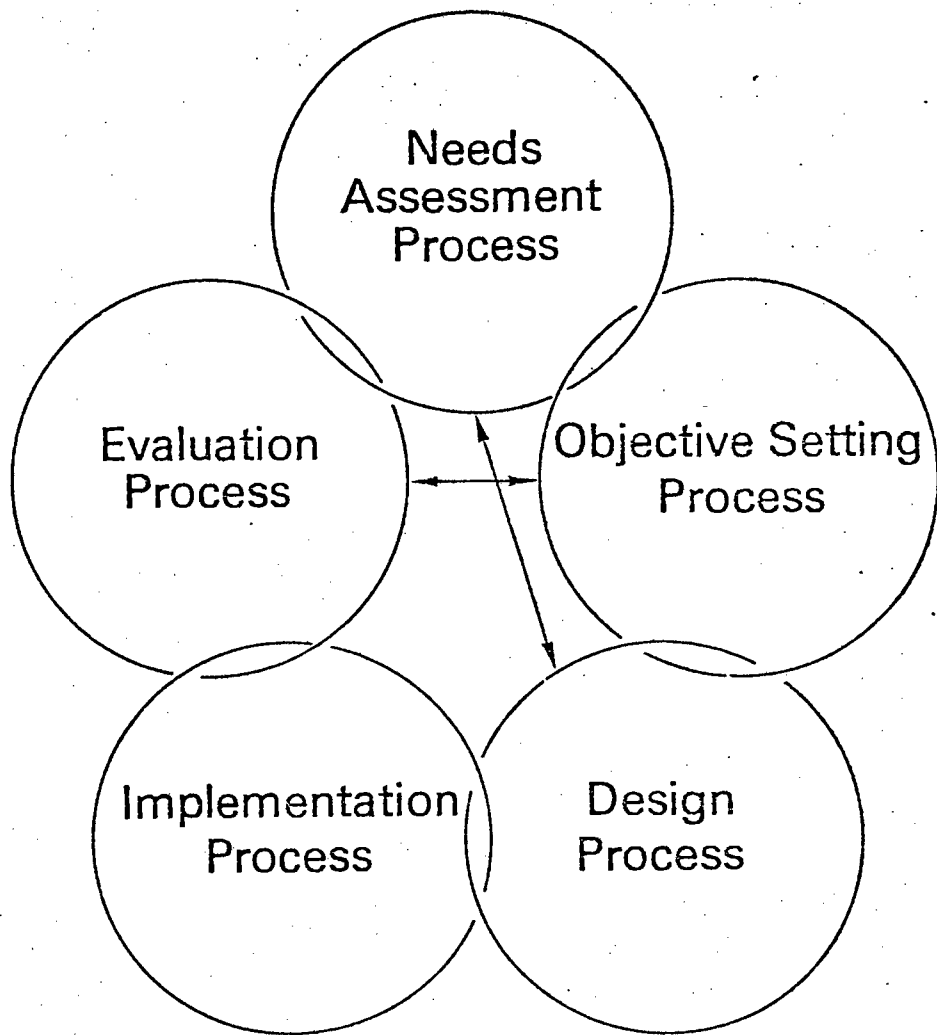
This training model, proposed by Miller,¹ shows each phase as a subprocess to the entire process. Further, the relationship of the total process is systemic in nature; i.e. the subprocesses are interdependent, stand individually but, when connected, form more than the sum of their parts.²

Each of these subprocesses will be studied in this section.

Chapter 6 will discuss the first three subprocesses, namely Needs Assessment, Objective Setting, and Design, while the Implementation and Evaluation subprocesses will be dealt with in Chapter 7.

EXHIBIT 6.1¹

Conception of the Training Model
as an Integrated Process



With reference to the Evaluation subprocess, it should be noted that the Evaluation of games can be interpreted in 3 ways:

- i. the assessment of games as a teaching device, particularly in comparison with other teaching methods;
- ii. judgement of a particular game in relation to specified teaching objectives; and
- iii. the evaluation of the performance of participants involved in the operation of the game chosen by the coordinator.

The writer considers it appropriate to discuss the latter interpretation of evaluation as a subprocess within the Implementation section of this dissertation as it affects participants directly (see chapter 7.2.4). The remaining two interpretations are esoteric and will be discussed fully in Part 4.

6.2.1 Needs Assessment Subprocess

The executive in any company or the student of business has to be convinced that any training done or course attended will be relevant to his needs³ and likely to have direct and measurable effects on the profitability of the business through the development of the individual.

Chapter 1 discussed the training needs of management in general. To summarise, management training needs are essentially threefold:

- i. appropriate theoretical knowledge,
- ii. a spectrum of necessary managerial skills, and
- iii. desirable attitudes and behaviour patterns toward the work situation.

However, within this general framework Lawton⁴ notes that the specific needs of individuals vary through time as well as from organization to organization. Some training is done, he continues, to improve skills and knowledge already possessed, and some, to acquire such qualities. Some are geared to satisfy the needs of certain general categories of positions, some to specific skills, and some to general knowledge.

Talbot⁵ identifies specific training needs as consisting of

- i. reactive needs, and
- ii. development needs.

The former refers to the skill and knowledge requirements of individuals resulting from change or expected change. But training needs are not just concerned with correcting faults and deficiencies in the present situation. Training is also concerned with satisfying future needs as well as shaping the future (development needs).

Reference to training needs in the above discussion and in numerous texts on management development, underline the importance attached to needs assessment as the initial process in the development of a training program. For unless there is some reasonable correlation between the training goals and those of the participants, there is likely to be a high degree of dissonance both in the learning opportunity and for the participant in his present or future work situation.⁶

Miller⁷ defines this assessment process as being composed of three subprocesses:

- i. The initial data gathering exercise through interviews he calls the exploratory subprocess. This process indicates initial findings and the general direction of enquiry.
- ii. A second and more detailed data generation activity guided by the results of the first, is referred to as the diagnostic subprocess. This subprocess should result in findings which are more specific in nature than those of the exploratory subprocess. It should result in validation of the original findings as well.
- iii. The third and final subprocess is the formulation of hypotheses specifying training needs by category. This subprocess might be called the hypothesizing of training needs.

This way of measuring the needs assessment process gives some insight as to the systemic nature of the process for each subprocess is closely connected to and flows from the results of the preceding subphase. Miller concludes that, had the process been ended at the diagnostic subprocess, as is frequently done in training efforts, the findings would not have been sufficiently specific or accurate to build precise and meaningful objectives.

In an academic environment, the process of needs assessment is, in the writer's opinion, somewhat easier than in a business organization. The three stage process

described above with respect to a simulation game run within a course is bounded by:

- i. the nature of the given course content (it itself should have been the result of an earlier needs assessment exercise) and
- ii. the level of academic study.

The Bachelor of Business Science degree, offered at the University of Cape Town, is a four year degree. The details of the degree are obtainable from the Commerce Faculty Prospectus,⁸ but of interest now are the 4 core courses, namely Business Science I, II, III and IV which run progressively through the 4 years of study and centre on management studies.

Level One:

It is often the case that a new student of business has little idea of the functions and dynamics of a business organization or of the terms used in everyday practice. There is therefore a need to initiate the student into the business environment by developing within him a holistic understanding of the system of business.⁹ This systems awareness of developing general comprehensions of some domains rather than detailed information about them, underlies the Business Science I course content.

Goffman¹⁰ emphasises the importance of presenting an overview to beginners before launching into the specific, because without a sense of the whole, detail is rejected and comprehension of these systems is rendered extremely difficult, if not impossible. There is also the danger that the acquisition of detail without prior acquisition of a holistic sense carries with it severe threats of conveying misconceptions.¹¹ Further, it is easier to learn a concept new than to unlearn it and then relearn it another way.¹²

Thus the primary training need of first year students of business is for a framework within which ideas can be placed in order that they are correctly orientated and understood.

Levels Two and Three:

At the commencement of the second level of study, the student has, hopefully, acquired a holistic understanding of the system of business. The need is now for detail.

Detailed studies into the functional areas of management are conducted at the second the third levels of study in the courses of Business Science II and III respectively. These areas are Marketing, Finance, Personnel, Production and Organization theory. In addition all students become acquainted, during these two levels of study, with Economic theory and Applied Business Statistics.

The writer has established through student feedback, that in addition to the knowledge requirement, students desire

- i. re-enforcement of the acquired theoretical knowledge, and
- ii. the opportunity to apply the theory to practical situations.

Level Four:

When the student enters the final level of management study, namely Business Science IV, he brings with him individual strands of detailed theoretical knowledge. Unless the student can perceive how these individual parts fit together in its entirety, much of the value and meaning of this knowledge will be lost.

Thus, at this final level of study, the need is for integration of all the strands of knowledge so far acquired so that the synergistic¹³ effect, of the whole being greater than the sum of the parts, can be seen to apply.

In addition, throughout the 4 levels of study, there is a continuous need to develop the necessary managerial skills and appropriate behaviour patterns and attitudes (see chapter 1).

6.2.2 The Setting of Training Objectives Subprocess

The final needs statements originating out of the needs assessment process would be pointless unless carried toward further action. The needs statements only indicate what is needed and do not define what would be striven for.¹⁴

Miller views the objective setting process as involving a continual reconceiving of the data and findings of the needs assessment process until they make meaning in terms of what objectives would be most meaningfully related to the actual training needs. This continual reworking of the needs statements demonstrates the dynamic interrelationship between the needs assessment process and that of objective setting.¹⁵

The setting of precise course objectives is, according to Henriksen,¹⁶ crucial to the design of the entire programme. When objectives are specified in advance, he continues, the necessary conditions can be spelt out, specific reinforcements ascertained, and methods of instruction determined.

He identifies the following areas in which specific objectives should be stated:

- i. Knowledge: The knowledge objectives, if stated precisely, describe the responses which the participants should make in reply to requests for information taught in the programme.
- ii. Skills: Objectives concerned with the achievement of skills describe the actual behaviour which the participants can exhibit under learning conditions.
- iii. Attitudes: Objectives concerned with attitudes state the beliefs, convictions, and emotional responses expected of the participants as a result of the development.

The Ceramics Glass and Mineral Products Industry Training Board also stress, in an Information Paper,¹⁷ the importance of clearly setting down the objectives of any training programme. This will help to ensure that only those items are included which help the trainee to achieve the learning or the standard required.

The Board believes that the statement of objectives should include the following:

- i. for whom the programme is written,
- ii. what the trainee is expected to be able to do at significant stages of the programme,
- iii. the standard of performance to be achieved,
- iv. how this standard will be tested, and
- v. the situation in which these standards will be tested.

Within the framework of the Business Science degree, and arising out of the needs assessment process, a differential set of objectives for each level of study can be identified.

As with the needs assessment process, a set of general as well as specific training objectives with respect to simulation gaming can be defined.

On the general level, and throughout the four levels of study, the training objectives using simulation, can be defined, in the writer's assessment, as:

- i. re-enforcing acquired theoretical knowledge;
- ii. developing the necessary management skills, and
- iii. promoting favourable attitudes and behaviour patterns toward the work situation.

Specifically, the training objectives at each level can be enumerated as follows:

First Level:

- i. provide students of management with an overall view of the organization,
- ii. introduce students to the major functional relationships within a company and those with its environment, and
- iii. familiarise students with the terms and concepts used in management.

Second and Third Levels:

Since the second and third levels of study concentrate on conveying detailed theoretical knowledge on the functional areas of management, their training objectives are identical.

They are to:

- i. promote the application of theory to practice,
- ii. develop a deep insight into the detailed functional relationships within a given functional area, and
- iii. promote the use of quantitative techniques in the decision making process.

Fourth Level:

The primary objective is that of integration. The student must bring together the accumulated store of knowledge, skills and behaviour patterns and apply it effectively as an integrated whole.

6.2.3 The Design Subprocess

Once the objectives have been set the training programme must be designed to meet those objectives.¹⁸

The design activity can be seen as a process of extending the objectives closer to action.¹⁹ This process of designing the program involves expanding the objectives into a general training concept composed of several parameters.

These parameters define general conditions and trends which would need to exist and develop respectively if the objectives were to be met.

Among the more important parameters are:

- i. the selection of the training media,
- ii. the choice of the Simulation Model,
- iii. the duration of play,
- iv. the frequency of contact sessions,
- v. the group structure,
- vi. the physical Gaming environment, and
- vii. the role of group advisors.

Each will now be discussed.

6.2.3.1 Selection of Training Media

The selection of the method of instruction should be based primarily on the extent to which it conforms to the principles of learning as discussed in chapter 2.2.

To recapitulate, the principles of learning put forward by Hounsell²⁰ are:

- i. motivation,
- ii. stimulus, response and re-inforcement,
- iii. feedback,
- iv. participation and practice,
- v. application of knowledge, and
- vi. perception.

According to Greenblat, and those familiar with gaming-simulations, these principles parallel the major arguments given for the effectiveness of gaming in teaching.²¹

Each of the above principles of learning, Greenblat continues, can be identified with one or another characteristic feature of a business simulation game. Further, the simulation technique, through its very nature (see chapter 2.3.3), is capable of providing the appropriate environment through which the objectives as set out in the 'objective setting' process can be met.

However, the writer is also a proponent of a balanced portfolio of educational tools. As shown from the survey of instructional media in chapter 2.3, each media has properties which are in part unique and in part overlapping with the

characteristics of other tools.

Thorelli and Graves believe that the current view of business educators is in the direction of a more relativistic view of all tools,²² - a view forcefully supported by the Pierson and Gordon-Howell reports on education of businessmen.²³ The trend, Thorelli and Graves conclude, is unmistakably toward the parallel use of several teaching methods.

Support for this view can be seen from the following quotations taken from the manuals of a selection of business games:

From INSTRAT:²⁴

'This simulation game is intended to be used as a supplement to an Investments, Security Analysis, or Personal Finance course. This game could also be used in a basic finance course in order to stimulate student interest in the general area of finance.'

From the Financial Management Decision Game:²⁵

'Standard finance texts should be used to confirm the appropriateness of, and improve, decision making tools used in the game. Also, a cross-reference between major finance and managerial economics texts and the decision variables within the game are provided.'

From OPSIM:²⁶

'The Decision Making game is designed to complement and strengthen executive development programs and courses in production management, managerial accounting, cost accounting, budgeting and systems management. The simulation is not meant to replace courses or textbooks, but as a supplement to them.'

From PROSIM V:²⁷

'Traditionally, production control has been taught in one of two ways. One way is the ordinary textbook - lecture - homework approach. Another way is the case-study approach. A third and new way of teaching production control is through simulation gaming. The new approach complements the traditional textbook - lecture - homework approach by permitting you to interact with a dynamic simulated production system.'

and finally,

From COMPETE:²⁸

'COMPETE may be used alone, with lectures, with cases, with reading assignments, or with some combination of these depending on the desires of the teacher in the particular course.'

A crucial point of view in this context is the integrative one. At the Graduate School of Business at Chicago and the Carnegie Institute of Technology, educators have found that an appropriate management game may serve as a convenient and stimulating focal point for broader discussions of theory as well as a source of golden opportunities for applying specific analytic techniques.²⁹

The writer has, since 1974 when Business Games were introduced in the Business Science degree, recognized the value of such an integrative approach and has striven to implement it in the manner advocated by the Chicago Graduate School and the CIT above.

Exhibit 6.2 illustrates the nature of the integrative approach as viewed by the writer.

The lectures should be designed around the gaming model and should cover the theory, concepts and techniques used in the model.

Case Studies which highlight problems similar to those encountered in the game, but in different situations and environments should be analysed concurrently. Such a practice should familiarise participants with the analysis of similar problems in different contexts and may even suggest possible solutions for their own problems in the game.³⁰

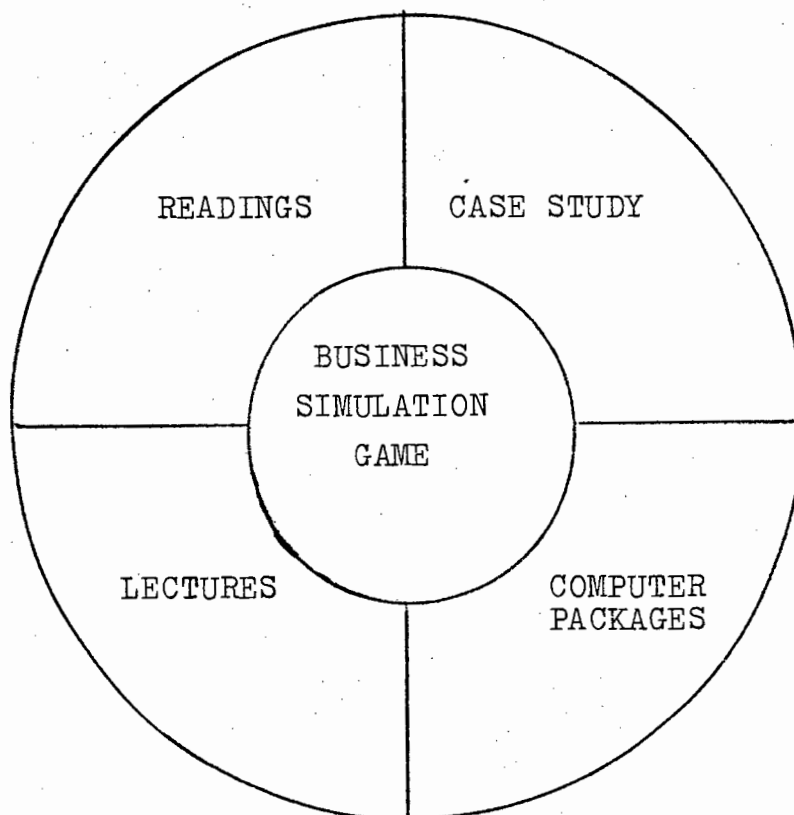
To accompany both the theoretical material covered in lectures and the case material, a set of pertinent readings from texts and journals should be prescribed.

Appendix 16 presents an illustration of lecture topics, reading assignments and case studies to complement the marketing simulation COMPETE.³¹

Finally, suitable computer packages of the kind discussed in chapter 5 that is, sensitivity analysis programs, statistical forecasting packages and optimization technique programs should be made available.

EXHIBIT 6.2

INTEGRATIVE APPROACH OF TRAINING MEDIA
TO A SIMULATION-BASED TRAINING PROGRAM



6.2.3.2 Choice of the Simulation Model

That games have an important and accepted place in education is attested by their continued use and development by many highly respected institutions. However, an inappropriate game may be worse than not using any game.³²

This observation by Meier et al emphasises the importance of matching the game objectives that should be defined at the outset of the model design process³³ (see chapter 4.3.1.1) with the course objectives (see chapter 6.2.2).

The writer has found that, almost without exception, game designers introduce their model (through their manuals) with a discussion of the educational objectives of their game. These introductory remarks about the principal lesson or lessons to be put over in the game are invaluable to the course coordinator in assessing the suitability of a given model for a particular training purpose.

Appendix 17 shows the educational objectives of four management games as defined by their respective designers.^{34, 35, 36, 37}

The choice of a model with the appropriate level of detail is a key problem in the use of games, according to Emshoff and Sisson,³⁸ otherwise the participant may not observe and process the appropriate aggregate or detailed variables as he would in the real situation being represented.

The choice of an appropriate business simulation game with respect to the Business Science courses will now be discussed.

Level One

The outcome of the needs assessment and objective setting processes is a non-complex general management simulation game. Such a model has relatively few variables which are highly aggregated in nature.

Aside, Thorelli and Graves³⁹ have found that such non-complex game models do show up the inevitable interconnectedness between various parts of business, and in their view, seem especially pertinent in training at the middle management level.

Levels Two and Three

Since the objectives at the 2nd and 3rd levels of study are identical, the

simulation model selected for each level should be similar in character, but should differ only in emphasis of the particular functional area.

In each case, the most appropriate model - the writer has established - to meet the needs of these students, is a functional management game of a rather complex nature.

The inherent advantage of functional games is that they can pry far deeper into the particular function than is possible in general games of corresponding complexity.⁴⁰

At the second level of study the marketing function is studied in detail, hence the choice of a marketing functional game.⁴¹

Similarly, since the emphasis of the course work has shifted to operations (production) management at the third level of study, an appropriate production management game⁴² has been selected.

Level Four

As discussed earlier (needs assessment, chapter 6.2.1; objective setting, chapter 6.2.2) the key word at this final level of study for the Bachelor of Business Science degree is 'integration'.

To meet this need and to emphasise the top management approach at this level, the writer believes a complex integrated general management simulation model of a highly detailed nature is appropriate.

Thorelli and Graves⁴³ advocate that complex games are generally vastly superior instruments for top management and leadership training in general than simpler games, due to their automatic emphasis on problems of organization, policy and decision-making processes.

6.2.3.3 The Duration of Play

Every business simulation game operates by moving through a segment in time which is divided into a number of consecutive decision periods. It is the task of the game coordinator to decide upon the size of this time segment, that is, the number of decision periods to simulate.

The writer has found from experience that if a model is run for too short a period of time (i.e. too few decision periods) it is likely that participants would not have had sufficient time to come to grips with the gaming model.

Thorelli and Graves⁴⁴ believe that the number of decision periods in a game run should be great enough to permit the teams to establish a working organization, to get their teeth into long range planning and to see the fruits of it. This requirement, they continue, speaks in favour of at least eight to ten decision periods.

With increased understanding of model behaviour, comes increased interest and motivation, the writer has observed.

However, considerations must also be given to an upper limit on play.

According to Thorelli and Graves,⁴⁵ no serious effort has been made, to their knowledge, to establish at what number of decision periods diminishing returns set in.

The ILO educators⁴⁶ concede that the duration of play is a difficult question to answer. They believe a halt should be called when the purpose of the game has been fulfilled: a game should not continue to the boredom of the participants, nor should they be seen to be literally 'playing' with no educational interest. 'If participants plead that they have now got the measure of the thing, and if only there were another decision (period) they would demonstrate their success, the coordinator has chosen well his time to close.'

The principle adopted by the writer is to cease simulation at that point where the motivation and interest of participants is judged to be at its highest.

Darden and Lucas⁴⁷ believe the solution to this problem is determined by such factors as course level, student sophistication, and number of class meetings per week. In their production-orientated game however, they claim that there is no optimum learning period; rather student learning can be prolonged for an indefinite period through ingenious changes of the parameter card, therefore changing the production environment provides new lessons.

In summary, Thorelli and Graves⁴⁸ suggest that the optimum number of periods will vary with the characteristics of both the individual participants and the game being played.

The writer's experience bears out the various designers' suggested duration of play in each of the respective models used in the Business Science degree. In each case, the actual number of decision periods played (as decided by the writer) has fallen within the limits proposed by the respective designers.

Level One

The relatively non-complex general management game is run over 10 decision periods. (No designer specifications).

Level Two

The Marketing simulation model used is run over 12 decision periods which coincides with the suggested simulation period.⁴⁹

Level Three

The manual for the Production Management Game used advocates between 10 and 15 decision periods for maximum learning effectiveness.⁵⁰ For a given game structure, 10 decision periods have been found to be adequate.

Level Four

A run of 16 decision periods for the complex General Management Game used at this level is considered appropriate. The manual advocates between 16 and 20 sessions of about 50 minutes each (later sessions may typically require less time).⁵¹ This longer duration is the result of greater complexity and the need to work through long term policy decisions.

6.2.3.4 The Frequency of Contact Sessions

There are 2 approaches to be considered by the coordinator. Either play could be

- i. continuous, or
- ii. intermittent.⁵²

Continuous play is characterized by a short intensive period of gaming. The period of time may be 2 days or 2 weeks, depending upon participant availability, but the essential feature is that the gaming operation continues uninterrupted until completion.

Intermittent play on the other hand implies that there is a time intermediary between decision meetings. By its very nature, the resultant gaming process extends over a longer period of time. If, for example, 2 decision periods a week are run, then a 7 week period would be necessary to complete a 10 period simulation exercise. (4 periods for Introduction and Conclusion).

Proponents of 'continuous play' believe that decision periods should be made short enough to subject the players to considerable time pressure.⁵³ This conforms to the view that time is usually crucial in business situations. Executives frequently face complex problems that must be resolved long before a thorough analysis can be completed.⁵⁴

Also, it is the writer's experience, that it is easier to maintain the momentum of the game and keep participant interest and motivation high through continuous play. This is more difficult to achieve for example, over a 7 week period than over a 2 week period, as more exogenous factors - such as other course work, assignment deadlines, tests - can impinge upon the game process and so prevent participants from giving of their best. This could consequently deprive them of deriving maximum benefit from the game.

Psychologists, according to Roberts,⁵⁵ point out that observation and retention of information increases with interest, and that game players must remain interested for maximum benefit. 'Players must forget external distractions. Also, it has been observed that interest in the business concepts which games are reported to teach best, falls off rapidly if play is continued for an excessive period of time.'

A possible drawback of the 'continuous play' approach is cited by Thorelli and Graves.⁵⁶ They maintain that many such sessions witness the emergence of an artificial supercompetitive spirit and a steamed-up emotional atmosphere which may actually hamper the educational process. Bass and Vaughan⁵⁷ warn that the sheer excitement involved in playing some games may involve trainees to such an extent that they lose sight of the primary purposes of the exercise - the teaching of principles, the correction of wrong approaches, and evaluation of consequences, among others.

A further consequence of 'continuous play' is a tendency to devote too much time

to play and not enough to a careful analysis and critique of the game results.⁵⁸ Many game administrators emphasise that games should be used in conjunction with more conventional teaching devices. Lectures, discussion sessions and other techniques can alert the game players to the artificiality of the assumptions in the model and help them to discriminate wisely between what can and cannot safely be applied to real-life situations.

Thorelli and Graves⁵⁹ are somewhat sceptical about game sessions involving continuous play. They advocate intermittent play for the following reasons:

- i. where groups rather than individuals play the game, there should be ample time available for the teams to solve their organizational problems;
- ii. if long-range planning is to be more than a pipe dream, teams must be allowed to set aside some considerable time for this purpose;
- iii. it is far from self-evident (to the authors) that normal training conditions should simulate the aspect of decision making under duress, - (they concede that some business decisions are made under duress, but question the validity of making all decisions under pressure);
- iv. a serious application of analytical techniques to intricate data requires more time than a formal decision period is likely to afford; and finally,
- v. in order to digest voluminous data, gain an overall perspective and acquire a sense of the interrelationships between the whole and its parts, the average participant needs time for personal and unhurried reflection.

They conclude that much of the learning experience will be lost if this process is frustrated.

6.2.3.5 The Group Structure

The way in which the teams playing the games are constructed is determined both by

- i. the design of the game, and by
- ii. the way in which the game is administered.

These 2 elements together or singularly, can affect the structure and composition of teams in 4 ways:

- i. the number of teams in the game;
- ii. the number of participants in each team;
- iii. the assignment of participants to teams; and
- iv. the possibilities for division of tasks within a team.⁶⁰

Each of these aspects of group structure will be discussed separately.

6.2.3.5.1 Number of Teams

The number of teams in a game is largely predetermined by its purpose and the model itself.⁶¹

Manual games are generally restricted to a dozen teams or less, due to the computational problems encountered with great numbers of teams.

With growing model complexity the maximal number of teams even in computerized games tends to be fairly limited. The original Carnegie Tech model as well as the MIT game, for instance, permit only 3 teams. The current version of the Carnegie game will accommodate 6 teams. In spite of its high degree of complexity INTOP may be used with up to 25 teams.⁶²

The Business Policy Game model permits an industry of 3 to 6 companies. For more than 6 teams, separate industries must be run concurrently.⁶³ The same logic applies to the Executive Game⁶⁴ where the maximum number of companies per industry is 9.

The majority of business games therefore can be said to simulate an oligopoly market structure. (Following on this, games can be used to explore some aspects of the interaction of firms in an oligopoly situation). An advantage of this oligopolistic situation is that players become very much aware of the impact of their actions on competitors and may provide participants as well as researchers with some useful insights into the pattern of such interaction.⁶⁵

In all computerised games, the writer has found that the constraint on industry size can be eased somewhat by the mere adjustment of the values of variables in the DIMENSION statements (assume FORTRAN or BASIC). A course coordinator with elementary programming knowledge can undertake such an adjustment to increase the maximum number of teams provided:

- i. it does not interfere with the purpose of the game, and
- ii. it does not push up computational time and costs to an unreasonably high level.

6.2.3.5.2 Group Size

The maximal number of members per team depends largely on the complexity of the game⁶⁶ and the time available for an effective organizing effort and intra-team communication in decision-making.⁶⁷

A further consideration, the writer has found to be relevant, is the participants' educational background and experience.

The average number of participants within INTOP teams has varied between 5 and 7 which, according to Thorelli and Graves, seems to provide an excellent challenge in learning from the game itself as well as in problems of organization and decision-making in executive teams.⁶⁸

There is a real danger that, if group sizes are too large relative to the determining factors above, internal organization and communications problems are likely to grow rapidly, perhaps to the detriment of the learning process.⁶⁹ In addition, the writer had found that some team members begin to take a minor role in decision-making, and the game goes on without their becoming involved sufficiently to learn very much from the experience.⁷⁰

Groups that are too small on the other hand (say, less than 3 members per team) deprive participants of the group decision-making experience⁷¹ and confronts them with too large an area of responsibility in decision making for effective decisions. The result often seems to be that the students tend to give up, foregoing much of the required analysis to save time, and making the necessary decisions 'off the top of their heads'.⁷²

Based on the business gaming experience acquired from administering games to Business Science students, the writer advocates an effective group size of between 3 and 5 members.

At the introductory level (level one) the writer believes that groups of 5 are desirable. It is felt that such a group size promotes confidence and provides

reassurance amongst members at this level, yet is less likely to carry 'passengers' than say, a group of seven to ten members.

At the more advanced levels (levels 2, 3 and 4) groups of size 3 and 4 have been found appropriate. In the writer's opinion, these group sizes avoid all the problems associated with too large or too small groups.

6.2.3.5.3 Assignment of Members to Teams

There are essentially 2 views on this subject:

- i. the coordinator assigns participants to teams; and
- ii. the participants choose their own groups.⁷³

6.2.3.5.3.1 Coordinator Assigns

The rationale behind this view-point is to provide a balance of participants on each team. For the best learning experience it is believed that the balance should be with regard both to

- i. the aptitudes of the students, and to
- ii. the specialization of the students.⁷⁴

McKenney and Dill⁷⁵ conducted a series of experiments related to the effects of team assignment on student attitudes and learning. Their conclusions are as follows:

'This study has tried to highlight 2 of the important factors in making simulation experience more productive from the standpoint of learning.

First, the way in which teams are organized has been stressed. Keeping groups together simply because they have worked together before does not seem to enhance what they get from the game.

Grouping them so that they are homogeneous in ability or prior performance has proved to have serious drawbacks.

Second, it has been found especially detrimental to both satisfaction and performance to make teams that reflect obvious differences in potential compete against each other in the same industry.

The results of this study have led to a recommendation against any method of grouping that puts the weaker members of the class together on teams and to a suggestion that each team should have at least a couple of men with above-average ability or leadership potential.'

6.2.3.5.3.2 Participants Choose

There is one major advantage in having students choose their own groups. It applies if the coordinator intends to have students accomplish a substantial part of the group work outside of the regular class period. It may be that the work and study schedules of those students arbitrarily assigned to each team may not be compatible.⁷⁶

A final recommendation resulting from the McKenney and Dill experiments is that, to the extent possible, student resentment against having team structure imposed upon them can be removed by letting the students decide themselves how team assignments should be made.⁷⁷

The writer has adopted, with some success, an assignment procedure which, in fact, combines the 2 approaches. It begins with participants selecting their own groups according to the size specified. Thereafter the writer reviews these groups and adjusts marginally where necessary to achieve a balance within and between groups based upon aptitudes and specialization.

6.2.3.5.4 Internal Group Organization

The interpersonal forces at work within the gaming group serve to teach the art of working through and with people. The team itself becomes a miniature human relations laboratory in which the members must learn how to get along with one another and to be able to organize to reach decisions acceptable to the whole group.⁷⁸

The allocation of tasks within a team may be

- i. determined completely by the game coordinator; or
- ii. it may be left completely free to the teams to organize themselves in a manner they feel will be most effective for successful business

operations;^{79, 80}

- iii. alternatively, a useful 'middle way' is to leave the choice free to the teams, subject to the proviso that no participant should undertake the task, in a game, corresponding to his area of professional specialization.⁸¹

Two advantages of this latter approach accrue:

- i. the game helps each participant to appreciate the other persons point of view in real life, and
- ii. teams develop a more open-minded view of organization problems.⁸²

In helping participants to make their choice of organization structure, Cotter⁸³ considers it appropriate to review with participants some of the differences between centralized organization and decentralized (delegation) organization and to distinguish between autocratic and democratic decision making.

The systems approach to simulation gaming is clearly emphasised as the following 2 extracts linking game design to group organization show:

- i. 'It was felt the participants should have as much freedom as possible in forming their firm organizations. To accomplish this freedom, a prime design criteria of the model (the UCLA Model No. 3) had been to require an equal amount of student analysis for managing either a product or a functional area. The workload requirements for either method of organization were seemingly balanced by allowing each firm to produce up to 3 products and to have roughly equal quantities of data on the financial, marketing and production aspects of the firm. To reinforce this flexibility, the accounting statements provided were organized in such a manner that the firms could divide the data either functionally or by product. The flexible design concept has proved to be very desirable and is common to most gaming models today.'⁸⁴
- ii. 'A crucial problem in marketing-orientated diversified companies is whether to structure primarily by customer groups, products, geographical areas, or management functions at the various levels of organization..... INTOP was explicitly designed with this type of organizational problem in mind..... (The game) is complex enough to stimulate experimentation with different

types of structure..... Data outputs are arranged in such a way that far-reaching divisionalization based on profit responsibility by area or products is possible.'

At this point, it may be worthwhile to recount briefly an informal experiment in the structure area.

'The 14 different INTOP company teams (of 5 members each) were unaware of participating in an experiment. It was merely pointed out to them that the complexity of the game was apt to require an efficient division of labour within each team.

We found that although a majority of companies (8 of 14) were in both the product X and the product Y businesses none of them went in for a product-oriented top management structure. Five companies started out with area managers, while the other nine adopted a functional setup.

At mid-game, all companies were required to rotate managerial positions in order to broaden the experience of participants. They were also asked to reconsider in this connection their division of labour.

All 5 area-oriented companies retained their structure. Interestingly, however, no less than 6 of the 9 functionally organized groups switched to area management. Three firms had functional management throughout. Not a single company changed from area to functional organization.'⁸⁵

One of the chief merits then of organization simulation by gaming is that it rapidly and tangibly will make the participants aware of the problems likely to arise under different organizational structures relative to particular company characteristics.

For the Business Science courses, the writer has adopted the following approaches to group organization structure:

Level One

Participants are advised not to undertake any formal functional, or otherwise, division of labour. Rather, each member of the team is encouraged to perform a complete analysis of results in all areas of the game. This ensures that each member is able to contribute to the joint decision making process in all

functional areas. It is suggested, however, that a chairman be chosen to coordinate the decision process.

The chief advantage of this approach is believed to be:

that each member is able to develop a detailed understanding of the entire model.

This is useful when the objective is to promote an overall view of the organization and become aware of its broad interrelationships.

Note: This approach is possible only with a non-complex model.

Levels Two, Three and Four

Participants are encouraged to select an organization structure which reflects division of labour and the assignment of the appropriate authority and responsibility to those tasks. There are numerous structures which can be adopted (see extracts above) and it is up to each company to choose that structure considered appropriate for effective decision-making.

Once organized, each company must present an organization chart that shows the lines of authority and the assignment of each member to a position in the company.

Such an approach is considered appropriate at these levels where complex games are used. For this reason, it is not considered possible, time wise, for each individual member to analyse in detail each segment of company operations.

There is, in the writer's opinion, a minimal loss of overview as discussion at the meeting stage provides the means whereby each manager can still develop a balanced overview of operations.

A related topic to group organization structure - and worthy of mention - is organizational research using simulation gaming.

By varying the procedures according to which teams of players are organized in playing a management game, it is possible to explore a great many features of organizational behaviour. For example, by changing the hierarchical nature of different firms' organization structures, it is possible to explore the effects of such hierarchies both on external performance in the market and on such

internal features as goal formation, intra group conflict, identification of members with the group, and evaluation of leadership patterns. Also it provides an opportunity to observe such organizational processes as planning, translation of plans into action, and the use of procedures and controls.^{86, 87}

6.2.3.6 The Physical Gaming Environment

Every variable in the design of the learning process through simulation, the writer has learnt, plays a critical role in determining the ultimate success of this approach. Of equal importance, is the physical environment in which the simulation experience takes place.⁸⁸

This is not simply a physical aspect, for the arrangement of furniture and the arrangement of groups in the room may very strategically affect the interaction that takes place.⁸⁹

Ideally, each company might have a separate 'board room' for decision making sessions.⁹⁰ However, a separate room for each team is a luxury, not a necessity. Grouping of teams in different parts of a large room works satisfactorily.⁹¹

The criterion of siting of each team should be such as to permit quiet and confidential discussion amongst team members without being overheard by other teams.⁹²

In addition, the writer believes the following facilities should be available:

- i. a common lecture room where all teams can assemble for briefings, lectures, and case study discussions;
- ii. a common notice board for the display of performance charts and necessary notices;
- iii. tools such as calculators, chalk boards and visual aids to promote analysis of data and discussion of results; and
- iv. where the sensitivity analysis feature (see chapter 5.2.5) has been made available to companies, each team should have ready access to a computer terminal or an open shop facility to aid in the evaluation of strategies under discussion.

6.2.3.7 The Role of Group Advisors

It is the contention of Greenlaw and Kight⁹³ (and supported fully by the writer) that if gaming is to be successfully used as a change-inducing training medium, a trained advisor, in addition to the course coordinator, should be placed with each team of participants during the decision making periods.

The functions of the advisor can be defined as follows:

- i. To provide a semi-continuous critique by utilizing the time between decision periods to explain the human dynamics of the group at work and the interpersonal skills displayed by the individual team members. This type of critique is felt by Greenlaw and Kight to be superior to the usual 'one shot' critique provided by the coordinator at the conclusion of the gaming session, since it permits the participants to try out new patterns relating to the group environment. In addition, the advisor can point out how the relationships of the players either assisted or impeded them in trying to reach their objectives.
- ii. To encourage and facilitate the use of rational, quantitative decision models by the players.⁹⁴
- iii. To serve as generalized sources to the extent that their teams solicited such help.⁹⁵ In support of this latter function, the writer has found that team queries are sometimes of such a nature that they can consume a large proportion of the coordinator's time. This consequently reduces the time the coordinator is available (i) to answer the balance of queries - this often resulting in student frustration, and (ii) to circulate, observe and monitor the teams' approaches to the game.

The conclusions of 2 experiments conducted on the role of group advisors are worth noting.

1. Purdue University, 1963⁹⁶

The aim of this study was to establish the impact (effect) of advisors on team performance.

The researchers found that on the basis of company performance, the difference in profit earned by the advised and unadvised teams was not large enough to be statistically significant. Nevertheless the authors

believe that the difference was real and that the advised students learned more from their experience. The experimenters base their conclusion on the subjective reports of the advisors as much as on the profits earned.

2. Game Research at the Harvard Business School, 1965⁹⁷

In general, the game experiments were aimed at improving the learning potential of the game. One aspect studied, inter alia, was the effects of 3 different advisor roles on game learning.

These orientations were:

- i. One set of advisors were to stress profits and make it clear to the participants that they were to be measured, not by style and strategies, but by economic results.
- ii. Another were to stress experimentation in group organization for decision making. These advisors were to take a more direct counseling role. Further, they were to grade students by how well they functioned as teams, with little or no emphasis on actual economic results.
- iii. A third group of advisors were to stress activities that would maximise the long term learning which teams could take from the game into other courses. These advisors were supposed to encourage radical variations in students' play, using the game less as a competitive economic exercise and more as a setting in which each man could practice analytical approaches that would improve his future capabilities as a manager.

The results of the experiment emphasises that the role which is chosen should be not only one that the advisors can play with comfort and conviction and one that the students will see as legitimate, but also one that is relevant to the game and to the general environment of the educational institution.

The conclusion is that the advisor serves better as a critic and interrogator of the role that the students are trying to assume than as an active counselor or consultant on how to manage. The role can be augmented usefully by encouraging students to look at their activities in the game against the perspective of their future aspirations as business executives.

In their overall conclusion the experimenters mention 'that the simulation model

is not all-important, and that the firm organization (another aspect studied concurrently) and advisor's role are quite significant aspects of the learning environment.'

This latter quotation reinforces the systems approach to gaming as mentioned at the beginning of this chapter and emphasised throughout.

6.3 Summary

Simulation Gaming must be seen as an integrative system. Within each subsystem of the larger Gaming system, the essential elements must be identified. The Implementation subsystem being one such subsystem involves organizing a training program around a Business Game.

The essential subprocesses involved are: Needs Assessment, Objective Setting, Design, Implementation and Evaluation of the performance of Participants within a given training program. The first 3 subprocesses were discussed above, while the remaining 2 aspects will be the content of Chapter 7.

CHAPTER 6

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CHAPTER 7

A SYSTEMS CONCEPT OF TRAINING USING BUSINESS SIMULATION GAMING: THE IMPLEMENTATION AND EVALUATION SUBPROCESSES

7.1 Introduction

The management of a game requires careful planning and continuous monitoring to ensure its ultimate success as a learning tool.

Apart from planning the structure of the gaming session - as was discussed in Chapter 6 - attention must also be paid to the procedure of execution. This is, in part, the purpose of this chapter.

In addition, this chapter will discuss the evaluation of the participant's performance during a game.

7.2 Implementation Subprocess

The specific steps to follow to run a game vary from one game to another. There are, however, four major elements of game administration common to all games:

- i. preparation,
- ii. introduction of the game,
- iii. operation or management of the game, and
- iv. post-game review and evaluation.¹ (the Evaluation subprocess).

These elements comprise the chronological order of events of a game session. Each will be expanded to expose the series of steps to be followed to ensure effective implementation and evaluation.

The last element, namely post-game review and evaluation, will be discussed under the heading 'Evaluation Subprocess'. (See chapter 7.3).

The systems approach will again be emphasised throughout.

7.2.1 Preparations prior to the Initial Meeting

Once the broader policy decisions concerning the gaming environment - as outlined in the Design subprocess of chapter 6 - have been settled, a few more mundane administrative tasks remain to be completed. They must however be seen

as being equally as important as the structural parameters.

7.2.1.1 A Time Schedule for the Game²

This detailed schedule will reflect the policy decision relating to 'frequency of contact sessions'. (See chapter 6.2.3.4).

It should state

- i. the time for all meetings, which could take the form of lectures, case study discussions, or board meetings for the preparation of decisions;
- ii. the deadlines for the submission of decision forms;
- iii. the time for the return of the results of their decisions; and
- iv. the date for submission of the management audit report (discussed in chapter 7.3).

Such a timetable, to be handed out at the first contact session, is, in the writer's opinion, necessary for an orderly progression through the gaming experience.

Thorelli and Graves³ believe it is highly desirable to impose fairly strict discipline with regard to timing as soon as feasible for the reason that Parkinson's law of 'work tends to expand to fill whatever time allotted to it' seems particularly applicable in management games. Through timing discipline, it is generally also possible to stimulate more effective team organization and data processing.

It is generally agreed among game designers and coordinators^{4, 5, 6} that the time spent by groups on decision making decreases as the game proceeds. Hence the timetable must reflect this time distribution by allowing more time in the earlier stages for decision making.

Concerning deadlines, the coordinator must prepare a decision rule to be applied in the event of a late submission.⁷ Two alternatives arise:

- i. the group may be fined by reducing their cash balance by a predetermined amount - this is in lieu of profit opportunities missed by a slow-moving executive group; or
- ii. a more severe, and yet perhaps more realistic, punishment is to refuse to

accept late decision forms. This in effect means that the previous period's decisions are rerun for the erring company.^{8, 9}

An example of such a schedule is to be found in appendix 18.

7.2.1.2 Pre-test the Computer Model

An essential pre-session activity that contributes significantly to the game success is a complete pre-test of the computer model.¹⁰

The reasons are as follows:

- i. to allow the coordinator to become familiar with the interactive nature of the simulation game;
- ii. to ensure the model is fully operative;
- iii. to confirm that the model is completed debugged and is computationally correct; that is, testing the behaviour of the model.

McKenney¹¹ suggests - and the writer concurs - that the simulation model should be tested by dummy running it for as least 4 decision periods. During this run a variety of unusual decisions should be made to test the model thoroughly. Consecutive runs, in the writer's opinion, do serve to check for continuity and consistency in model behaviour.

As for changes in a tested model, experience has shown, McKenney continues - and it is the writer's experience too - that it is easier to live with a minor discrepancy than to try to correct the computer program after a game has started.

While on the subject of computing it is worth mentioning that the coordinator should make arrangements with the appropriate Computer Centre staff for the timely and orderly processing of decisions. This may involve obtaining a higher computing priority rating. Such arrangements are necessary to ensure the scheduled timetable is adhered to with respect to the return of decision results.

7.2.1.3 Set Starting History and Parameter Values

The activity of creating interesting firm starting positions also requires the attention of the coordinator prior to the initial meeting.

In most game runs teams start out from a basis of equality in terms of both size and mix of resources.¹² To name but a few, they are:

Tempomatic IV;¹³ the Decision making game;¹⁴ and the Executive Game.¹⁵

There is however, no obvious reasons why other alternatives should not be considered.

Thorelli and Graves¹⁶ believe that the vexing problems of evaluating management performance, in real life as well as in gaming, might be better highlighted if the teams were started out with different resource allocations. They feel the simplest way of trying out this idea would be merely to ask the teams of one course to take over where the teams of a prior run had left off.

McKenney¹⁷ believes that the goal to setting appropriate histories for starting positions is to have each firm a bit different but to have equal market opportunities. In support, he maintains that if one firm feels it had a poor position or another a favoured position, its managerial effort in the game can be dampened and non-functional discussions can be generated.

The testing of the model (chapter 7.2.1.2) and the setting of history and parameter values can be performed simultaneously. This is so since the model requires data upon which to operate.

7.2.1.4 Become Familiar with the Rules of the Game

Apart from understanding the interactive nature of the model, the writer has found that the coordinator must also be well acquainted with the written scenario as presented in the player's manual.

A thorough knowledge of the rules of the game is imperative to provide direct and unequivocal responses to participants' queries. Such guidance, in the writer's experience, can contribute toward a more positive learning environment.

7.2.1.5 Compile Supplementary Learning Material

The concept of integrating the Business Simulation Game into a broader educational context has been fully discussed (see chapters 5.2.3 and 6.2.3.1). In essence

the conclusion reached is that a game that is just 'stuck in' as a random event without thought to the ways in which it relates to the curriculum or endeavour will be less successful as a learning media than one which is meshed with other tools and topics.¹⁸

The amount of time available for lectures, case study discussions and other related assignments is a function of the 'frequency of play' decision variable (chapter 6.2.3.4). Continuous play by its very nature limits the extent of extra-gaming activities more so than intermittent play.

Whatever the format of play, adequate time must be provided in the game timetable for any extra-gaming activities.

Appendices 16 and 19 illustrate a collection of lecture topics, case studies and readings that could be used. In addition to the compilation and preparation of related course work, the coordinator must ensure there are sufficient players' manuals - ideally, one for each participant.¹⁹

7.2.1.6 Summary

The design of a simulation gaming-orientated learning program involves planning at both the policy level as well as at the administrative level.

At the policy level, decision rules are required for such variables as: choice of training media, the choice of Business Game, duration of play, frequency of contact sessions, group structure, the physical gaming environment, and the role of group advisors.

At the administrative level such tasks as: preparing time schedules, checking out the computer model, constructing starting history- and parameter-data, becoming familiar with the game rules, and compiling supplementary learning material, should be completed prior to the commencement of the course.

With these planning and organizing functions complete, the coordinator should have the entire game-orientated learning program under control and ready for execution.

7.2.2 Introduction to the Game

The way in which the game is introduced to participants by the game coordinator may well be critical in determining the success of the experience.²⁰

The writer has divided this introductory phase into 3 sections. They are:

- i. the orientation meeting,
- ii. the trial decision period, and
- iii. the post-trial decision discussion.

7.2.2.1 The Orientation Meeting

From experience the writer identifies 2 functions to be performed at this initial meeting.

It should be used to (i) implement the administrative arrangements and appropriate policy decisions, and (ii) prepare participants for the simulation experience ahead.

7.2.2.1.1 Implementation of Decision Rules

This purely administrative function would involve:

- i. handing out the time schedule, worksheets, decision forms and any case study material,
- ii. organizing participants into teams according to the decision rule on group size and composition,
- iii. assigning group advisors (if any), and
- iv. distribute the player's manual.

In this regard the coordinator has the option of giving out the player's manual in advance of the introductory session. For simpler management games this is not always necessary according to Duke and Greenblat,²¹ since such games can be easily introduced at the time of play. More complex games, like INTOP, however will not operate successfully unless the player's have prepared themselves thoroughly. Thorelli and Graves²² - designers of INTOP - advocate that whenever possible the player's manual should be distributed well in advance to the participants for individual reading and study.

7.2.2.1.2 The Orientation Process

To be able to operate effectively in a new position an executive must assimilate in a brief period a vast amount of information about the company he is joining, about the industry in which it is active, the products it makes and so on. This immersion in 'the rules of the game' is equally desirable for prospective participants in management games. In fact, in all games, rapid and thorough orientation is a prerequisite to effective participation.²³

In accordance with the psychology of learning as well as practical experience, this introductory process usually may be facilitated and shortened most effectively by diversified use of learning media.²⁴ Apart from encouraging participants to study the manual thoroughly, the writer also gives an oral presentation covering:

- i. a general overview of Business Simulation Gaming, and
- ii. a detailed description of the nature of the simulation model to be played.

In addition, there are 2 important points to be stressed to participants at this introductory session.

- i. Incorrect decisions derived from ignorance of the rules relating to industry and company actions cannot be condoned - once again emphasising the importance of becoming familiar with the environmental constraints of the model.
- ii. The model's environment must be accepted as having its own set of peculiar characteristics and no attempt must be made to compare it to any known business environment.

(See chapter 4.3.1.2.1 for discussion on 'REALITY' concept).

The writer's experience of student behaviour and responses at the introductory phase is similar to, and well expressed by, McKenney²⁵ as follows:

'When the students are learning the rules and are becoming acclimatized to the simulation data, their behaviour is marked with a great deal of individual floundering and anxiety. This anxiety generates long discussions with the game coordinator on how unrealistically the simulation functions, thus preventing them from operating effectively; or how immensely sophisticated the model seems to

be with complex rules far beyond them, thus accountable for their poor results.' The ability of the course coordinator, as can be deduced, is of great importance at this point in the gaming experience to

- i. dispel the feeling of being overwhelmed by this learning media,
- ii. generate confidence amongst participants in their ability to manage the simulation game effectively through direct answers to questions from the floor, and
- iii. create an atmosphere in which the greatest enthusiasm and benefit to the participants will be attained.²⁶

To summarise, the first phase of the introductory process; namely the initial contact session, aims to

- i. organize and implement the administrative arrangements, and
- ii. familiarise participants with the rules of the game - the static aspect of gaming - as fast as possible.

7.2.2.2 The Trial Decision Period

The background information to companies is usually furnished in 2 ways.

- i. through the player's manual which describes the company and its environment, and
- ii. through a set of financial- and operating - statements summarising the status of the company as of the beginning of the simulation period.²⁷

However, at the start of any simulation experience participants, although perhaps familiar with the rules (the static aspect), are unfamiliar with the dynamics of the industry with respect to:

- i. the manner in which the model industry will react to their decisions, and
- ii. the effect (impact) other firms' decisions will have on their operations.

To overcome this uncertainty, to a degree, and to give participants the 'feel' of Industry behaviour, the writer believes a trial decision period should be scheduled before the commencement of the true and binding runs.

Companies should be encouraged in their trial run to

- i. test the model with decisions, sometimes of an extreme nature to establish model limits, and
- ii. acquire all additional information such as market research reports and industry reports which they would normally be careful in selecting due to the cost involved.

Supplementary uses of a practice run are identified by the writer as follows:

- i. to serve as a basis for developing efficient decision-making machinery,
- ii. to reconsider the internal group structure for possible reassignment of authority and responsibility amongst members to ensure an effective decision-making body,
- iii. to test each participant's knowledge and understanding of the game rules, and
- iv. to aid each team in setting realistic goals to be achieved by the completion of the simulation exercise.

7.2.2.3 The Post-trial-decision Discussion

This is the final phase in the preparation process before the true simulation runs begin. The functions of this session - as defined by the writer - are

- i. to provide a comprehensive revision of the static and dynamic elements of the game,
- ii. to promote discussion on the process of management, and
- iii. to discuss the evaluation-of-company-performance criteria.

7.2.2.3.1 Revision of the Static and Dynamic Elements

With the return of the trial decision period results, adequate time should be devoted to an exhaustive discussion thereof.²⁸

There are bound to be misunderstandings of the rules and misinterpretations of actions. But through a system of open discussion, questioning and possibly even unfolding the sequence of events that occur in the model stage by stage,²⁹ the majority of problems which could impair an orderly start to the game proper could be overcome.

The importance of this revision function should not be underestimated as the

understanding with which a participant leaves this session will, in the writer's opinion, form the basis of future reasoning and subsequent learning.

7.2.2.3.2 Expound the Process of Management

Participation in a Business Game involves players in managerial role playing.³⁰

To ensure that each participant is geared to perform this role effectively, and to provide a framework for direction, the writer believes that the start of the binding runs should be preceded by a discussion on the theory of the process of management.

A particular model is presented as an illustration.

In the model offered by Farmer and Richman³¹ their approach is, first, to identify the critical elements in the management process, and, second, to identify the various environmental factors which are believed to have a significant impact on the management process and management effectiveness.

In brief, the critical elements of the Management process are:

- i. Planning and Innovation,
- ii. Control,
- iii. Organization,
- iv. Staffing, and
- v. Direction, leadership and Motivation.

The environmental factors are:

- i. educational variables,
- ii. sociological-cultural variables,
- iii. political and legal variables, and
- iv. economic variables

(Appendix 20 gives a detailed presentation of these elements as well as a schematic diagram of the model).

Such a general and theoretical discussion must however, be followed by a more pragmatic approach.

The General Motors Institute³² usually start their Business Simulation Exercise

with a conference entitled "Setting Objectives for the Operation of a Business". The participants are encouraged to examine certain environmental variables before setting their own company objectives. For example, it is pointed out that a company must examine its market, competition, resources, capacity and manpower in order to set realistic goals.

Cotter,³³ in turn, proposes that before preparing and submitting their first set of decisions, participants should undertake a set of activities and prepare a number of reports for their use in planning business operations during the game. These activities essentially revolve around setting goals and formulating initial strategies and policies for company operations. Appendix 21 discusses these activities in detail.

The writer, too, has developed an approach which participants are encouraged to implement over the course of a game. It involves 3 linked activities, namely,

- i. setting objectives,
- ii. formulating strategies and policies, and
- iii. developing a comprehensive management information system.

The effect of such a post trial decision period discussion is well expressed by the General Motors Institute trainers as follows:³⁴

'By providing the conferees with information necessary to make decisions, the broader becomes the experience until the point is reached that to arrive at decisions requires long range planning, the establishment of broad company objectives, annual and quarterly objectives, and rather specific policies.'

7.2.2.3.3 Evaluation-of-Performance Criteria

It is believed by the writer that those being evaluated have a legitimate claim to being informed in advance as to the standards of appraisal.

What these standards of appraisal should be, as well as their relative ranking, is ultimately a question of judgement and values.³⁵ It is also a question related to the purpose of running the game and the use to be made of the ratings.

If, for example, a simulation is used as a means of testing risk-willingness

among decision-makers, the criteria of evaluation must reasonably be somewhat different from what they would be if the same simulation is used in a training program in business organization and policy.

The actual method of performance evaluation and choice of criteria will be discussed in chapter 7.3.2 on 'performance evaluation' but is mentioned in the orientation phase to maintain the chronological order of events.

7.2.3 The Operation of the Game

This is the focal point of all planning and preparation undertaken by the designer, coordinator and students. To ensure its success it should be remembered that simulation gaming is a learning experience where unfettered motivation is to be encouraged rather than restrained, and where free exploration and self-discovery at both individual and group level should be maximized.³⁶

The particulars of implementation are highly variable. There are a few kinds of activities, however, which are typically engaged in by the game coordinator.

They are:

- i. the counselling of teams,
- ii. the manipulation of the Game environment,
- iii. the broadening of the educational experience,
- iv. the accumulation of performance data, and
- v. certain procedural matters.

Each will be reviewed below.

7.2.3.1 The Counselling of Teams

A fair proportion of the coordinator's time will be spent on counselling in various forms. This function is of considerable significance in influencing the yield participants will obtain from the simulation.³⁷ The activities involved are categorised below.

- i. Remind players of the rules as situations arise.³⁸ Participants will

inevitably vary in their willingness and ability to assimilate the structural information. Not infrequently they will request information from the coordinator which they could themselves obtain by further study of the manual or output data. The nature of the clientele and the purpose of the run should determine the readiness with which the coordinator responds to their questions.³⁹ If he is overly solicitous he will soon find participants turning to him as a 'walking encyclopedia' rather than bothering to consult the manual or think the problem through before requesting aid.⁴⁰ The coordinator may even consider it judicious to charge a consulting fee for each question answered after a few sessions.

- ii. Deal with unanticipated consequences.⁴¹ No matter how adequate the preparation, no matter how thorough the instructor's manual provided, there will be unanticipated consequences.

Occasionally some peculiar combination of play may produce unreasonable results, as it is practically impossible to foresee every conceivable constellation of maybe several hundred variables. Perhaps an experimentally-minded coordinator may make changes in game parameters a bit too radical. Some complaints may originate in the nonchalant way a team has filled out its forms, or in an error by the key-punch operator. Or the coordinator may, for instance, not have communicated properly the impact of a given environmental change which has been introduced.

Whatever the nature of the difficulty, Thorelli and Graves suggest that in the interest of equity and morale, problems should be handled judiciously.⁴² In addition, the writer believes that any such problems must be treated as a matter of urgency and an acceptable solution - not always the permanent solution - must be found as soon as possible. Reruns are not always desirable. Time wise they will upset the schedule, while they may further disrupt the rhythm of the game. As a temporary solution to a single team's complaints, corrections may be made ex post facto⁴³ with an adjustment in the history file to the relevant variables.

To be able to take prompt action it is incumbent upon the coordinator to have and understanding of the game mechanics and of the system being simulated.⁴⁴

This emphasizes the link between design and implementation within the systems concept.

iii. Careful observation and assistance to those who require it.⁴⁵ An important point to remember concerning observation during the game run is that most of the participants are in a situation that is foreign to them in terms of the context of game-play.

McKenney⁴⁶ isolates decision periods 3 through 5 as being one of the more critical phases of the simulation. If the firms do not understand how to operate in the environment or cannot achieve a working group because of interpersonal problems, it is essential to provide assistance.

7.2.3.2 The Manipulation of the Game Environment

Depending upon the design features of the underlying model, it may be possible for the coordinator to regulate aspects of the game environment to provide a more stimulating and challenging learning experience and to highlight certain learning points. The nature of the manipulation will now be discussed.

7.2.3.2.1 Game Parameter Changes⁴⁷

This facility was discussed in chapter 4.3.2 as part of the model design process.

The sensitivity of participants to changes in the institutional environment may be tested by the introduction of special incidents manifesting themselves in terms of change in basic game parameters. Such parameters may be for instance, new legislation evidencing itself to the participants in such forms as lower taxes, credit restrictions, tariff increases; strikes may be declared; price elasticities may change as a result of the emergence of substitute products, or conversely, new uses for existing products are found. In fact, there are few practical limits to the amount and types of change which may be incorporated into a well-built model.

While the model may possess few constraints as to the number and extent of such structural changes, there are indeed limits to the capacity of teams to adjust.⁴⁸ The writer believes that changes should be introduced only when participants are capable of handling them both from an operational and learning point of view.

To establish this 'optimum' point, the coordinator requires an intimate understanding of the status of the simulation and the comprehension of participants. This task may be facilitated by the coordinator examining computer outputs before each session and through regular observation and consultation with each team.

Another important question in considering any given change is whether - and how far in advance - teams should be warned.

Yet another, is the degree of accuracy and reliability of warnings. A word of warning: as often as not the problem is to make the coordinator exercise reasonable self-restraint in the introduction of disruptive influences in the simulation.⁴⁹

7.2.3.2.2 Telescoping Decision Periods⁵⁰

The basic significance of time and timing in all decision-making may be emphasised by stimulating or requiring long-range planning by the teams. Such planning and policy-making may be forced on the companies by extending the time span of decisions. (See chapter 5.3.2).

This would involve requesting companies to prepare and submit decisions for a number of consecutive decision periods with no intervening feedback.

Some restraint in the introduction of environmental changes in the game may however, be desirable when companies are asked to make decisions for two or more periods. Indeed, when teams have no opportunity to prescribe changes in decisions from one period to the next, it would seem appropriate that the environment be held constant - perhaps with the exception of minor business cycle fluctuations.⁵¹

7.2.3.2.3 Varying the Rate of Information⁵²

The coordinator may, if he so wishes, introduce complexity gradually over the course of the game to avoid overwhelming the participants.

This would involve activating dormant modules in the game model to provide the additional complexity and generate additional information.

This however, is possible only if the model is designed with such modular features.

An example of one such simulation model is Schrieber's Top Management Decision Game.⁵³ This game is designed to progress through a series of phases, each

enriching the game by adding complexity. This enrichment is intended to expand the decision variables (and consequently the information flow) and to add realism as participants gain experience with the behaviour of the model. (See chapter 4.3.5.2 and appendix 13).

7.2.3.3 The Broadening of the Educational Experience

As has been discussed earlier (see chapter 5.2.3) simulation gaming should not be viewed as a complete and independent form of instruction. Simulation is most effective when it is an integral part of a multifaceted and mutually supporting educational strategy.⁵⁴

The discussion in chapter 5.2.3 will not be repeated. It will suffice however, to comment that if the auxiliary material as outlined in appendix 16, is for example, satisfactorily implemented, the participant would have been presented with a good opportunity to perceive or appreciate the larger implications of his experience.⁵⁵

7.2.3.4 The Accumulation of Performance Data⁵⁶

The execution of this function requires the setting up of a data capture system. This gathering of facts must be carried out with some goal, direction, or structure as a guide.⁵⁷

In the context of a simulation game such a system should isolate the important performance indicators with an update every period for the purpose of:

- i. Control, and
- ii. Evaluation.

7.2.3.4.1 Control of Simulation Experience

In most games run - and especially those which constitute a part of a broader educational program - the coordinator will want to be able to follow developments in detail. This certainly is necessary if he wishes to influence the course of events by injecting suitable environmental developments, or offer counselling to teams.⁵⁸

7.2.3.4.2 Evaluation of Team Performance

The accumulation of historical data is essential for any intelligent attempt at evaluating team performance. The collection of such data during the course of a game should be purely mechanical, as the choice of performance indicators would have been made prior to the initial run (see chapter 7.2.2.3.3).

This data however, should not be used only as input to the post-game critique session, but also serves as the basis for a continuous review system which should be emphasised as an indispensable part of the overall evaluation system.⁵⁹

As part of a continuous review system the writer publishes graphs and tables each period of performance indicators for each company. These charts illustrate the current performance of each company relative to its competitors and to its past performance.

7.2.3.5 Procedural Matters

The administrative duties performed during the course of a game run are no less important than any of the previously mentioned activities.

A list of such activities shall now be outlined.⁶⁰

1. Supply the necessary resources. In addition to the player's manual handed out prior to or at the commencement of the game, resources such as decision forms, work sheets and even case study material should be distributed at the beginning of each cycle.
2. Collect decision forms for submission to the Computer Centre. Upon collection, each decision form should be checked for
 - i. appropriate identification codes in terms of a company reference number and a period number, and
 - ii. for accuracy of figures.

With regard to accuracy, the coordinator is not in a position to check the validity of the decision values, but, through scanning, can query extreme-looking values. It is desirable to scan the decision form in the presence of a team member so that any queries can be handled immediately.

3. Process the Decision Data. The mechanics involved are:
 - i. preparing the punched cards,

- ii. activating the computer model, and
- iii. collecting the computer printouts.

Additional responsibility in this regard rests with the coordinator:

- i. he must ensure that the decision data is correctly transferred to the punched card, and
- ii. the printouts must be scanned for any blatant errors in processing before being returned to the participants.

Sufficient time should be set aside in the time schedule to allow for any reprocessing.

- 4. Return the Decision Results. Results should always be returned at the scheduled time to maintain student confidence in the simulation system.

Delays, the writer has found, are met with disappointment and sometimes even disapproval and should be avoided at all costs.

This demonstrates the importance of pre-game planning in terms of

- i. pre-testing the model to ensure no 'bugs', and
- ii. arranging priority processing with the computer centre.

The participants place high priority on confidentiality. For this reason results should be returned in sealed envelopes or by some other means which satisfies this need.

- 5. Assemble Statements of goals from each company. During the first few sessions many groups will not yet have developed efficient decision-making machinery.⁶¹ Similarly the process of goal setting and policy formulation will not have been finalized.

Thus the writer believes it is unlikely that realistic goals and strategies would be forthcoming from teams prior to the commencement of the true game runs as is the ideal situation. It is therefore advisable to delay the calling in of written statements of objectives and policies until at least a reasonable understanding of the simulation model has been achieved.

McKenney⁶² comments:

'Once the students are involved and understand how to operate in the simulation (usually by the 3rd decision period), it is opportune to require each firm to define its goals and policies for submission (to the coordinator) and for the board (coordinator) to require each firm to defend the bases they are using in order to plan for the attainment of these goals.'

Once defined, the objectives serve as a basis for evaluation of team performance (see chapter 7.3.2) and may not be changed for the duration of the game. Policies and strategies however may be revised, but must be substantiated in writing to the coordinator for his approval.

7.3 The Evaluation Subprocess: The Final Review Session

In the writer's opinion there are 2 distinct yet related aspects to be dealt with at this review session.

They are:

- i. a post-play discussion - critique, and
- ii. a formal evaluation of the performance of participants. (See chapter 6.2).

7.3.1 Post-Play Discussion - Critique

According to Taylor and Walford⁶⁴ there must be a post-game session to put the simulation in proper perspective. In their view the experience gained during the simulation needs to be capitalized upon and focused into consciousness, or else time spent on this experience will have been largely wasted.

The view on the importance of this post-play discussion - critique as a means for bringing out the lessons learnt is shared by other practitioners as well.^{65, 66}

Thorelli and Graves⁶⁷ however see limited value in a post-game critique session. They believe that many evaluation sessions are no more than supercharged exercises in post-rationalization of team behaviour. It is their conviction that the prime learning in a dynamic educational situation is - or should be - "in the doing", that is, in the making of decisions, the observation of their results and the immediate analysis of cause-effect relationships. Thus they advocate that a continuous review rather than a one-off review session should be emphasised as an indispensable part of the simulation learning system.

In the writer's experience neither one is, in itself, completely adequate. Each has an important function to perform in the overall evaluation process and should both be employed to complement each other.

While continuous review focuses on immediate past company behaviour and performance, the critique session can recapitulate, for the purpose of reinforcing knowledge, and presenting a holistic view on all that has occurred during the course of the game. Duke and Greenblat identify 3 distinct phases of the post-play critique discussion.⁶⁸

- i. The first phase involves letting the participants vent their spleens about the things that happened in the game itself. Many participants in the game would have become very emotional and highly involved in what transpired. So before asking them to analyse the experience, they must be given the opportunity to express their feelings.
- ii. The second stage is a systematic examination of the model presented by the game from the perspective of the various roles. The world looks different to those in different situations; likewise the game looks different to those in different roles within it. Analysis cannot take place until perceptions of what transpired have been shared between participants.

Such discussion provides not only a revision of the simulation in capsule form, but an alternative interpretation of it. This discussion may also help to clarify the motives and reasonings of different groups in pursuing certain strategies.⁶⁹

- iii. Finally, the participants and the coordinator should focus on the reality which was represented by the game rather than the game itself. This involves removing participants from the game situation altogether and addressing thoughtfully and at some length the actual reality that the game simulated.

Loveluck,⁷⁰ and Carlson and Misshauk⁷¹ add a further dimension to the post-play critique session.

They advocate that a major advantage of the game environment lies in the interaction situation it creates among the participants in the game. They see the game situation as serving as a type of behavioural laboratory in which all the processes inherent in group interaction come into play. Thus the game

situation, if properly constructed provides a valuable experience enabling the participants to gain greater insight into the process of group interaction and the impact of their own behaviour on other members of the group.

For the above reason, these authors believe that any group that intends to make use of simulation would lose one of its major contributions if it did not devote at least some discussion to an analysis of the human behaviour that took place within the groups during the simulation experience.

To lead this discussion on group behaviour the coordinator must have some knowledge of the subject and also have observed the groups in action during the simulation. This again emphasises the importance of an active role by the coordinator during the course of the simulation.

7.3.2 A Formal Evaluation of the Performance of Participants

A question which still remains unanswered in the literature is whether one should attempt to grade at all. Since games tend to stimulate high levels of interest and involvement, grades may not be necessary to induce participants to work hard.

However, it should also not be forgotten that most human beings seem to have a dualistic outlook towards measurement of their own performance: they frequently tend to resent it while at the same time they have an irresistible craving for being evaluated.⁷²

The discussion in this section is based on the assumption that performance appraisal is either desirable or a practical necessity.

The performance appraisal of an individual participant may be divided, in the writer's opinion, into 3 categories:

- i. economic performance of the team,
- ii. the quality of related assignments, and
- iii. analysis of individual behaviour within the group.

7.3.2.1 Evaluation of Economic Performance of the Team

This economic type of evaluation serves as feedback to each company on the degree of success achieved in realising its operating objectives in a competitive environment.

By virtue of its nature, this evaluation is performed at the group level. For individual appraisal, each participant is assigned an equal grade, based on the assumption that they all did in fact contribute.

As was mentioned in chapter 4.3.3.1, an important consideration in designing a game structure is the criteria for measuring successful playing.⁷³

In addition, these performance criteria should be communicated to participants prior to the commencement of the game (see chapter 7.2.2.3.3).

So far there are 2 questions concerning economic performance evaluation which have not yet been discussed. They are:

- i. what are these criteria? and
- ii. how are they measured?

7.3.2.1.1 The Performance Criteria

The performance criteria used in any given play will naturally depend upon the particular purpose for which the game is being run.⁷⁴ In addition the criterion function for success becomes more difficult to formulate with more complex models.⁷⁵

In general, the measurement will be selected from:

- i. market share,
- ii. profit,
- iii. rate of return on capital,
- iv. stock-market valuations,
- v. output as a proportion of capacity,
- vi. average unit costs of production, and
- vii. growth in assets, and others.⁷⁶

These measurements should be a combination of both static and dynamic measures, that is, involving both measures of totals as well as of rates of change.⁷⁷

According to Thorelli, Graves and Howells,⁷⁸ criteria used to evaluate team performance are of 2 kinds: general and specific.

General criteria are substantially identical to those that the stock market and financial analysts would apply, such as profitability or growth in assets or sales.

The emphasis should be on 'action potential for the future' at the termination of the game, to underscore the point that the game deals with only a fairly brief period of the life of modern 'perpetuate' corporations. Such an evaluation approach is likely to reduce attempts at end-of-game strategies simply to maximize the criterion function.

While the general criteria provide a certain basis for inter-team comparison, the special criteria emphasize that the achievements of an organization can only be gauged in terms of the goals it has set itself.

This requires each company to set down in writing its general business philosophy and operating objectives, with a plan comprising at least the major strategies to be applied in obtaining the objectives (see chapter 7.2.3.5.5). Then at this final review session each company should be given an opportunity to review its operations in terms of its own goals.

7.3.2.1.2 The Measurement of the Performance Criteria

It is a well-known fact that there is no unanimous agreement on how to weigh the criteria by which success of an organization may be measured.^{79, 80}

Problems in measurement arise from the different goals each firm has set for itself.

It is important to note that achievement of objectives need not in itself constitute superior performance.⁸¹ If objectives are defined with sufficient modesty and vagueness their attainments may be a trivial feat. Teams should be informed that their objectives as well as their degree of goal attainment will be taken into account in evaluation.

The statement of objectives should be examined with the following considerations in mind:

- i. level of ambition - absolutely and as related to resources at hand,
- ii. internal consistency,
- iii. specificity and 'actionability',
- iv. imagination, and
- v. strength of supporting arguments.

It is, essentially, left to each coordinator to develop his own performance evaluation scheme, but it is quite important to clearly state both the criteria for evaluation and the grade weight given to the game within the total course framework.⁸²

A practical approach to this problem of measuring performance is suggested by Thorelli and Graves⁸³ (and has been successfully implemented with minor adaptations by the writer in all games used in the Business Science curricula).

- i. The approach involves, firstly, the coordinator deciding upon a given mix of suitable criteria to govern the evaluation of economic performance in the simulation.
- ii. Secondly, according to the reasoning presented in chapter 7.2.3.5.5 on goal setting and policy formulation, the coordinator should allow companies until the third decision period to lodge with him a written statement of their priority rating of the criteria. These criteria then become the objectives of the company. Each company, in assigning priorities, would have decided upon a prime objective and a set of secondary objectives. The criteria are weighted accordingly and serve as a basis for evaluating company performance.

This system of differential weights provides flexibility to companies to develop individual strategies.

- iii. Thirdly, the weighted criteria are combined in an overall yardstick.
- iv. Finally an analysis followed by a discussion on suitable indicators of strong and weak action potentials may be quite rewarding. Indicators could include credit worthiness, inventory position, productive capacity, age of plants and a number of conventional financial ratios.

In conclusion, the writer wishes to state that he has not found a strong positive correlation between the variables, 'economic performance' and 'amount of learning that took place'.

7.3.2.2 The Quality of Related Assignments⁸⁴

To a considerable extent the standards to be used in appraising such work are identical to those educators would apply in grading examination papers or

theses generally.

The nature of the assignments was discussed in chapter 7.2.1.5 and most of the written assignments are eminently suitable for individual contribution.

A major assignment which the writer sets as part of the participant evaluation process is a management audit report.⁸⁵ It is emphasised that this report should be an individual effort of self-evaluation explicitly relating company performance during the period reviewed to business philosophy, objectives and plans as previously submitted to the coordinator.

7.3.2.3 Analysis of Individual Behaviour within the Group

The evaluation of social processes involved in organization and decision-making can be an important learning experience, (see chapter 7.3.1) but needs careful handling.

Loveluck⁸⁶ identifies 4 major methods of evaluating the social processes involved in a game.

Method 1: The first is an informal discussion between instructor and participants. This is an intuitive approach which depends totally on the skills of the instructor and his attitude towards group processes. Its disadvantage rests on the scarcity of instructors as adept at the analysis of group dynamics as at the economic analysis which is an equally important element of the total evaluation.

Method 2: This approach involves using trained observers to analyse the dynamics of each group throughout the game. The advantage is the concentration of considerable expertise on group processes; its disadvantage is the expense in resources to assemble sufficient trained observers.

Method 3: A third approach is to avoid the resource problem by using 'non-expert' observers. This is done by equipping the observers with predetermined categories of behaviour. This method has the apparent, but not real, advantage of economy, but is built on the shifting sands of possibly outdated and irrelevant hypotheses.

Method 4: This approach, recommended by Loveluck as the best available, involves the generation and measurement of the participants' own attitudes towards group processes. These sociometric techniques are not without their disadvantages,

but they have 2 overriding advantages:

- i. they require no observers, and
- ii. they can be used to produce statistics which, although debatable, can be used as a basis for discussion, grading and a comparison with the more easily generated statistics of economic performance.

A useful technique is that in which the evaluation is able to focus on the individual's behaviour and group processes, and to link these with the economic results of the game.

In this, an index - termed the consonance index - is devised, and used in the evaluation. The purpose of this index is to measure, by analysis of participants' own responses to a questionnaire, the extent to which group members perceive the influence structure of the group in the same way. Appendix 22 indicates how the consonance index is constructed.

Another sociometric technique used by the writer is that of Peer Group evaluation.⁸⁷ Since the coordinator cannot possibly be present at all team meetings, it is often difficult to determine each participant's contribution to the overall team effort. It is therefore of value to acquire feedback from the participants themselves on how they would rate the contribution of their fellow team members.⁸⁸

This feedback could be obtained by using confidential student rating forms. Confidentiality is imperative to ensure the students' objectivity in the ratings. Appendix 23 presents 2 examples of rating forms used in COMPETE⁸⁹ and INTOP⁹⁰ runs respectively.

The INTOP developers believe that if students are made aware at the beginning of the simulation that such sociometric scoring will be employed at the end, this may have a positive motivational effect even in runs where no formal grades or ratings are to be established by the coordinator. Further, they are not aware of any research indicating whether advance awareness of future rating by colleagues may also have dysfunctional consequences, such as subduing certain forms of creativity.

While they have made no direct attempt to validate this instrument, they believe

there has been a substantial degree of correlation among the mutual appraisals of the members within most teams.

7.4 Summary of the Implementation Process

The Implementation Process (chapters 6, 7) is but one element of the enlarged gaming system. The other elements include the Design of Simulation Games (chapters 4, 5), and their Evaluation (chapter 8).

The Implementation Process may itself be seen as a system of elements revolving around a learning program. Chapter 6 discussed the elements of Needs Assessment, Objective Setting and Design of the Learning Program. The remaining 2 elements namely, the Implementation (or execution), and Evaluation subprocesses were covered in chapter 7.

It was, however, mentioned in the introduction to chapter 7 that the evaluation of Business Games can be interpreted in 3 ways. One way - the evaluation of the performance of participants - was discussed in chapter 7 as it is seen as an integral part of a learning program.

The other 2 interpretations, namely (i) the assessment of Games as a teaching device, particularly in comparison with other teaching methods; and (ii) the judgement of a particular game in relation to specified teaching objectives, will be addressed in detail in the following chapter.

CHAPTER 7

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PART FOUR

THE EVALUATION PROCESS

CHAPTER 8

EVALUATION OF BUSINESS SIMULATION GAMING AS A TOOL OF LEARNING

8.1 Introduction

This chapter has 2 objectives. Firstly, it hopes to bring together the findings and viewpoints of authors who have delved into the area of the evaluation of Simulation Gaming. Secondly, the writer intends to point out the way of future research in this field.

8.2 Definition of Evaluation

Any attempt at evaluation of the simulation gaming method is an attempt to determine the effectiveness of this method as a teaching technique.¹ As stated by Garvey,² evaluation is the act of determining the value of an unknown in terms of that which is known.

Although the above statements are considered definitions of evaluation, they are nevertheless rather vague for our purposes. They do however serve as guidelines for a more explicit definition which can be stated as follows:

Simulation gaming evaluation involves measuring the contribution of the simulation method in achieving certain specified educational objectives.

Two problems immediately follow from this definition.

- i. The first involves measurement. Precision of measurement is difficult at best, and frequently impossible in education.

This results from the fact that the instruments of measurement are not precise and/or there are no satisfactory instruments with which to measure.³ In Business Simulation exercises, the questions of 'what' to measure and 'how' to measure criteria is by no means a settled issue. This is clear from the different approaches adopted by writers in the field of simulation gaming evaluation to the same generally agreed upon objective. Discussion of such studies later in the chapter will illustrate this point.

- ii. The second problem raised by the above definition involves delineating

clear, unambiguous and measurable educational objectives.

It is the writer's opinion that each Business Simulation Game can achieve only a subset of all educational objectives that are ascribed to the simulation gaming method. Hence in order to evaluate the effectiveness of any particular simulation gaming experience a potential user must ensure the educational objectives chosen are consistent with the particular Business Simulation Model selected for use.

As an illustration of this point, the structure of Business Simulation Models in the Business Science degree at U.C.T. are considered. In the first year of a 4 year period of study, a non-complex, interactive general business policy model is administered. Its prime objective is to introduce students to the concepts of management, illustrate the interrelationships between functional areas and give an overall view of a business organization.

Such objectives would be inappropriate in the student's final year of study when a complex general business policy model is administered. Here the model is used as a focal point to integrate all theoretical knowledge acquired previously. Numerous subobjectives flow from the prime objective of integration, but will not be discussed now as the purpose of this illustration is to show that educational objectives and hence the choice of a simulation model vary from one learning situation to the next (see chapters 6.2.2 and 6.2.3.2).

A wide range of educational objectives that can be achieved through the use of Business Simulation Models have been hypothesised (see chapter 2.3.3). A review of some of the more commonly agreed upon objectives is given:

- i. teaching the complex interrelationships that exist in an organization,⁴
- ii. re-enforcing, through application, previously acquired theoretical knowledge,
- iii. giving an integrative view of the organization,⁵
- iv. teaching decision making under uncertainty and with incomplete information,
- v. developing numerous skills such as decision-making, planning and forecasting, communication and organizing skills,⁶
- vi. experiencing the various aspects of group dynamics.

Broadly speaking, objectives can be classified into 2 categories;

- i. those objectives which can be identified with every simulation gaming experience, and
- ii. those educational objectives which are appropriate only to a particular simulation model as they result from the peculiar design of the model.

Originally, when Business Simulation Models were first introduced into academic courses in the late 1950's and early 1960's, their educational objective was vaguely defined as 'getting business experience'. However, in more recent years, these rather vague statements about experience-getting have been replaced by more precise, specific and detailed objectives some of which were outlined above.⁷ Also a set of well defined objectives can be more readily evaluated than vague multi-interpretable statements.

8.3 Reason for Evaluation of Business Simulation Gaming

Since the introduction of the first Business Game in 1956, the value of gaming as a teaching and training device has been questioned.⁸ The need for validating management games is greater than it is for other teaching methods, such as the lecture or the case study approach, for the following reasons.^{9, 10}

- i. the design and development costs; the designer's time, the programming cost and the computer costs are the prime expenses involved here. To develop even a rather simplistic Business Simulation Model, the time commitment is rather heavy. Apart from designing the basic model and perhaps doing the programming as well, considerable time is taken up in the de-bugging phase and numerous test runs to establish appropriate parameter values to get the desired behaviour from the game.
- ii. The operating costs; these include the cost of computer time, materials, (such as players manuals), and clerical assistance, and the lecturer's time in administering the model.
- iii. Opportunity cost which result from the existence of alternative uses of people's time.

Alternative educational methods do exist and the question raised is: Do Management games have any advantage over other methods of instruction which justify the allocation of scarce resources to their development and use?

For the above reasons, legitimate grounds exist for the need to validate Business Simulation Gaming as a tool of learning.

8.4 Studies conducted into Simulation Gaming Evaluation

8.4.1 Background

The evaluation aspect of simulation models would appear to be the most neglected area of study in the entire field of Simulation Gaming. In 1961 at the Tulane Conference on Business Games and 5 years after the development of the first Business Simulation Gaming Model the prevailing opinion was general dissatisfaction with the existing evidence supporting the educational virtues of business gaming.¹¹ But despite the suggestion of the conference that statistical and objective comparative validation studies of games versus case studies be conducted in the future, Raia¹² in 1966, observed that most of the support for management simulation is impressionistic, consisting primarily of intuitive judgements based on personal experience. He concludes that surprisingly little empirical research has been undertaken to determine the educational value of this relatively new approach to business training. Again, in 1972, a survey¹³ concluded that there was a lack of objective proof of validity. Finally, Wolfe and Guth,¹⁴ in 1975 whilst conceding some progress, still feel that considering the present veneration of management games as teaching devices, there are lamentably few rigorously controlled evaluations of their teaching ability.

8.4.2 Previous Experimental Evaluations

Several researchers in the field of Business Simulation Gaming have felt that, although opinions and expressions are of some value in justifying the continued use of simulation gaming as a tool of learning, there is a need to appraise the effectiveness of games in terms of more objective criteria.¹⁵

The writer shall now consider only those studies which are simultaneously objective, systematic and comprehensive.

(A) One of the earliest in this field was conducted by Dill, Hoffman, Leavitt, O'Mara¹⁶ at the Carnegie Institute of Technology in 1960. The study was concerned primarily with investigating relationships between game performance and certain

characteristics of organizational and group behaviour. Data collection took place before, during and after the simulation exercise. The relevant variables on which data was collected before simulation were

- i. ranking the attractiveness of a game to other methods of learning,
- ii. average intellectual capacity of a team - measured by scores on the ATGSB (admission Test for Graduate Study in Business),
- iii. classification into "Personality Types" as measured by scores on the Myers-Briggs questionnaire, and
- iv. participant's predictions about the relative influence of team members.

During the simulation,

- i. gross profit figures, together with
- ii. aspects of morale and attitude, as measured by a questionnaire after each period of play, were recorded.

After the simulation, an interview established

- i. the actual influence of individual participants on one another,
- ii. the degree of dispersion of influence within groups, and
- iii. the degree of consonance (agreement among participants about who was influential) in each group.

Statistical tests were finally conducted on possible relationships between different sets of variables.

The conclusions reached by the researchers were as follows:

- i. no relationship was found between game performance and individual ability;
- ii. no relationship was found between game performance and personality variables;
- iii. a direct statistical relationship between game performance and the dispersion of power (influence) within groups was found, hence more dispersion, better performance; and
- iv. a direct statistical relationship was found to exist between game performance and consonance of perceptions of influence within groups, hence more consonance, better performance.

A criticism often levelled at a Business Game is that it does not test and develop managerial skills, as high intelligence and related analytic skills are

sufficient for success in the Game. With the available data, Dill et al were able to test this hypothesis and they concluded that games appear to do better than courses (presumably lectures and case studies) in calling forth non-intellectual skills.

In conclusion of this study, then Dill et al found that, irrespective of the results achieved, it is possible to evaluate certain educational aspects of the simulation game.

(B) In 1961, McKenney¹⁷ undertook a study aimed at providing evidence that a business game is a more effective method of teaching some aspects of planning than is a series of cases. It was a comparative study between results achieved from game participation and those achieved through case study analysis only. The evaluation consisted of grading the written examinations of students in both the game and the case study sections before and after the simulation exercise in terms of concepts of decision making associated with planning. The three concepts on which both groups of students were graded by means of a case study examination before and after gaming were:

- i. today's decisions create tomorrow's environment;
- ii. goals and plans are carried out by a series of consistent decisions that vary in accordance with the environment; and
- iii. functional decisions of a firm are interrelated.¹⁸

The Mann-Whitney U Test¹⁹ was chosen by the researcher as the appropriate statistical tool to test his hypotheses. The null hypothesis was defined as H_0 : The two sections are equally aware of concepts 1-3 when preparing a decision plan. The alternative hypothesis was:

H_1 : The game section undergone a learning experience which makes them more aware of these concepts than the non-game section.

The results of the test showed that the null hypothesis was rejected for concepts 2 and 3 at the 5% level of significance, while concept 1 was accepted.

Since the purpose of the game was to improve the planning ability of the students, a more general hypothesis was formulated:

H_0 : both sections are equally proficient planners as characterized by the 3 concepts. The alternative hypothesis was:

H₁: the game section was involved in a learning experience which helped members develop into better planners as defined by the 3 concepts.

The results of the test on the data obtained by summing each student's score over the 3 concepts lead to a rejection of the null hypothesis at the 5% level of significance.

The overall conclusion reached by McKenney was that the game-session experiment indicated that Business Gaming has some demonstratable advantages as a teaching device.

(C) A somewhat less rigorous study was undertaken by Dill and Doppelt²⁰ in 1962 using the Carnegie Tech Management Game as the data collection vehicle. The basis for their study is primarily from responses to questionnaires administered to players and from observations made during 8 runs of the Game over a 4 year period. From these, they have tried to generalize responsibly about the learning process involved.

The purpose of this study was to find out essentially what and how students learn through participation in a simulation exercise.

The conclusions arrived at after analysing the questionnaires can briefly be summarized as follows:

- i. problem recognition rather than the application of general or specific solutions or strategies featured as the dominant kind of learning that took place in the simulation experience;
- ii. the acquisition of knowledge was derived primarily from interpersonal interactions with other participants and with outside groups like boards of directors than from interaction with the game model itself.

Additional topics, such as investigating changes in the pattern of learning as play progressed, and identifying a correlation between the amount of learning that takes place and the level of motivation during a game, were considered by the authors. However, the results reflect more the authors' opinions than statistically validated findings. For this reason, I have excluded these additional topics in my discussion.

(D) In an attempt to add to the admittedly small body of objectively verifiable

knowledge on the value of simulation gaming, Raia²¹ undertook a research project in 1965 which was essentially a comparative study between case studies and Business Simulation Games.

He defined his major hypothesis as follows:

H₀¹: Management Simulations do

- i. increase learning: defined here as the understanding of theoretical concepts and techniques of sound management and the ability to analyse business problems and to apply these concepts and techniques to their solutions (knowledge and skill);
- ii. promote more favourable attitudes toward various aspects of the course - in particular its content, its administration and its instructors (attitudes);
- iii. promote high levels of interest and motivation - which supposedly promotes learning (interest and motivation).

Concurrently Raia set out to test a second hypothesis:

H₀²: A relatively simple game provides essentially the same benefits as one that is more complex in terms of the above 3 factors.

Three groups were used, namely a control group learning through cases and readings only, a simple game group using cases and a simple management game; and a complex game group using a more advanced management simulation and the same cases as the simple game group.

Data collection methods with due consideration given to their reliability and validity consisted of:

- solicitation of opinions from observers,
- structured rating scales,
- specific tests such as written examinations, and
- semantic differential questionnaires.

In each test of hypothesis, the t-statistic²² was used to test for equality of means between any two groups.

The analysis of data produced the following results and conclusions:

1. Knowledge and skill (learning):

See appendix 24(a) for results.

- i. In the final written examination, both game playing groups scored significantly higher than the control group. Thus hypothesis $H_0^1(i)$ is accepted. Raia therefore concludes that participation in management games provide better understanding of basic concepts and techniques and improves ability to apply them to specific situations.
- ii. Also, neither game playing group scored significantly higher than the other. Hence accept hypothesis H_0^2 . The results indicated that the learning experience is not directly proportional to the degree of complexity of the simulated environment.

2. Attitudes:

- i. The results of the Semantic Differential questionnaire indicated no significant differences in either the direction or intensity of student attitudes to various aspects of the course among the 3 groups. Thus the null hypothesis, $H_0^1(ii)$ that gaming promotes a more favourable attitude towards aspects of the course was rejected. See appendix 24 (b) for results.
- ii. A test of difference in means between the two game groups again showed that a relatively simple game provides the same benefits as one that is more complex. Thus H_0^2 is accepted.

3. Interest and Motivation:

See appendix 24(c) for results.

- i. A factor to represent interest and motivation was obtained by combining a behaviour score - derived from observation - and a perception score - derived from a questionnaire. Tests on this data showed that the combined perception and behaviour scores were found to be significantly higher for the game-players than for the non-players. Thus hypothesis $H_0^1(iii)$ was accepted with the conclusion that participation in a management game provides higher levels of interest and motivation.
- ii. Again no significant difference in interest and motivation was found between participants in models of different complexities. Thus H_0^2 was again accepted.

In conclusion of this study, Raia was able to show

- i. that games enhance learning and heighten student interest and motivation, and
- ii. that a relatively simple game provides essentially the same benefits as a more complex one.

(E) Most of the reported research into Simulation Gaming up until the mid 1960's had been at the Graduate level - mainly Business Schools. Anderson and Robinson were among the first to compare simulations to cases as supplementary teaching aids in 3 diverse upperclass undergraduate courses.²³

They tested several hypotheses which, in essence, expressed the superiority of simulation gaming to case studies as a supplementary teaching activity. The results of the study did not support the claims and expectations by the researchers. They concluded therefore that simulation gaming is not uniformly superior to case studies as a supplementary teaching device. The only positive conclusion was that simulation gaming is more involving and interesting than case studies in terms of behavioural measures of interest.

(F) Another comparative study between games and cases was undertaken by Moore²⁴ in 1967 at the University of Colorado. Five simulation games were utilized in the course on which the study was conducted.

To ensure that the course content for the two groups - non game and game - was similar, Moore prepared five cases which he felt covered the same subject matter as each of the games. Data was then collected on separate case and game sections. The findings did not support a general proposition that games are more effective than the case method from the standpoint of learning.

(G) A useful insight into what had been achieved to date (1973) is given by Schriesheim²⁵ in a study which involved a recent review of the empirical evidence on the effectiveness of games as a teaching and training device. In his study, Schriesheim identifies what he calls the ten most common claims about what business games teach or foster. He then attempts to establish if these claims are validated or not by the empirical evidence. Exhibit 8.1 gives a summary of the results.²⁶

EXHIBIT 8.1²⁶

**Learning from Business Games: Summary of Empirical Results of
Research
(N = 12)**

Claim	Number of Studies with Findings that were		
	Positive	Non-positive	Negative
Decision-making skills	0	2	0
Planning and forecasting skills	1	0	0
Recognition of the interrelationships in business	1	3	1
High participant interest and motivation	2	1	1
Knowledge of facts and use of specific techniques	1	5	1
Interpersonal skills	1	2	0
Bearing of the consequences of decisions	0	0	0
Organising ability	0	2	0
Communications skills	0	0	0
Acceptance of the computer	0	0	0

The following conclusions can be drawn from the results:

- i. The majority of studies' findings were inconclusive (non-positive),
- ii. the areas most concentrated on by researchers are: (a) the acquisition of knowledge (b) recognition of the interactive nature of business (c) participant interest and motivation and (d) the importance of group dynamics.

(H) Schriesheim believes that evidence (or relative lack of it) based on empirical studies does not reveal the complete picture about the usefulness of Simulation Gaming Models as a teaching tool. For this reason, Schriesheim and Schriesheim,²⁷ in a second study examined evidence provided by expert opinion as there exists a large body of support for the effectiveness of games coming from educators' experience with gaming. A content analysis of the non-empirical evidence reported in the literature showed that four claims appear to be largely supported by expert opinion.

They are, in descending order of importance, that games

- i. induce high interest and motivation of participants,
- ii. promote the recognition of interrelationships,
- iii. develop decision making skills, and
- iv. planning and forecasting skills.

The writer has included this second study by Schriesheim in this discussion on empirical studies as he feels it aptly illustrates the degree of consensus between the empirical research and the intuitive judgements of Simulation Gaming proponents.

(I) After a survey of past evaluation studies of management games as teaching devices, Wolfe and Guth²⁸ in 1975 concluded that none had evaluated a management game in a "pure" sense, that is, a game alone versus case alone as the sole teaching aid; and all the evaluations have housed the games in a mixture of courses. They set out to determine the comparative learning effects produced in a business policy course section using a complex management game instead of a series of cases.

The study aimed to compare the effects produced in a game only section with the effects produced in a case only section.

In order to ensure high validity of results, the experimenters attempted to control as many factors as possible through the use of a controlled before-after research design and using a test instrument whose reliability and bias could be determined.

Data was obtained from scores achieved by members of both sections in a nine-question essay examination administered before and after the course. (The examination²⁹ is shown in Appendix 25).

The study involved testing a main null hypothesis:

H_0^1 : Students in a game only class obtain higher overall understanding of business policy course material than do students in a case only class.

and two sub hypotheses:

$H_0^2(a)$ Students in a game-only business policy class obtain a higher degree of principle and concept mastery, and

$H_0^2(b)$ Students in a case-only business policy class obtain a high degree of fact mastery.²¹

The non parametric tests of Mann-Whitney U³⁰ and Wilcoxon matched-pairs³¹ were used to test the null hypotheses formulated above.

The results showed that whereas no difference existed in the pre-course examination scores - as expected - the postcourse examination scores of the game section were significantly higher than their case section counterparts. This lead to the acceptance of H_0^1 at the 5% level of significance. (See appendix 26(a) for statistical results).³²

Also, as seen from appendix 26(b),³³ $H_0^2(a)$ is accepted, for the Game Section scored significantly higher on principles after the course than did the Case Section. However, hypothesis $H_0^2(b)$ was rejected as both sections obtained equally high levels of fact mastery. See appendix 26(c).³⁴

On the basis of the above results, Wolfe and Guth were able to conclude that games with teacher guidance are superior to the case approach in the teaching of certain business policy principles. Despite the empirical findings being in favour of games, the authors did not find the results convincing. The seeming game advantages did not manifest themselves in the analysed data. Furthermore, they wondered why a technique that is basically dynamic does not produce glaringly

superior results with those principles that accentuate the dynamic elements of policy making.

The above discussion reviewed most of the major research undertaken in the field of Business gaming evaluation since the inception of Simulation modelling in the management teaching environment.

8.4.3 Discussion on Past Studies

All researchers in this field of Business Simulation Gaming Evaluation are aiming at one thing: to prove the superiority of the simulation gaming technique as a teaching tool over other methods such as case studies, lectures and readings. However, as the findings from the studies reviewed above show, the task is proving to be more difficult than may have been initially thought. The reasons will hopefully become apparant during the course of this discussion.

8.4.3.1 Classification of Studies

Each study falls into one of two types: The comparative study and the intrinsic study.³⁵

- i. By far the most frequently used method is the comparative approach.

In each instance the experiment is conducted by comparing results achieved from a control group who participate in case studies only against those achieved in the game-orientated experiment group. The studies of McKenney (1961), Raia (1966), Robinson and Anderson (1965), Moore (1967) and Wolfe and Guth (1975) fall into this category.

These comparative studies have been characterised by the presence of a control group who, in each case, were exposed to case studies only. Before and after tests involving both groups on a set of predetermined variables were conducted and the results analysed for any significant difference. The purpose behind the design of this before-after experiment with one control group is to create a situation as nearly equivalent to the experiment group as possible. In this way, any resulting differences between the two groups may be attributed to the different treatments accorded to the two groups by the experimenter.³⁶ In practice however, a good deal of error often

stems from the fact that it is not possible to set up groups that have every circumstance in common.³⁷ The extent to which the experimenter is able to create identical groups, affects the reliability of his findings. Each of the above researchers attempted - some to a greater extent than others - to set up groups with the minimal of difference in order that any observed difference may be attributed to the different treatments only and so improve the reliability of the study.

- ii. The "intrinsic" study approach on the other hand, involves a before-after test situation but without the existence of a control group. In theory, the experiment is conducted by comparing a given group's performance, at the beginning of the experiment, with its own performance at the close of the experiment. The difference between the pretest and the posttest is used as an estimate of the influence of the test stimulus.³⁸ The two studies of Dill, Hoffman, Leavitt, O'Mara (1960) and Dill & Doppelt (1962) adopted this approach. However, without a control group, the experimenter runs the risk of attributing the influence of external factors, experimenter factors and interval factors to the test stimulus, and hence drawing erroneous conclusions.³⁹ On the other hand though, not having a control group is not always undesirable. In such experiments the purpose generally is to find out if the test stimulus (in this instance, the simulation game) is able to produce desired results and not whether it achieves certain results better than other stimuli. Such an approach (intrinsic) dictates that simulation gaming be measured with reference to its effectiveness as a means to achieve one or a combination of several different objectives. It need not be assessed in comparison with other techniques.⁴⁰

To the extent that the two studies mentioned above appear to have been conducted in this context, their results are valid.

8.4.3.2 Research Methodology: Degree of Variable Control

In all experiments, irrespective of the design format, the problem of factors other than the test stimulus influencing and distorting the results must be recognised and wherever possible controlled.⁴¹

Anderson et al attempted to control some of the significant variables, including intelligence, grade-point average, and certain personality data.⁴² In Raia's study, the following steps were taken to reduce the problems inherent in grading examinations:

- i. independent graders were used,
- ii. the papers were not identified other than by a student number,
- iii. the first 25% were regraded to eliminate the learning effect of the grader, and
- iv. at least 25% were regraded in a different sequence to check the grader's consistency.⁴³

McKenney⁴⁴ and Guth and Wolfe⁴⁵ used an identical system to Raia to evaluate written examinations.

Below, the writer has included extracts from different research reports indicating the researchers' attempts to control extraneous variables:

Raia:

'Assignments (to groups) were made initially on a random basis.'

'The same measures were applied to all groups throughout the study.'

'Some of the more significant variables controlled in this study include the instructors, instructional methods and techniques, grade-point average, course load, age and work experience.'

'An attempt was also made to minimize cross-communication between the three groups;'

McKenney:

'The (simulation) firms were created so as to possess a diversity of educational backgrounds, but to represent about equal intellectual talent.'

'The ratings resulting from evaluating the examinations were first analyzed to test the grader's evaluations for lack of bias; second, to check the consistency of the grader.'

Wolfe, Guth:

'As determined by the flip of a coin, 27 students pursued the course's objectives through case analysis and discussion, while a game section of 44 students pursued

the same objectives experientially.'

'Profile data collected from the students and verified against records held by the dean's office indicated that each section was statistically equivalent.'

In a criticism of their own work, Guth and Wolfe⁴⁶ point out that the research design employed is weak in controlling

- i. the interaction between testing and the treatment, and
- ii. the use of a game in a non-experimental situation.

The above discussion demonstrates the treatment of extraneous factors by the various researchers in their endeavour to produce findings which were both valid and reliable.

8.4.3.3 State of Nature: Possible Reasons

Despite their efforts, the findings generated by the above studies appear at times to contradict each other and are in general inconclusive. Why? Apart from possible flaws in experimental design, other reasons suggest themselves.

- i. The maturational process within the individual.⁴⁷ A simulation exercise usually takes place over an extended period of time e.g. 6 weeks to as long as 6 months in some instances. Within this period of time a certain degree of maturation would have taken place which could modify the participant's outlook independent of the simulation process. If there were no control groups, the distortion of results may be aggravated by the fact that a change in the experimental group might appear to arise from the test stimulus, whereas it might be the result of maturational processes.
- ii. The Hawthorne effect⁴⁸ may be operational. Students might have an increased awareness of certain experimental variables and the fact that 'something-was-going-on' might have produced the Hawthorne effect.⁴⁹ The group(s) under study may exhibit a completely different behaviour pattern as a result of the interest shown in their performance. This change in the situational importance of the participants could have an impact greater than the test stimulus itself.
- iii. The passage of time is in itself a potential extraneous factor.⁵⁰ Apart from the maturational affect mentioned in (i), it becomes increasingly

difficult to control existing variables (such as attendance at meetings), and minimize the effect of the presence of new variables, (such as the exchange of views between groups) the longer the time span of an experiment. Such occurrences may change the attitudes of subjects between the pretest and the posttest.

- iv. In each case, the test stimulus - the management simulation model - used was different. Wolfe and Guth state that not all games are equally interesting or challenging.⁵¹ Hence some models may have evoked greater enthusiasm and interest than others.

Also, each model is unique in design - shaped by the imagination of the designer. They vary greatly in complexity and are designed for different purposes and have different structural, content and administrative characteristics.⁵²

Therefore by its very nature each model will emphasise different features to any other model. These inherent differences in models could also contribute to the varying reactions received by the researchers. To the extent that the same model is used throughout an experimental run, internal validity will prevail, but the question of external validity or the generalizability of results of a study as a result of different models used, is another matter.⁵³

- v. Of great importance too, is the physical environment in which the simulation exercise is played.⁵⁴ The writer himself has come to realise how sensitive simulation gaming is to environmental factors such as the time of day of the decision periods, suitability of venue, frequency of decision periods, speed of feedback, work pressures from other courses and others. Wolfe and Guth⁵⁵ notes this problem as follows: 'The differential drop-out rate between sessions could have been caused by the Case Section's (control group) unattractive time slot (2:00 to 4:00 p.m. at an urban campus), and many Case Study students expressed a distaste for the hours required to read, analyse and write up the cases.' Dill, Hoffman, Leavitt, O'Mara⁵⁶ comment that much of the success in promoting hierarchical organization (one of their test criterion) seems to depend on the arrangements under which the

game is played and the attitudes which the boards of directors take.

Further, students respond not only to their own profit performance, but to their successes and tribulations as an organization and to the arrangements under which the game was played.

vi. The administration of games and coordinator effort are not standardized.⁵⁷

No two administrators execute a game in exactly the same way. In addition, the approach of the game administrator has been shown by Schriesheim to be significant in influencing participants behaviour and attitude toward the simulation exercise. Also, the entire gaming experience is greatly affected by teacher enthusiasm. The degree of coaching and follow up discussion allowed during play varies greatly, and probably greatly affects research results. This factor then, should also be borne in mind when comparing the results and findings of different studies directed at the same objective.

vii. A further factor that could explain the contradiction of certain findings among different studies, is the natural biases within the courses.⁵⁸

Moore's study, conducted in a production management course, found that game students master a greater degree of factual material than case study students.⁵⁹

Guth and Wolfe's study, conducted in a Business policy course, does not corroborate Moore's findings. They in fact found that game and case students respectively were equal in fact mastery.⁶⁰ They add that the production management course might consist of 'hard' factual material, while the Business Policy course glossed over specific technical detail and emphasises conceptual material.

Apart from the problem of comparing results obtained from two somewhat different academic subject areas - as just noted - Guth and Wolfe also warn of two other factors which should be borne in mind when trying to make comparisons between different studies:

- (a) there is a difference between making a principle explicit and defining it; and
- (b) the problem of instrumentation manifests itself in the form of grading procedures and definitions.

In the above studies, different results were found depending upon the level of academic study of the participants. Anderson and Robinson⁶¹ conducted their study of the undergraduate level, while the majority of other research was undertaken at a post graduate level. Anderson et al compared one kind of simulation game with case studies at 3 different senior undergraduate courses and found that simulation gaming is not uniformly superior to case studies as a supplementary teaching device.

- viii. A further factor could be the different value or goal systems of each group of participants and the problem of identifying and measuring the group's goals.⁶² Anderson et al⁶³ found that student benefits depend greatly on the student's own motives. Thus researchers must, inter alia, be aware of the different value systems prevailing within each study in order to avoid drawing erroneous conclusions when comparing different studies.
- ix. There are also differences among researchers as to exactly what to study. Although all evaluative research is directed at proving the superiority of simulation gaming over other techniques as a tool of learning, each study to date has chosen a different set of criteria on which to base their findings. These criteria are linked to the postulated objectives of simulation gaming. When simulation games were first introduced, their objectives were broadly defined as getting business experience (see chapter 8.2). However, during the 1960's, objectives of general management games as indicated earlier, have tended to become more precise and specific.⁶⁶ These objectives and many others were by no means clearly delineated at the time of some of the earlier studies.
- The spectrum of objectives is still being added to by game developers. Also some objectives are more widely accepted than others.
- Schriesheim's⁶⁷ review of empirical results in 1973 reflects the divergent objectives pursued by researchers in their endeavour to expose the learning benefits of the simulation technique. Since each game structure exhibits only a subset of all learning objectives of games - no game can exhibit all - and different models were used in each study, it has not been possible to define a single set of criteria to which all researchers could prescribe.

There are however, three objectives most frequently considered in evaluation studies: They are:

- (a) knowledge of fact and use of specific techniques,
- (b) recognition of the interrelationships in business, and
- (c) high participant interest and motivation.

The inconclusiveness of many empirical studies could possibly be ascribed to the matching of a game structure (the model used) to an incompatible set of learning objectives. Meurs⁶⁸ notes that in many of the studies, there does not seem to exist a close link between the characteristics and objectives of the game and what has been measured.

Thus the model chosen and its corresponding learning objectives should be clearly specified if research is to fairly evaluate effectiveness.

Guth and Wolfe⁶⁹ also note that there has been a shift in emphasis in evaluation studies. The early question of "how much" is learned through gaming has changed recently to a question of "what" is learned.

Thus the question of "what to measure" in order to evaluate the effectiveness of the simulation techniques is far from settled. Only further research and experiences with simulation runs can show the way.

- x. A further problem facing researchers in Simulation Evaluation is the choice of data gathering instruments.

Raia notes that there are essentially three methods of data collection available to a researcher. They are: written examinations, questionnaires, and observation.⁷⁰ With each method, the reliability of data depends very much upon how accurately it is able to record the data required. Since reliability is usually determined by a comparison of measures repeated at two points in time, and since the basic objective of evaluative research is to measure change over time, it is easy to see that reliability constitutes a special problem for evaluative research.⁷¹

Added to this is the difficulty of obtaining precise measurement as difficulties of measurement are the result of using instruments which are not precise. A further difficulty could lie in the fact that, having decided upon the type of data needed to test an hypothesis, the researcher finds that there are

no satisfactory instruments with which to measure.⁷² Also the use of an inappropriate technique to gather certain data could seriously affect the validity of any findings. This requires then that one consider the validity of the various data gathering instruments as well as their reliability.

Raia comments as follows about the reliability and validity of the various approaches to gathering data:⁷³ 'Probably the least reliable approach to measurement involves the solicitation of opinions. While these opinions can be useful as indications, they do not provide reliable and valid measures of factors such as increase in knowledge or skills. Structured rating scales tend to focus attention upon specific factors and usually provide somewhat more reliable measures. Since they still measure opinion, their validity as measures of knowledge and skill is questionable. A better approach seeks direct measures of knowledge, skill, attitudes and performance through the use of specific tests. Although these measures are considerably more difficult to construct and obtain, the increased confidence that can be placed in the results warrants the increased effort.'

Thus the question of how to measure the values of factors in an evaluation study warrants careful attention if the findings of the study are to have any credibility at all.

8.4.3.4 Conclusion on findings

There are essentially two conclusions which can be drawn from the collective findings:

- i. Empirical studies have not produced glaringly superior results on the role of simulation gaming as a teaching device. In fact the collective findings have been, in parts, contradictory and largely inconclusive.
- ii. there is a general lack of external validity or generalizability of empirical findings.

The reasons for this rather unspectacular performance as reflected in these conclusions can, the writer believes, be found in the factors discussed above. Unless there is an attempt among researchers to standardize on specific objectives

and methods, findings will continue to be contradictory and lack universal acceptability.

8.5 A Pointer to the Future

Research into this field of study is far from complete. Hence it would not be inappropriate in this section to outline a course of action for further evaluation research. This proposal, it is hoped, will contribute towards overcoming the problems of inconsistency, inconclusiveness and lack of generalizability among findings as identified in the previous section.

The call is for greater standardization of certain variables in the research design. Without this standardization, results will remain localized to that set of circumstances only.

i. Agreement on Research Objectives

The prime variable to consider it: 'what are we trying to achieve through the use of the simulation gaming approach?' The research objective of 'showing the superiority of the simulation method as a teaching device' is too vague to be used as an hypothesis in any study. What is needed is unanimity on a set of clear, unambiguous and concrete objectives which can be translated into specific research hypotheses for testing. Studies are moving in this direction and have gradually narrowed the field down to a few specific research objectives. Schriesheim's⁷³ summary of what games are believed to teach serves to illustrate this movement.

ii. The 'Design-Objectives' Link

Secondly, if a simulation game is to be fairly evaluated, the link between its design characteristics and the research objectives sought must be carefully considered. Too many people, up to now, have failed to recognize that necessary link between objectives and design.⁷⁴

It should be clear that what can be taught with a game depends largely on the characteristics of that game.⁷⁵ As mentioned earlier (see chapter 8.4.3.3) each model has its own design features and unless the objectives being sought are consistent with what the model is capable of achieving, the results are likely to be inconclusive. A game can only meet its objectives if these objectives serve as a basis for the design.⁷⁶

It would be unreasonable to request that each researcher in the future use the same model in order that at least one of the factors is constant. However, what would help when comparing different studies is a verification that the model chosen as the test stimulus is consistent with the research objectives defined. As Greer⁷⁷ notes, what is paramount is that the user knows what he is trying to teach and that he uses a game which is valid for this purpose.

iii. Teaching Environment

Thirdly, the teaching environment in which a study is undertaken needs formalization. By this is meant that certain events during the course of a simulation exercise should become standard practice. Such events would include an appropriate pregame written examination, frequent debriefing sessions, lectures related to problems encountered in the game,⁷⁸ intermediate written reports and periodic budget and policy statements,⁷⁹ a final debriefing session in order to pinpoint what has been observed or learned and to formalize the knowledge that has been gained, a postgame examination and finally, a complete written management audit report at the termination of the course.⁸⁰

This requires unremitting and energy consuming attention from instructors, but this, in the writers opinion, is essential if the full benefit of business simulation gaming is to be felt.

Also related to the teaching environment of games and with implications for evaluative research is the need to integrate simulations into the regular course curriculum and classroom activities. (See chapter 5.2.3).

Although a management game itself is supposed to be integrative in nature, McKenney has observed that games are often treated as isolated experiences or frills within the classroom. This problem was noted by him in 1962 when he stated that, in his game, the most obvious oversight of the game session was the lack of effective integration of the game session with ongoing classroom activities.⁸¹ The fact that Guth and Wolfe raise this problem again in their report in 1975, implies it is still pertinent.⁸² It is the writer's experience with business simulation models that by simply adding a simulation gaming exercise onto a Business course as opposed to integrating it into the course will result in students viewing it as an isolated experience which causes a game to lose much

of its relevance. However, in the department of Business Science, moves toward integration are afoot. Appropriate models are being matched to the courses. But the process is far from ideal. Ideally in a given course, the game should serve as the focal point of discussion and the common denominator and experience of all⁸³ - a course should be built around a simulation model. (See exhibit 6.2).

Thus, if evaluative research is to produce any meaningful results it must be conducted in a teaching environment most conducive to simulation gaming. Such an environment as outlined above, is, in the writer's opinion, a structure for which to strive. The University of Indiana has carried integration many steps further, by structuring its School of Business around a series of management simulations. In this instance, the simulations provide the common touchstone or experience for both students and faculty.⁸⁴

iv. Repetition

One of the reasons, according to Schriesheim,⁸⁵ which contribute most to make studies inconclusive, is that most of the research on games is of the single study variety. In an experiment of the simulation evaluation type, the results can be viewed as a single observation from an underlying population. In statistical terms such a point estimate is not considered a reliable measure of the true population parameter, unless accompanied by a measure of variability. This analogy serves to illustrate the writer's final point, namely that, in order to produce conclusive results, the same study must be repeated as many times as is reasonably possible before final conclusions are drawn. The writer is well aware that even a single run of a simulation game is onerous and time consuming. Also, in order to obtain a similar environment with similar students, a full academic year - until the next batch of students occupy that position - may have to elapse. However, it may be possible to split the course in which the simulation game is to be used, into at least three mutually exclusive groups. The experiment can then be run with each group simultaneously.

Whatever the method chosen, the writer feels that multiple runs of the same experiment are imperative for reliable conclusions to be drawn.

The pointers outlined above must be considered in addition to the usual careful attention that must be paid to the whole research design and methodology.

8.6 Conclusion

Business Simulation Gaming is still a relatively new and exciting tool to many, but unless its purpose is properly understood and carefully used - as it is hoped this dissertation was able to show - its full benefit will not be felt and may even lead to disillusionment with simulation gaming as a supplementary method of education.

CHAPTER 8

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APPENDIX 4

A Do-It-Yourself Simulation*

The best way to understand how a computer can simulate an operational situation is to work out a problem. Consider a situation in which machines fail from time to time. As there is only one repairman, sometimes a machine is out of use for a while before repair starts.

There are only three machines. Thus, the failure of a machine changes the odds for another failure. (For example, if all three machines are out of order, there is no chance for another failure, until at least one of the machines is repaired.) We will assume that the statistics for the repair time are of a type not easily analyzed.

Let us now create a simulation for this situation and see how we could begin to accumulate data about machine utilization (the percent of time that the machines are actually available).

Numeric Representation of Shop Conditions

We will create our simulator by use of some three-by-five cards, which will represent the data being manipulated, and by a specific procedure which you can execute. This procedure is analogous to a program to be executed by a computer.

* Extracted with permission from R. L. Sisson, *Management Science Selections*, Data Processing Digest, Inc., 6820 La Tijera Blvd., Los Angeles, Calif., 90045, 1967.

First, consider a layout for the data as shown in Figure 1A-1. The locations represent a card or deck of cards. The nature of each of the cards involved is described as follows.

Time. Number the cards from zero to, say, thirty and place this deck, in sequence, in the upper left-hand corner of a table. These numbers are clock times. Turning one of these cards over will represent the passage of fifteen minutes. Thus, each card represents a time unit as measured in quarter-hour periods.

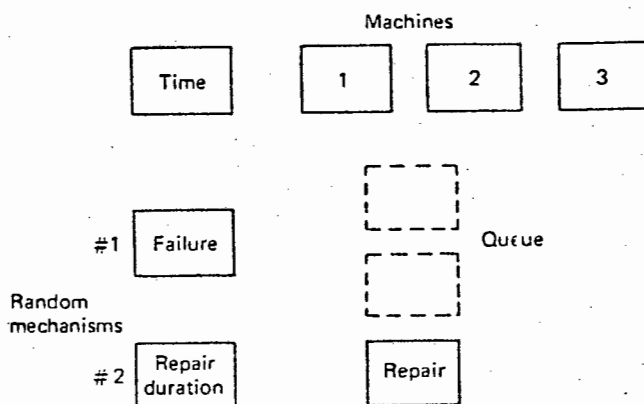


Figure 1A-1
Simulator
arrangement.

Machines. Create three cards labeled "machine one," "machine two," and "machine three," and place these in the three spots as shown in Figure 1A-1. These cards will represent the status of a machine. Note that they do not represent the physical position of the machine. When the machine cards are in these normal positions, the machine is operating. When the cards are moved into the queue or repair position, the machine is waiting for repair or being repaired, respectively.

It is convenient also to place on the machine cards a table for accumulating data. This table would have a column for entering times at which the machine fails and the times when the machine is returned to operating condition.

Machine two		
Down time	Return time	Down duration
_____	_____	_____
_____	_____	_____
_____	_____	_____

The last column, which is the difference between the first two, will represent the duration of down periods. At the end of the simulation, the down time may be accumulated and used to compute machine utilization statistics.

Representing Uncertainty

We will need two other mechanisms that generate numbers according to a statistical distribution. Let us look at the one for generating failures. Assume that experience has shown that a machine fails in an unpredictable

way, once every ten quarter-hour periods. We might represent this mechanism by creating a deck of ten cards, nine of which we mark with "no," and one marked with "yes." Create such a deck and place it in the random mechanism area—for failures. Your intuition will confirm the fact that if we shuffle and select one card at a given time period, we can determine whether a particular machine has failed at that time or not, and that this procedure will approximate the statistical distribution we had derived from machine records. We will, of course, repeat this procedure for each machine in each period.

Let us assume that our study of shop history has shown that the statistics of service time are these: Out of every ten repairs (on the average), three are serviced in one fifteen-minute time period, two are serviced in two time periods, three are serviced in three time periods, one is serviced in four time periods, and two in five time periods.

In order to simulate this kind of a service durations statistical distribution, we can create another deck of ten cards.

On 3 cards write 1
" 2 " " 2
" 2 " " 3
" 1 " " 4
" 2 " " 5

If we shuffle these cards, draw one, and interpret the number on the card as the repair duration for the particular case under study, then we have a mechanism for representing the statistical distribution or the variation in repair time as we believe it to actually occur.

Simulation Procedure

Now we need a procedure that will cause this data and the random mechanisms to represent our repair process. The formulation of this procedure is critical and a part of the simulation process that requires some skill. However, an examination of the procedure will illustrate some of the principles of developing a simulation.

Read over the procedure for simulating the shop in Figure 1A-2. Let us follow it through. We start by advancing time. This is represented by turning over a time card.

Failures

We now have to examine the various machines to see if any have failed. Steps 2 through 7 accomplished this activity. We observe whether machine one is operating or not. (If it is not, it cannot fail again.) If it is, we use our first random mechanism to determine if the machine fails at this time (step 3). We do this by selecting a card at random. If it does not break down, we will go on to step 6. If it does break down, we can represent the change in status by moving the machine card from its operation position to the queue area. In order to accumulate statistics, we will record the current clock time in the down-time column on the machine card. Clock time is the number on the time card facing up.

Figure 1A-2 Simulation procedure.

app. 1A
do-it-yourself
simulation

Set up: Put the cards in place. Set all the machines in operating positions.
Start the simulation.

- (1) Turn over a time card. If there are no more cards, go to step 15.
- (2) Is machine one operating? (Is there a card in operating position?)
If no, go to 6; if yes, go to 3.
- (3) Select a card at random from random mechanism 1.
If it says "no," go to 6; if "yes," go to 4.
- (4) Record the clock time as the down time on the machine one card.
- (5) Move the machine one card to top of queue.
- (6) Repeat 2-5 with two in place of the underlined one, i.e., for machine two. If two is just completed, then:
- (7) Repeat 2-5 for machine three.
- (8) Is there a card in repair?
If no, go to 11; if yes, go to 9.
- (9) Does the return time (last entry) equal the clock time?
If no, go to 1; if yes, go to 10.
- (10) Return the machine card to its operating position.
- (11) Move all the cards in the queue down so that first one enters repair.
If there are no cards in the queue, go to 1; if there are cards, go to 12.
- (12) Select a card at random from random mechanism 2.
- (13) Add the number on the selected card to the clock and enter the sum as return time on the card in repair.
- (14) Go to 1.
- (15) Compute down durations: (return time) - (down time).
- (16) Sum down durations = total down time.
- (17) Compute average machine utilization =

$$\frac{3 \text{ (last clock time)} - \text{(total down time)}}{3 \text{ (last clock time)}}$$

- (18) Stop.

We now repeat this process for machines two and three. (We have abbreviated this process in steps 6 and 7.) We now have adjusted part of the shop for the current time period; namely, we have adjusted for all failures that may have occurred. Now we must examine the repair process.

Repair

In step 8, we determine whether the machine in repair, if any, has completed service. We can do this by matching the clock time with the return time noted on the card in the repair position (if there is no card there, we skip this step). If the service is completed at this time period, we would return the machine card to its operating position as identified by the machine number (step 10).

These steps represent the change in status of the repair process due to the completion. Since the repairman is now free, we have to determine whether there is another machine that is down and requires his services. We do this by observing whether there are any machine cards in the queue (step 11). If not, we go back to step 1 and advance to the next time period. If there are one or more machines waiting in the queue, we move the last one into the service position. (Note here we are assuming a first-come, first-served process. We could use the simulator to examine

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other methods of determining which machine to service next.) All the other cards in the queue must be moved down one. Now determine how long this particular repair will take (step 12). Use our second random mechanism. Shuffle and select one card from the second batch. The number on this card will tell us the repair duration. By adding this repair duration to the current clock time, we can predict the completion time of this service.

We make this addition and write the completion time on the machine card as the "return time." (Even though the machine has not returned, we can, in our simulator, predict exactly when it will.) This serves both to

Figure 1A-3
Typical simulation history.

<i>Time</i>	<i>Events</i>
1	—
2	—
3	—
4	—
5	—
6	—
7	—
8	Machine 1 fails Repair duration = 4 (12)*
9	—
10	—
11	—
12	Machine 1 returns
13	Machine 2 fails Repair duration = 5 (18)
14	—
15	Machine 3 fails
16	—
17	Machine 1 fails
18	Machine 2 returns Machine 3 to repair Repair duration = 3 (21)
19	—
20	—
21	Machine 3 returns Machine 1 to repair Repair duration = 3 (24)
22	—
23	Machine 2 fails
24	Machine 1 returns Machine 2 to repair Repair duration = 2 (26)
25	—
26	Machine 2 returns

* () = completion time.

record the data and to provide a notice for later processing as to whether this machine service is completed or not. (Recall how we used return time in step 9.) We have now adjusted the simulator to represent the repair process and we can advance time and see what happens next.

Steps 15 through 17 compute the output—machine utilization in this case—at the end of the run. Set up your cards and try executing the simulator for twenty or thirty periods in order to understand the process of simulation.

Figure 1A-3 lists the results of an actual simulation run for twenty-six periods. No failures occurred for the first seven periods. (Was it proper to start with no machine in repair?) At time 8, machine *one* failed, moved directly to the repair area, and a repair time of four was computed. This would give completion at time twelve. To examine the process in more detail, notice time eighteen in Figure 1A-3. Machine *two* has completed its repair time and returns to the operating position. Machine *three*, which has been waiting in the queue, moves into the repair position. The repair duration is computed as three and the completion time, therefore, is twenty-one. The simulator has simulated the process of the queue and repair service procedures.

At the end of the twenty-six periods, the machine cards would appear as shown in Figure 1A-4. The machine utilization turns out to be twenty-five down periods out of seventy-eight total machine periods, giving a machine utilization of approximately two thirds.

Machine one

Down Time	Return Time	Down Duration
8	12	4
17	24	7
		<u>11</u>

Machine two

Down Time	Return Time	Down Duration
13	18	5
23	26	3
		<u>8</u>

Machine three

Down Time	Return Time	Down Duration
15	21	6
		<u>6</u>

Total down periods: 25

Total periods 3 machines \times 26 = 78

Machine utilization $\frac{78 - 25}{78} = \frac{53}{78}$

Figure 1A-4
Machine status
at time 26.

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and models

We could rerun the simulator with a different set of service statistics in order to determine the improvement in machine utilization resulting from, say, a faster repairman. We could examine different procedures for selecting the next item from the queue. This might be useful, for example, if we wanted to be sure that machine *one* was up as much as possible.

Needless to say, the simulator should be run for many more than twenty-six periods in order to be sure that a good average picture of the situation is obtained; that is, that the results are not due to a chance sequence of events.

Source : EMSHOFF J., SISSON R. pp. 16-22

A

COMPANY 1

WORLD 1

YEAR 2

QUARTER 4

COST AND SALES ANALYSIS

COST OF PRDUCTION	CURRENT COST		BASIC COST LEVEL					
	TOTAL	/UNIT	/LINE	/UNIT				
LABOR	873	2.80	11200	2.80				
MATERIALS	374	1.20	4799	1.20				
MAINTENANCE	78	.25	1000	.25				
OTHER COST	0	.00						
REPLACEMENT	75	.24						
CURRENT COST	1400	4.49						
DEPRECIATION	40	.13						
TOTAL COST	1440	4.62	16999	4.25				
OUTPUT	TOTAL	AREA 1	AREA 2	AREA 3	AREA 4	PCT SALES		
ACTUAL OUTPUT	312	312	0	0	0	92.6		
NORMAL CAPACITY	312	312	0	0	0	92.6		
INVENTORY								
AVAILABLE UNITS	418	418	0	0	0	124.0		
ENDING INVENTORY	81	81	0	0	0	24.0		
SALES ANALYSIS							ORDERS	
TOTAL	337	337	0	0	0	100.0		
AREA 1	170	170	0	0	0	50.4		170
AREA 2	44	44	0	0	0	13.1		44
AREA 3	44	44	0	0	0	13.1		44
AREA 4	79	79	0	0	0	23.4		79
ACTIVE SALESMEN		18	5	5	7			

SPACE IS AVAILABLE FOR 2 NEW LINES IN AREA 1 PLANT CONSTRUCTION MAY BEGIN.

APPENDIX 5

B

COMPANY 1

WORLD 1

YEAR 2

QUARTER 4

FINANCIAL STATEMENTS

INCOME STATEMENT			FUNDS STATEMENT			POS STATEMENT		RATIO ANALYSIS	
	\$	PCT	PER		\$		\$		
	000S	SALES	UNIT		000S		000S		
1GROSS SALES	3370	100.00	10.00	1ACCTS COLLECT	2771	1CASH BAL	3596	SALES/ASSETS X	30.80
BEGIN INVENT	489	14.51	1.45	BANK LOANS	1983	ACC REC	1685	COGS/INVENT	3.18
PRBC COST	1440	42.73	4.27	OTHER REC	0	INVENTORY	373	SALES/P+E X	55.98
AVAIL GOODS	1929	57.24	5.72	BEGINNING CASH	3347	CUR ASSET	5654	BONDS/EQUITY X	28.49
ENDING INVENT	373	11.07	1.11	TOTAL SOURCES	8101	PLANT NET	2980	CURR RATIO	2.16
BONDS SOLD	1556	46.17	4.62	2PRODUCT COST	1400	EQUIPMENT	3000	QUICK RATIO	2.02
GROSS PROFIT	1814	53.83	5.38	SELL EXP	785	TOT ASSET	11634	INT COVERAGE	35.60
2ADVERTISING	146	4.33	.43	R+D EXP	140	TAXES PAY	614	NET CUR ASSET	3040
SALES SALARY	105	3.12	.31	OTHER EXP	180	BANK LOAN	2000	INCOME/ASSET X	3.16
COMMISSIONS	67	1.99	.20	CAP REPAID	2000	CUR LIAB	2614	INCOME/SALES X	10.27
GEN SELL EXP	357	10.59	1.06	PLANT INVESTMT	0	BONDS OUT	2000	INCOME/EQUITY X	5.18
TRANSPORTAT	110	3.26	.33	EQUIP INVESTMT	0	TOT LIAB	4614		
OTHER SELL EXP	0	.00	.00	TAXES	0	CAP STOCK	5000		
TOT SALES EXP	785	23.29	2.33	DIVIDENDS	0	RET EARN	2020		
PROF ON SALES	1029	30.53	3.05	TOTAL ALLOC	4505	TOT EQUITY	7020		
3RES AND DEV	140	4.15	.42	CASH AVAILABLE	3596	LIAB+EQUITY	11634		
STORAGE EXP	10	.30	.03	REQUIRED LOAN	0				
BONC INTEREST	20	.59	.06	CASH BALANCE	3596				
BANK DISCOUNT	17	.50	.05						
OTHER EXPENSE	0	.00	.00						
EXECUTIVE COMP	150	4.45	.45						
TOT OTHER EXP	337	10.00	1.00						
NET PROF B T	692	20.53	2.05						
4INCOME TAXES	346	10.27	1.03						
NET INCOME	346	10.27	1.03						
DIVIDENDS	0	.00	.00						
RET EARNINGS	346	10.27	1.03						

Source : COTLER R.V.

C		INDUSTRY REPORT		WORLD 1	YEAR 2	QUARTER 4	
STOCK MARKET	PRICE	CHANGE	EARNINGS	DIVIDENDS	SHARES OUTSTANDING		CREDIT RATING
DJ/WS/SP. INDEX	125.47	9.79	13.25	6.45			
COMPANY 1	10.25	4.69	.58	.00	600		2
COMPANY 2	10.25	4.69	.58	.00	600		2
COMPANY 3	10.25	4.69	.58	.00	600		2
COMPANY 4	10.25	4.69	.58	.00	600		2
COMPANY 5	10.25	4.69	.58	.00	600		2
COMPANY 6	10.25	4.69	.58	.00	600		2

AREAS	PRICE				SALESMEN				ADVERTISING(EST)				NEW CONST(LINES CAP)			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
COMPANY 1	10.00	10.00	10.00	10.00	18	5	5	7	60	20	20	30	0	0	0	0
COMPANY 2	10.00	10.00	10.00	10.00	5	18	5	7	20	60	20	30	0	0	0	0
COMPANY 3	10.00	10.00	10.00	10.00	5	5	18	7	20	20	60	30	0	0	0	0
COMPANY 4	10.00	10.00	10.00	10.00	18	5	5	7	60	20	20	30	0	0	0	0
COMPANY 5	10.00	10.00	10.00	10.00	5	18	5	7	20	60	20	20	0	0	0	0
COMPANY 6	10.00	10.00	10.00	10.00	5	5	18	7	20	20	60	20	0	0	0	0

	SALES (000'S)	PRD. DUCTI0N	IN. VENT0RY	PERCENT 0F MKT	UNIT PR0D C0ST	UNIT SELL EXPENSE	M0DEL AVAIL	M0DEL PR0DUCED	NEW LINES IN PREP
COMPANY 1	337	312	81	16.67	4.62	2.33	1	1	0
COMPANY 2	337	312	81	16.67	4.62	2.33	1	1	0
COMPANY 3	337	312	81	16.67	4.62	2.33	1	1	0
COMPANY 4	337	312	81	16.67	4.62	2.33	1	1	0
COMPANY 5	337	312	81	16.67	4.62	2.33	1	1	0
COMPANY 6	337	312	81	16.67	4.62	2.33	1	1	0

	SALES (\$000'S)	ADV EXPENSE	R AND D EXPENSE	NET INCOME	CURRENT ASSETS	T0TAL ASSETS	CURRENT LIAB	BONDS 0UTST	T0TAL EQUITY
COMPANY 1	3370	146	140	346	5654	11634	2614	2000	7020
COMPANY 2	3370	146	140	346	5654	11634	2614	2000	7020
COMPANY 3	3370	146	140	346	5654	11634	2614	2000	7020
COMPANY 4	3370	146	140	346	5654	11634	2614	2000	7020
COMPANY 5	3370	146	140	346	5654	11634	2614	2000	7020
COMPANY 6	3370	146	140	346	5654	11634	2614	2000	7020

INDUSTRY T0TALS	AREA 1	AREA 2	AREA 3	AREA 4	T0TALS	GNP INDEX			
0RDERS(000'S)	516	516	516	474	2022	118.10			
SALES(000'S)	516	516	516	474	2022				
CAPACITY(000'S)	624	624	624	0	1872				
PR0DUCTI0N(000'S)	624	624	624	0	1872				
INVENT0RY(000'S)	162	162	162	0	486				
ADVERTISING(\$000'S)	230	230	230	186	876				
						CREDIT RATING			
						INTEREST RATE	N01	N02	N03
						SH0RT TERM	3.0	3.5	4.5
						LONG TERM	3.3	4.0	5.0

KEY
 COMPANY 1
 COMPANY 2
 COMPANY 3
 COMPANY 4
 COMPANY 5
 COMPANY 6

APPENDIX 6

1. Purpose

THE UNIVERSITY OF CHICAGO International Operations Simulation is the first major business simulation exercise oriented toward the specific problems of international trade and overseas operations. It derives special significance from the fact that international operations – and competition from abroad in domestic markets – will become an increasingly vital element in the evolving enterprise system of the 1960s. The rather high degree of realism in the game also brings out the fact that effective solution of international business problems often requires diagnostic ability and conceptual thinking to a greater degree than most other management situations – and whatever other merits business games may have they *do* stimulate these qualities.

The simulation is intended to illustrate with some considerable degree of realism the types of problems encountered in overseas operations and international competition at home and their *general* significance to management. We are interested not only in external issues but also in problems of internal organization and cooperation which tend to beset international concerns more than others. Personal observation in the General Electric Company and interviews with presidents of several other large American and European companies in international business furnished the base for the selection of parameters and variables believed to be both relevant and representative in a broad sense. In a general and selective way the game also portrays

* In this chapter a vertical line in the margin indicates passages also incorporated in identical or closely similar form in the *International Operations Simulation Player's Manual* (1963).

Users of INTOP may find this arrangement practical in deciding what materials to include from this chapter in the oral briefing of players.

Purpose

33

various institutional characteristics of the international economic environment, such as the fact that during the postwar period business cycles have differed between nations in *timing* as well as in amplitude, and that the European Economic Community (EEC) countries have had a more rapid rate of economic growth than our own.¹

While a prime purpose of the simulation is to increase understanding of the problems of international operations in general, and those of the multi-national corporation in particular, INTOP is so designed as to yield substantial payoff in *general management training as well*. This is achieved by a balanced representation of such classical functional areas of real-life companies as finance, marketing, production, and research and development. The companies will also face major problems of personnel, executive teamwork and internal organization: the number and complexity of decisions make survival depend on effective division of labor *within* company teams. The relative complexity of a management game of this nature makes the use of a computer indispensable. The exercise is programmed in FORTRAN for IBM and other types of equipment and for Remington Rand Univac.

Among the particular advantages of INTOP is that this simulation forces participants into a *stream of truly entrepreneurial (top management) decisions* of business philosophy and objectives (as opposed to the heavy strategy-tactics emphasis of most other games). This is accomplished by continually facing the teams with the choice of representing national or international companies, and, if the latter, whether by exporting, licensing, or selling to overseas distributors, or overseas-based manufacturing. In addition, there is the choice between a single-line and a diversified producer.

A principal aim of the simulation is to focus the attention of participants on the challenging idea "that changing a business — finding it new roles, new customers, new markets — is even more important than operating it efficiently."² Whatever the stance adopted, participants are necessarily faced with groping for logic in the business objectives-strategy-tactics sequence.

The emphasis on entrepreneurial decisions makes it imperative that the *top-management* level be represented in the organization of participating teams. However, the purpose is also to make ample room for *middle management* simulation whenever desirable. If we assume, for instance, that a given company elects to organize geographically, top management may be represented by a president (in Liechtenstein) and two area vice presidents in the U.S. and the EEC. Each vice president may have functional managers reporting to him, and, indeed, in

¹ When and if the United Kingdom and/or other countries join the EEC INTOP Standard parameters governing that part of the simulation ("Area 2") will be redimensioned accordingly.

² John B. McKitterick, "Profitable Growth—The Challenge to Marketing Management," an address given at the 45th National Conference of the American Marketing Association, June 20, 1962 (mimeographed), 22.

many areas of the game there is ample room for subfunctional management as well. The marketing manager in, say, the U.S. may well make effective use of a sales manager and a marketing research manager. The level or levels emphasized should primarily depend on the specific purpose for which the game is being run. It is flexible enough to allow wide variety in this regard.³

INTOP is a fast-moving exercise. This is assured by a model providing for vigorous competitive interaction in consumer markets in combination with opportunity for inter-company selling, borrowing and licensing. The dynamics are further emphasized by a number of time-lag and scheduling functions. Yet a wealth of data is provided, enabling skillful management to bring operations under reasonable control. A major purpose of the game is to stress *the role of long-range planning* as an indispensable instrument in this context. Subsidiary aims in this area are to encourage the *selective and efficient use of data* and to draw the attention to the value of systematic collection and analysis of *competitive intelligence*. One of the biases of the design group is that a majority of business firms fail to make systematic use of competitive information or provide adequate facilities for its orderly collection.

An important consideration in the design of INTOP was its future use as a *business planning and research instrument*.⁴ In particular, it has been built with simulation of multi-national corporate organizations in mind. However, the game by analogy — or by simple change of parameters, if desired — is equally applicable to the internal cooperation problems of any dispersed and diversified concern operating exclusively in domestic markets. Basic environmental characteristics may be held constant or varied within unusually broad ranges. It is also possible to introduce drastic simplification in the game if the research or business planning aims at hand so permit or require. Conversely, the modular design of the model facilitates its amendment or expansion when desired.

The foregoing is a condensed restatement of the specific purposes which were uppermost in the minds of the INTOP design group. In addition, the group had a broader aim in mind: to design a modular, *multi-purpose* game. That is, we wanted to *give every administrator of the game a chance to write his own ticket as to the purpose, complexity and functional content of the exercise*. The result is a game which without undue effort can be restructured to meet almost any of the purposes for which games are being used (as discussed in the first part of Chapter 1). Detailed suggestions as to how the standard model may be simplified or further enriched for various purposes are given in Chapters 4 and 5. Some variations going beyond the standard framework are discussed in Chapter 6.

³ Some suggestive organization patterns are displayed on the back cover of the *Player's Manual*.

⁴ Cf. Appendix VII and *supra*, 4ff for illustrative applications in these areas.

Parameter Choice and Change

FIG. 43 Sample Worksheet for Area and Product Variations, by Function (Continued)

(USING INTOP STANDARD FOR PURPOSE OF ILLUSTRATION)

Parameters	U.S.	EEC	Brazil	U.S.	EEC	Brazil	Dictionary Symbol
	X	X	X	Y	Y	Y	
(V16) Obsolescence Cost Rate	4	4	4	2	2	2	PM12
(V17) Factory Construction Time	2	2	2	2	2	2	PM13
(V18) Methods Improvement:							
Max. Cost Reduction Limit	7	6	4	5	6	3	PM14
Optimal Methods Expense	4	2	1	6	5	3	
(V19) Factory Acquisition Cost	5	4	2	8	7	2	PM17
(V20) Maximal Factory Capacity	5	4	2	9	7	2	PM18
(V21) Fixed Cost for Factories	6	4	2	8	6	2	PM19
Fixed Cost Per Factory (If Inventoried)	0	0	0	0	0	0	PM01
(V22) Depreciation Rate	6	6	6	6	6	6	PM20
<i>Financial Parameters†</i>							
(V23) Capital Transfer Tax – Area To Home	0	0	0	–	–	–	PF01
Capital Transfer Tax – Home To Area	0	0	0	–	–	–	PF14
(V24) Fraction of A/R 2 Added to A/R 1	0	7	6	–	–	–	PF02
Fraction of A/R 1 Added to Cash	4	5	3	–	–	–	PF03
(V25) Fraction of A/P 2 Added to A/P 1	0	7	6	–	–	–	PF04
Fraction of A/P 1 Subtracted From Cash	4	5	3	–	–	–	PF05
(V26) Savings Interest Rate	3	3	5	–	–	–	PF06
(V27) Borrowing Interest Rate	3	4	5	–	–	–	PF07
(V28) Supplier Credit Interest Rate Below Switch-over Amount	6	6	6	–	–	–	PF08
Supplier Credit Switch-over Amount	7	7	4	–	–	–	PF09
Supplier Credit Interest Rate Above Switch-over Amount	9	9	9	–	–	–	PF10
(V29) Income Tax Rate	8	7	4	–	–	–	PF11
(V30) Fraction of Losses Available As Tax Credits	5	3	0	–	–	–	PF12

*A zero means that a parameter is not used in INTOP Standard.

†Area financial parameters apply irrespective of products (only area variations are possible).

APPENDIX 8

DEPARTMENT OF BUSINESS SCIENCE.

BUSINESS SIMULATION.

B.I.C.S.

Historical Data of period 0

Cash Balance	R300,000
Plant Investment	R100,000
Raw Material units	10,000 Units
Raw Material Value	R100,000
Finished Goods Units	1,000 Units
Finished Goods Value	R24,000
Equity	R524,000
Market Factor	
- Retail	100
- Builder	100
Sales force at end of period 0	- 20
New model available in period 0	- 0
Number of shifts	1
Loan to be repaid in period 0	- R0
Loan Received in period 0	- R0
Profit in Period 0	- R0
Research and Development to date	R0
Number of new models introduced so far	0

-----oOo-----

DECISION INPUT FORM

COMPANY

QUARTER TO BE SIMULATED

			1	2
			3	4
1. MARKETABLE SECURITIES	\$	<u>5</u> , <u>8</u> 0, 0	<u>0</u>	<u>0</u>
2. SALES DISCOUNT ON RECEIVABLES				<u>9</u>
3. SHORT-TERM LOANS	\$	<u>10</u> , <u>13</u> 0, 0	<u>0</u>	<u>0</u>
4. TWO-YEAR INTERMEDIATE TERM LOAN	\$	<u>14</u> , <u>17</u> 0, 0	<u>0</u>	<u>0</u>
5. THREE-YEAR INTERMEDIATE TERM LOAN	\$	<u>18</u> , <u>21</u> 0, 0	<u>0</u>	<u>0</u>
6. LONG-TERM LOAN	\$	<u>22</u> , <u>25</u> 0, 0	<u>0</u>	<u>0</u>
7. SHARES OF PREFERRED STOCK			<u>26</u>	<u>31</u>
8. SHARES OF COMMON STOCK			<u>32</u>	<u>38</u>
9. COMMON STOCK PRICE PER SHARE			<u>39</u>	<u>43</u>
10. DIVIDEND PER COMMON SHARE			<u>44</u>	<u>47</u>
11. UNITS OF MACHINE CAPACITY PURCHASED			<u>48</u>	<u>51</u> 0 0
12. UNITS OF PLANT CAPACITY PURCHASED			<u>52</u>	<u>55</u> 0 0
13. CAPITAL BUDGETING PROJECT A				<u>56</u>
14. CAPITAL BUDGETING PROJECT B				<u>57</u>
15. UNITS TO BE PRODUCED			<u>58</u>	<u>61</u> 0 0
16. PURCHASE OF DEMAND AND PRICE FORECAST				<u>62</u>
17. STRIKE SETTLEMENT				<u>63</u>
18. UNIT PRICE OF PRODUCT	\$		<u>64</u>	<u>68</u>
19. PENALTY	\$	<u>69</u> , <u>72</u> 0, 0	<u>0</u>	<u>0</u>

HBS Faculty Report of Each Firm in an Industry

INDUSTRY 41 - PERIOD 8 - FACULTY REPORT							
FIRM 5	BALANCE SHEET ^a			CASH FLOW STATEMENT ^b			
ASSETS			LIAB/N.W.	SOURCES	APPLICATIONS		
CASH	312.	ACCT PAY	315.	OPERATIONS	204.	OPERATIONS	0.
SEC	0.	NOTES PAY	0.	LOANS	0.	DIVIDENDS	0.
ACCTS REC	989.	TAXES	160.	SALE STOCK	0.	PLANT PUR	100.
INVENTORY	804.	L.T. DEBT	0.	SALE BNDS	0.	LOAN REPAY	0.
PLNT-EQUIP	2303.	EQUITY	3933.	CSH-SEC DEC.	0.	BOND RET	0.
						CSH-SEC INC.	104.
TOTAL	4408.	TOTAL	4408.	TOTAL	204.	TOTAL	204.

FINANCIAL INFORMATION ^c					
EPS	0.22	STOCK PRICE	9 1/4	SHARES OUTSTANDING	660102.
CURRENT RATIO	4.43	QUICK RATIO	2.74	L.T. DEBT/TOT ASSETS	0/0 0.

INCOME STATEMENT ^d		PRODUCT LINE REPORT ^e			Simulation Gaming	
		1	2	3		
SALES	2818.	PRICE	7.25	12.25		16.15
LESS C.G.S.	1347.	C.P.U.	3.48	5.91		9.20
GROSS PROFIT	1471.	SLS UNITS	278.	64.	1.	
EXPENSES		MARKETING	205.	120.	10.	
FAC OHD	402.	PROD DEV	40.	40.	5.	
S AND A	760.	OPER PROF	275.	109.	-75.	
OPER PROF	308.	PRCD VOL	278.	64.	1.	
INT EXP	0.	FGD INV	0.	0.	0.	
SEC INC	0.	NR MEN	688.	224.	56.	
TAXES	160.	HRS OVTM	0.	0.	0.	
NET PROFIT	148.	O/O UTIL	90.	99.	23.	

F I N G A M E C O . I
S U M M A R Y D A T A Q U A R T E R 1

HISTORICAL INFORMATION

COMMON STOCK SHARE INFORMATION:

PRICE AT QUARTER CLOSING	35.56	ACCUMULATED WEALTH	35.66
QUARTERLY EARNINGS	0.74	DIVIDEND YIELD	0.011
PRICE EARNINGS RATIO (BASED ON CURRENT QUARTER EPS)			12.00
SELLING PRICE UR MARKET PRICE WHEN TENDERED			0.00

OTHER INFORMATION:

		ACTUAL PRICE	100.00
ACTUAL DEMAND	97383.	SHORT TERM SECURITY YIELD	.01288

YIELDS ON OUTSTANDING DEBT:

SHORT TERM	2 YEAR LOAN	3 YEAR LOAN	BOND	PENALTY LOAN
.02980	.03110	.02500	.01400	.05000

PRICE OF PREFERRED STOCK	32.15	DIVIDEND YIELD ON PREFERRED	.03110
--------------------------	-------	-----------------------------	--------

DIVIDENDS PER SHARE ON PREFERRED ACCUMULATED AND UNPAID			0.00
---	--	--	------

RETURN ON INVESTMENT	0.193	RETURN ON EQUITY	0.306
----------------------	-------	------------------	-------

PREFERRED STOCK CALL PREMIUM			.08000
------------------------------	--	--	--------

BOND CALL PREMIUM			.08000
-------------------	--	--	--------

INFORMATION FOR FUTURE QUARTERS

QUARTER	2	3	4	5
---------	---	---	---	---

FORECAST:

UNITS	104669.	113004.	108712.	102786.
-------	---------	---------	---------	---------

PRICE PER UNIT	\$101.76	\$105.36	\$103.05	\$102.44
----------------	----------	----------	----------	----------

ACTUAL:

PLANT CAPACITY (UNITS)	100000.	100000.	100000.	80000.
------------------------	---------	---------	---------	--------

MACHINE CAPACITY (UNITS)	100000.	100000.	75000.	60000.
--------------------------	---------	---------	--------	--------

OTHER OVERHEAD (DOLLARS)	200000.	200000.	200000.	200000.
--------------------------	---------	---------	---------	---------

DEPRECIATION (DOLLARS):

MACHINERY	478125.	478125.	384375.	311250.
-----------	---------	---------	---------	---------

CAPITAL BUDGETING	0.	0.	0.	0.
-------------------	----	----	----	----

PLANT	1300000.	1300000.	1300000.	989000.
-------	----------	----------	----------	---------

PRINCIPLE REPAYMENT ON DEBT:

SHORT TERM	0.	0.	0.	
------------	----	----	----	--

2 YEAR	312500.	312500.	312500.	312500.
--------	---------	---------	---------	---------

3 YEAR	300000.	300000.	0.	0.
--------	---------	---------	----	----

BONDS	300000.	300000.	300000.	300000.
-------	---------	---------	---------	---------

INTEREST DUE NEXT QUARTER ON OUTSTANDING DEBT:

SHORT TERM	0.	INTERMEDIATE	83031.	BONDS	33600.
------------	----	--------------	--------	-------	--------

PRODUCTION COSTS PER UNIT NEXT QUARTER

UNITS	FIRST 60000	NEXT 40000	NEXT 20000	OVER 120000
-------	-------------	------------	------------	-------------

LABOR COST	39.00	29.00	25.00	33.00
------------	-------	-------	-------	-------

MATERIALS: FOR ALL LEVELS OF PRODUCTION				15.00
---	--	--	--	-------

MACHINERY	47.00	PLANT		321.00
-----------	-------	-------	--	--------

WARFHOUSING FEES:

UNITS	FIRST 2000	NEXT 5000	OVER 7000
-------	------------	-----------	-----------

COST/UNIT	1.00	3.00	8.00
-----------	------	------	------

RATES ON FUNDING IN QUARTER 2:

SHORT TERM	2 YEAR LOAN	3 YEAR LOAN	BOND	PREFERRED
------------	-------------	-------------	------	-----------

.0199	.0192	.0186	.0177	.0267
-------	-------	-------	-------	-------

CAPITAL BUDGETING ALTERNATIVES FOR NEXT QUARTER

LIFE INITIAL COST	UNIT CAPACITY	OVERHEAD SAVING	UNIT LBR. SAV. QUARTER 2	QUARTERLY LBR SAVINGS CHANC
-------------------	---------------	-----------------	--------------------------	-----------------------------

A 2YR 518400.	100000	\$ 13000.	\$0.65	\$0.02
---------------	--------	-----------	--------	--------

B 3YR 648000.	120000	\$ -8000.	\$1.09	\$-.02
---------------	--------	-----------	--------	--------

Source : COTLER R.V.

C	INDUSTRY REPORT				WORLD 1	YEAR 2				QUARTER 4				CREDIT RATING			
STOCK MARKET	PRICE				CHANGE	EARNINGS				DIVIDENDS				SHARES OUTSTANDING			
DJ/M/SP. INDEX	125.47				9.79	13.25				6.45							
COMPANY 1	10.25				4.69	.58				.00				600			
COMPANY 2	10.25				4.69	.58				.00				600			
COMPANY 3	10.25				4.69	.58				.00				600			
COMPANY 4	10.25				4.69	.58				.00				600			
COMPANY 5	10.25				4.69	.58				.00				600			
COMPANY 6	10.25				4.69	.58				.00				600			
AREAS	PRICE				SALESMEN				ADVERTISING(EST)				NEW CONST(LINES CAP)				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
COMPANY 1	10.00	10.00	10.00	10.00	18	5	5	7	60	20	20	30	0	0	0	0	
COMPANY 2	10.00	10.00	10.00	10.00	5	18	5	7	20	60	20	30	0	0	0	0	
COMPANY 3	10.00	10.00	10.00	10.00	5	5	18	7	20	20	60	30	0	0	0	0	
COMPANY 4	10.00	10.00	10.00	10.00	18	5	5	7	60	20	20	30	0	0	0	0	
COMPANY 5	10.00	10.00	10.00	10.00	5	18	5	7	20	60	20	20	0	0	0	0	
COMPANY 6	10.00	10.00	10.00	10.00	5	5	18	7	20	20	60	20	0	0	0	0	
	SALES (000'S)	PRD- DUCTI0N	IN- VENT0RY	PERCENT 0F MKT	UNIT PR0D C0ST	UNIT SELL EXPENSE	M0DEL AVAIL	M0DEL PR0DUCED	NEW LINES IN PREP								
COMPANY 1	337	312	81	16.67	4.62	2.33	1	1	0								
COMPANY 2	337	312	81	16.67	4.62	2.33	1	1	0								
COMPANY 3	337	312	81	16.67	4.62	2.33	1	1	0								
COMPANY 4	337	312	81	16.67	4.62	2.33	1	1	0								
COMPANY 5	337	312	81	16.67	4.62	2.33	1	1	0								
COMPANY 6	337	312	81	16.67	4.62	2.33	1	1	0								
	SALES (\$000'S)	ADV EXPENSE	R AND D EXPENSE	NET INCOME	CURRENT ASSETS	TOTAL ASSETS	CURRENT LIAB	BONDS 0UTST	TOTAL EQUITY								
COMPANY 1	3370	146	140	346	5654	11634	2614	2000	7020								
COMPANY 2	3370	146	140	346	5654	11634	2614	2000	7020								
COMPANY 3	3370	146	140	346	5654	11634	2614	2000	7020								
COMPANY 4	3370	146	140	346	5654	11634	2614	2000	7020								
COMPANY 5	3370	146	140	346	5654	11634	2614	2000	7020								
COMPANY 6	3370	146	140	346	5654	11634	2614	2000	7020								
INDUSTRY TOTALS		AREA 1	AREA 2	AREA 3	AREA 4	TOTALS											
ORDERS(000'S)		516	516	516	474	2022	GNP INDEX				118.10						
SALES(000'S)		516	516	516	474	2022											
CAPACITY(000'S)		624	624	624	0	1872											
PR0DUCTI0N(000'S)		624	624	624	0	1872					CREDIT RATING						
INVENT0RY(000'S)		162	162	162	0	486	INTEREST RATE				N81	N92	N83				
ADVERTISING(\$000'S)		230	230	230	186	876	SHORT TERM				3.0	3.5	4.5				
							LONG TERM				3.3	4.0	5.0				

KEY
 COMPANY 1
 COMPANY 2
 COMPANY 3
 COMPANY 4
 COMPANY 5
 COMPANY 6

APPENDIX 11

.....
** INDUSTRY DATA **

	PREVIOUS PERIOD	THIS PERIOD
ECONOMIC INDEX	100.0	101.0
INDUSTRY WEIGHTED AVERAGE PRICE	\$ 5.00	\$ 5.39
INDUSTRY MARKETING EXPENDITURE	\$ 115000.00	\$ 524000.00
TOTAL MARKET (UNITS)	400000.	404010.
COMPANY AVERAGE PROFIT AFTER TAXES	\$ 15000.00	\$ -8242.06

** COMPANY DECISIONS **

PRICE PER UNIT	\$ 4.95
MARKETING EXPENDITURES	\$ 45000.00
PRODUCTION RATE	46000.
ADDITIONAL PLANT. EQUIP.	\$ 0.00
LOAN REPAYMENT	\$ 20000.00

** OTHER DATA **

SALES LOST (UNITS) 0.

Source : MEIER R., NEWELL W., PAZER H. p. 184

APPENDIX 12

MARKET RESEARCH REPORT

COMPANY 4

QUARTER

1. TOTAL MARKET SIZE AND TREND:

	RETAIL MARKET UNITS	BUILDERS' MARKET UNITS
	-----	-----
QUARTER 8	69000	13000
QUARTER 9	34000	13800
QUARTER 10	52000	20000
QUARTER 11	104000	13000

2. TOTAL DEMAND (UNITS):

	RETAIL MARKET	BUILDERS' MARKET
	-----	-----
COMPANY 1	14160	2224
COMPANY 2	11661	1885
COMPANY 3	23115	1912
COMPANY 4	18950	2387
COMPANY 5	36131	5155

3. TOTAL SALES (UNITS):

	RETAIL MARKET	BUILDERS' MARKET
	-----	-----
COMPANY 1	7147	1123
COMPANY 2	12465	2015
COMPANY 3	24710	2844
COMPANY 4	20257	2552
COMPANY 5	36318	5182

4. SELLING PRICE (RAND):

	RETAIL MARKET	BUILDERS' MARKET
	-----	-----
COMPANY 1	33.00	31.00
COMPANY 2	31.00	30.00
COMPANY 3	32.00	32.00
COMPANY 4	34.00	32.00
COMPANY 5	27.00	26.00

TOP MANAGEMENT DECISION GAME

FORM 6

ECHO COMPANY

MARKET RESEARCH INFORMATION BULLETIN
FOR YEAR 7 QUARTER 3

COMPANY	UNIT PRICES	SALES (UNITS)	PERCENTAGE SALES
ALPHA COMPANY	\$ 4.100	1700113.	16.6
BAKER COMPANY	\$ 5.800	3043910.	29.6
CHARLTON COMPANY	\$ 3.750	3994000.	38.6
DELTA COMPANY	\$ 3.900	1076092.	9.0
ECHO COMPANY	\$ 3.900	1607457.	15.2
TOTAL ACTUAL SALES		11701572.	100.000
SALES LOST TO INDUSTRY DUE TO OVERSOLD CONDITION OF SOME COMPANIES		428797.	
TOTAL POTENTIAL MARKET		12300370.	
YOUR COMPANY LOST SALES OF	0.	UNITS DUE TO LACK OF AVAILABLE FINISHED INVENTORY	
TOTAL INDUSTRY EXPENDITURES FOR MARKETING		1600000.	
TOTAL INDUSTRY EXPENDITURES FOR RESEARCH AND DEVELOPMENT		1501000.	

FIGURE 6.4. Top Management Decision Game—Typical Market Research Information Bulletin

TOP MANAGEMENT DECISION GAME

FORM 4

ECONOMETRIC NEWS LETTER

AS OF YEAR 7, AT THE BEGINNING OF QUARTER 4

UNIT RAW MATERIAL PRICES FOR THIS QUARTER---- \$ 2.250

HOURLY DIRECT LABOR RATES FOR THIS QUARTER--- \$ 2.007

GENERAL BUSINESS STATISTICS

SERIES *****	UNIT OF MEASURE *****	DATE ****	AMOUNT *****
GROSS NATIONAL PRODUCT	BILLION \$	2 QUARTERS AGO	646.3
RETAIL SALES (ADJUSTED)	BILLION \$	2 MONTHS AGO	21.3
FBI PRODUCTION INDEX (ADJUSTED)	INDEX NO.	2 MONTHS AGO	136.
BANK DEBITS, TOTAL	BILLION \$	2 MONTHS AGO	312.3
CONSUMERS PRICE INDEX	INDEX NO.	3 MONTHS AGO	110.8
WHOLESALE PRICE INDEX	INDEX NO.	LAST MONTH	106.3
STANDARD AND POOR 500 STOCK INDEX	INDEX NO.	YESTERDAY	60.90
UNEMPLOYMENT	MILLIONS	2 MONTHS AGO	3.54
AVERAGE WEEKLY FACTORY EARNINGS	DOLLARS	2 MONTHS AGO	102.45
POPULATION	MILLIONS	2 MONTHS AGO	190.6

FIGURE 6.5. Top Management Decision Game—Typical Economic Data Report

APPENDIX 13

Schrieber's Top Management Decision Game is illustrative of the complex nature of current management games. The game is designed to allow three to six teams of players, each representing a company, to manage the economic aspects of their respective companies and to compete with each other in a single consumer goods market. Each firm produces one product, which is identified only as a semiluxury item sold through retail outlets. The model provides a high degree of realism in types of cost, financial, and economic data provided to the players.

A typical simulation begins with each company in the same financial position. Plays of the game represent quarters of a year, and results are fed back to the companies in the form of quarterly operating reports representing a balance sheet, income statement, economic news letter, and market research report. At the end of each four periods annual summaries are prepared which include a work-in-process inventory, standard cost analysis, and a financial summary of the annual operations of the other competing firms.

The game is designed to progress through a series of phases, each enriching the game by adding complexity. This enrichment is intended to expand the decision variables and to add realism as participants gain experience with the behavior of the model. Fig. 6.2 is a balance sheet and Fig. 6.3 is an income statement for a typical firm in the third phase of the game (phase C). These reports provide the teams with fairly complete cost and financial data.

Phase A, which usually lasts through four periods, is completely deterministic. Each period eight decisions are made in this phase: selling price, marketing expenditures, research and development expenditures, production quantity, raw material purchases, plant expansion or contraction, and marketing research information expenditures. In addition each team

submits forecasts of sales, profits, and cash position. Constraints are placed on expenditures of each firm to keep them from bankrupting themselves while learning the mechanics and basic behavior patterns of the model. Since no external financial transactions are permitted, an abbreviated balance sheet is prepared; the liabilities and net worth section contains only one consolidated figure instead of the complete set of data shown in Fig. 6.2.

In phase B the game is altered in three aspects: constraints on expenditures are removed, borrowing funds is permitted, and two random factors are introduced. The firms are free to manage their cash expenditures as they see fit, and funds may be obtained from short-term bank loans and from short-and long-term loans from private sources, including loans from other companies, as shown in Fig. 6.2. The two random factors apply to marketing and to research and development expenditures, as indicated in Fig. 6.3, and represent variations in the quality or effectiveness of those expenditures resulting from the element of risk. The number applying to each item is expressed as a percentage—100 per cent being average effectiveness.

In phase C the game is expanded to include changes in the equity structure of the firms and trading in capital stock. Four new decision variables are introduced: issue new capital stock, declare cash and stock dividends, buy and sell treasury stock, and buy and sell stock of other companies. The market price for stock at a given time is determined by a computed intrinsic stock price and adjusted by the influence of stock transactions.

Phase D introduces a major capital equipment replacement decision. The companies are presented with an impending loss of capacity because of equipment deterioration, and must decide whether to repair or replace the deteriorating equipment.

Market research information available to the teams is presented in the report in Fig. 6.4. Competitors' prices are made available at no cost, since this information could be expected to be readily obtained. Three other items of information must be purchased: industry sales, sales and market share of competitors, total industry expenditures for marketing, and total industry expenditures for research and development.

APPENDIX 14

Form 2
OPSIM Company _____
Sales Forecast _____
Period _____

	Current Period		Next Period
	Units	Dollars	Units
I. Product One			
1.	Actual sales last period		
2.	Estimated new orders		
a.	Trend value		
b.	Seasonal value		
c.	Total new orders		
3.	Unfilled orders on hand		
4.	Gross estimated sales		
5.	Less lost sales		
a.	Backorder cancellations		
b.	Stockout cancellations from other periods		
c.	Total lost sales		
6.	Total estimated sales		
II. Product Two			
7.	Actual sales last period		
8.	Estimated new orders		
a.	Trend value		
b.	Seasonal value		
c.	Total estimated new orders		
9.	Unfilled orders on hand		
10.	Gross estimated sales		
11.	Less estimated lost sales		
a.	Stockout cancellations		
b.	Stockout cancellations from other periods		
c.	Total lost sales		
12.	Total estimated sales		
III. Total Estimated Revenue			
13.	a. Product One		
	b. Product Two		
	c. Total		

Form 3
OPSIM Company ____
Desired Current Production
Period ____

Description	Product One	Product Two
Sales Forecast		
Plus Desired Ending Inventory		
Desired Goods Available For Sale		
Less Beginning Inventory		
Desired Current Production		

Form 4
OPSIM Company ____
Scheduled Current Production
Period ____

Description	Product One	Product Two
Desired Current Production		
Allocated Production Capacity Available		
Scheduled Current Production		

Form 5
 OPSIM Company _____
 Capacity Utilization and Variable Overhead Cost
 Period _____

Description	Capacities			
	1	2	3	4
Current Capacity:				
Number of Machines				
Hours of Capacity				
Per Machine				
Capacity Hours Available				
Less Capacity Required for Current Production:				
Product One:				
Production Scheduled				
Conversion Rate				
Total Hours Required				
Capacity Hours Available for Product Two:				
Less Product Two:				
Production Scheduled				
Conversion Rate				
Total Hours Required				
Excess Capacity				
-Capacity Hours Available				
Less Excess Capacity				
Capacity Utilized				
Variable Overhead Rate				
Total Variable Overhead				
Less Variable Overhead				
Product One				
Variable Overhead				
Product Two				

Form 6
 OPSIM Company _____
 Raw Materials Required For Production
 Period _____

Current Production	Raw Materials					
	1		2		3	
	Con- ver- sion Rate	Units Required	Con- ver- sion Rate	Units Required	Con- ver- sion Rate	Units Required
1						
2						
Raw Materials Required						
Unit Cost						
Total Raw Material Cost						
Raw Material Cost:						
Product One						
Product Two						

Form 7
 OPSIM Company _____
 Raw Materials Acquisitions
 Period _____

Item	Raw Materials					
	1		2		3	
	Con- ver- sion Rate	Units	Con- ver- sion Rate	Units	Con- ver- sion Rate	Units
Estimated Produc- tion Next Period Product Quantity						
1						
2						
Estimated Requirement for Next Period						
Plus Estimated Desired Ending Inventory Next Period						
Requirement Next Period						
Plus Current Production Requirements						
Total Requirement						
Less Inventory on Hand						
Units to be ac- quired this period						
Unit Cost						
Total Cost						

Form 8
OPSIM Company _____
Direct Labor Required For Production Schedule
Period _____

<u>Current Production</u>		<u>Direct Labor Hours</u>			
<u>Product</u>	<u>Quantity</u>	<u>Conversion Rate</u>	<u>Hours Required</u>	<u>Hourly Cost</u>	<u>Total Cost</u>
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
Total Labor Required		_____	_____	_____	_____

Form 9
OPSIM Company _____
Maintenance Labor Hired
Period _____

<u>Description</u>	<u>Quantity</u>
Maintenance Workers	_____
Pay Rate	_____
Total Cost	_____

Form 10
OPSIM Company ____
Capital Expenditures
Period ____

<u>Item</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
Machine 1	_____	_____	_____
Machine 2	_____	_____	_____
Machine 3	_____	_____	_____
Machine 4	_____	_____	_____
Total Capital Expenditures			=====

Form 11
 OPSIM Company _____
 Period Cost Budget
 Period _____

Cost

Cash Expenses:
 Carrying Costs:

	<u>Average Inventory</u>	<u>Rate</u>	<u>Cost</u>
Product One	_____	_____	_____
Product Two	_____	_____	_____
Raw Material 1	_____	_____	_____
Raw Material 2	_____	_____	_____
Raw Material 3	_____	_____	_____

\$

Setup Costs:

Product One	_____	_____	_____
Product Two	_____	_____	_____

Ordering Costs:

Raw Material 1	_____	_____	_____
Raw Material 2	_____	_____	_____
Raw Material 3	_____	_____	_____

Fixed Production Costs (Excluding Depreciation)

Selling and Administrative Cost

Interest Expense

Total Cash Costs for the Period

Depreciation Expenses:

	<u>Number of Machines</u>	<u>Periodic Charge</u>	<u>Amount</u>
C1	_____	_____	_____
C2	_____	_____	_____
C3	_____	_____	_____
C4	_____	_____	_____
Plant	_____	_____	_____

Total Period Cost

Form 12
 OPSIM Company _____
 Cash Budget
 Period _____

Description	Amount
Cash on Hand	
	Per Cent Collected
Plus: Cash from Operations:	Amount This Period Received
Current Sales	_____
Collection of last Period's Receivables	_____
Interest Income	_____
Cash Available	_____
Less: Cash for Operations:	
Variable Overhead	Amount
Product One	_____
Product Two	_____
Raw Materials Purchases	
One	_____
Two	_____
Three	_____
Direct Labor	_____
Maintenance Labor	_____
Period Costs	_____
Net Cash Balance from Operations	_____
Plus: Cash From Sale of Short-Term Securities	_____
Adjusted Cash	_____
Plus: Debt Acquired (only if overdrawn)	_____
Available Cash	_____
Less: Debt Repayment	_____
Excess Cash	_____
Less: Purchase of Short-term securities	_____
Ending Cash Balance	_____

Form 13
OPSIM Company _____
Budgeted Contribution Margin and Period Contribution
Period _____

Description	Product One	Product Two	Total
	Amount	Amount	
Sales			
Less Variable			
Cost of			
Goods Sold:			
Beginning In-			
ventory			
Cost of Current			
Production:			
RM1			
RM2			
RM3			
Direct Labor			
Variable Overhead			
Cost of			
Production			
Cost of Goods Available			
Less Ending Inventory			
Cost of Goods Sold			
Contribution Margin			
Period Contribution			

Form 14
 OPSIM Company _____
 Analysis of Variances from Budgeted Contribution Margin
 Period _____

	<u>Product One</u>	<u>Product Two</u>	<u>Total</u>
Actual Contribution Margin	_____	_____	_____
Budgeted Contribution Margin	_____	_____	_____
Variance From Budget (Unfavorable)	=====	=====	=====
<u>Volume Variance</u>			
Budgeted Sales in Units	_____	_____	
Actual Sales in Units	_____	_____	
Volume Variance in Units	_____	_____	
Revenue Variance:			
Budgeted Sales Price Per Unit	_____	_____	
Revenue Variance (Sales Price times Volume Variance)	_____	_____	
Cost Variance:			
Budgeted Cost Per Unit	_____	_____	
Cost Variance (Cost Times Volume Variance)	_____	_____	
Volume Variance	=====	=====	=====
<u>Cost Variance</u>			
Actual Sales in Units	_____	_____	
Budgeted Unit Cost	_____	_____	
Budgeted Variable Cost	_____	_____	
Actual Variable Cost	_____	_____	
Cost Variance	_____	_____	_____
Total Contribution Margin Variance	=====	=====	=====

APPENDIX 15

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Supply of Blank Forms

Chapter Quizzes

APPENDIX 16

V

ADDITIONAL CLASS MATERIAL AND GRADING INFORMATION

This section of the Teacher's Manual will briefly examine some additional material that the teacher may utilize along with the simulation competition. In addition, some grading criteria for evaluating the performance of the students in the simulation competition will be suggested.

Suggested Lecture Topics

In the past, it has been found very helpful to the student teams to have the lecture topics follow the course of the students' decisions during the simulation competition. The COMPETE simulation can be used as a basis in many of the lectures to show how the competitive environment arising during the play of the simulation can be related to the job of the marketing manager as described in most basic marketing management textbooks. That is, how the decisions of the student teams with regard to product development, pricing, promotion, etc. must be made in relation to the situation in the marketplace regarding competition, demand, etc. Since the student teams are being placed in the position of the marketing managers of the business firm, this affords the teacher a good opportunity to lecture on all areas of decision making for the marketing manager.

A possible sequence of lectures may be as follows:

1. The Marketing Process

This lecture could briefly cover the role of marketing in the economy and then thoroughly examine the role of marketing from the point of view of the individual business firm. This lecture would be given at the first or second class meeting before the students have had adequate time to thoroughly examine the Student Manual for COMPETE.

2. Explanation of COMPETE

Early in the second week of classes, the teacher should take one or two class meetings (or as many as are necessary) to explain the COMPETE simulation and answer all student questions. The teacher should make all efforts to insure that there are no misunderstandings of any part of the simulation before the first round of decisions are made.

3. Setting Objectives

Since the student teams should establish their objectives with respect to the play of the simulation before competition begins, a logical topic to cover after the explanation of COMPETE would be the setting of company objectives. The questions to be answered in this lecture would include why should a company set objectives? what do we mean by the objectives of a firm? what are some possible objectives? and how can a firm measure achievement of objectives?

4. Planning Strategies

Once a firm has selected the objectives they hope to achieve, the planning of strategies to achieve those objectives logically follows. This lecture should cover alternative strategies that are available to the firm and how the strategy selected must be consistent in all areas of the marketing mix and consistent with the goals of the firm.

5. Selecting Target Markets

The business firm must determine the target market(s) that they hope to appeal to. For example, is the firm going to appeal to the quality-conscious consumer or the price-conscious consumer? Is the firm going to attempt to reach each regional market equally or will the firm concentrate more on one regional segment than another? In this lecture, the teacher should tie together the selecting of a target market with the setting of the company's strategies. The whole area of market segmentation can also be discussed at this point.

6. Selecting Company and Brand Names

Since the individual teams must select company and brand names before competition begins, another lecture topic early in the quarter would revolve around the selection of brand names. The topics covered would include the importance of a good brand name, the characteristics of a good brand name and alternative branding strategies.

7. The Marketing Mix

It will take a number of lectures to thoroughly cover this topic. The lectures should probably be broken into the traditional areas of the marketing mix often referred to as the 4 P's of marketing:

- a. Product
- b. Price
- c. Promotion
- d. Place

Each of these areas should be discussed from the point of view of the marketing manager. Tools of decision making may be included in these discussions such as the use of break-even analysis when setting prices.

8. Evaluating Performance

Again, it will take a number of discussions to adequately cover this topic. These discussions may also focus on each element of the marketing mix. The student teams should be encouraged to perform a profit contribution analysis for each of their products. They should be encouraged to develop charts showing the relationship between advertising expenditures and market potential, sales force size and market potential, etc. In other words, the student teams should be encouraged to, and given aid in, attempting to evaluate the relationships between the elements of the marketing mix and their sales and profit performance.

9. Marketing's Social Responsibility

Although not included as part of the simulation competition, a discussion of the social responsibilities of marketing would make for a good way to conclude the course. This is an area of much current concern to businessmen, academicians, consumers, and students and would provide the teacher with another (excellent) opportunity to individualize the course and discuss another area of current concern to the marketing manager.

Suggested Reading Assignments

Many teachers may desire to utilize reading assignments along with the COMPETE simulation. This will provide the student with a broader base of material over the course of the quarter or semester to enhance his learning experience. To individualize the course, the teacher may desire to assign a series of readings for his students from various journals. If this is not feasible, the teacher may desire to assign a text or readings book. Some suggestions along these lines will be made here.

A. Textbooks

1. Alderson, Wroe and Paul E. Green, Planning and Problem Solving in Marketing, Richard D. Irwin, Inc., 1964, 639 pages.

This book covers many of the areas that were suggested as lecture topics. It provides an overall view of decision making from the point of view of the marketing manager. The book is divided into three parts as follows:

- I. Management Perspective
 1. System and Leadership
 2. Direction and Control
 3. Planning and Problem Solving

- II. Evaluation Problems
 - 4. Uncertainty and Decision Making in Marketing Planning
 - 5. The Fundamentals of Bayesian Decision Theory
 - 6. Value Theory and Its Relationship to Decision Making
 - 7. Market Position Analysis
 - 8. New Product Development Decisions
 - 9. Pricing Decisions
 - 10. Promotional Decisions and the Effectiveness of Sales Effort
 - 11. Channel Decisions and the Logistics of Distribution
 - 12. Control Decisions
- III. Planning Problems
 - 13. Design Principles for Market Planning
 - 14. Resources and Objectives
 - 15. Forecasting and Planning
 - 16. The Search for Effective Strategies
 - 17. Designing Marketing Campaigns
 - 18. Designing Marketing Facilities
 - 19. Designing Marketing Organizations
 - 20. Designing Marketing Systems
 - 21. Operation under a Detailed Marketing Plan
 - 22. Perspectives on the Planning Function

2. Alderson, Wroe and Michael H. Halbert, Men, Motives, and Markets, Prentice-Hall, Inc., 1968, 118 pages.

This is a short paperback which examines the role of marketing in the economy, the role of marketing in the business firm, and the development of marketing plans.

The book is divided into the following six chapters:

- 1. The Marketing Mechanism
- 2. The Marketing Climate
- 3. The Mission of Marketing
- 4. The Development of Marketing Plans
- 5. Research for Planning and Decision Making
- 6. The Marketing Prospect

3. Donnelly, James H. and John M. Ivancevich, Analysis for Marketing Decisions, Richard D. Irwin, Inc., 1970, 378 pages.

This book provides an analytic approach to marketing decision making. This book should only be used if the students have some quantitative background. However, the book does provide the student with the tools necessary to objectively make decisions and evaluate results. The book is divided into the following four parts:

- I. Introduction
 - 1. The Analytical Approach to Marketing Decisions
 - 2. Model Building and Analysis
- II. Analytical Concepts, Tools, and Techniques
 - 3. Probability
 - 4. Decision Theory
 - 5. Mathematical Concepts
 - 6. Mathematical Programming
- III. Applications
 - 7. Product Planning
 - 8. Distribution
 - 9. Promotion Strategy
 - 10. Pricing
- IV. Computers and Simulation in Marketing
 - 11. Marketing Information Systems
 - 12. Simulation
 - 13. The Future of Analytical Methods in Marketing

4. Kollat, David T., Roger D. Blackwell and James F. Robeson, Strategic Marketing, Holt, Rinehart and Winston, Inc., 1972, 548 pages.

The basic objective of this book is to examine marketing management within the framework of the business firm and to view the relationship between marketing and the other functional areas of the business firm. The book is divided into six sections and 22 chapters.

- I. Corporate and Marketing Planning
 1. Corporate Strategy
 2. Marketing Strategy
- II. Identifying and Assessing Market Opportunities
 3. Analyzing Market Opportunities Through Research
 4. Obtaining Market Data
 5. Consumer Behavior: Cultural, Social, and Demographic Dimensions
 6. Consumer Decision Processes
 7. Industrial and Institutional Markets: Structure and Behavior
 8. Global Markets: Structure and Behavior
 9. Selecting Market Targets
- III. Developing Marketing Programs
 10. Product Programs
 11. New-Product Programs
 12. Pricing Programs
 13. Channel Programs
 14. Physical Distribution
 15. Advertising Programs
 16. Sales-Force Programs
 17. Managing Marketing Personnel
- IV. Pretesting Marketing Programs
 18. Test Marketing
 19. Simulation
- V. Controlling and Evaluating Marketing Programs
 20. Information Systems for Marketing Management
 21. Controlling and Evaluating Marketing Programs
- VI. Social and Ethical Perspectives
 22. Social and Ethical Perspectives for Corporate Executives

5. Kotler, Philip, Marketing Decision Making: A Model Building Approach, Holt, Rinehart and Winston, Inc., 1971, 720 pages.

This book provides the analytical tools necessary for marketing decision making and the evaluation of marketing performance. The student should have some quantitative background before this book is used. The contents of the book are divided into four sections as follows:

1. Marketing Analysis and Decision Making
- I. Macromarketing Decision Theory
 2. Aggregate Sales Response to a Single Marketing Instrument
 3. Multiple Marketing Instruments
 4. Competitive Strategy
 5. Carryover Effects
 6. Multiple Territories
 7. Multiple Products
 8. Joint Marketing and Production Planning
 9. Company Goals
 10. Uncertainty
- II. Micromarketing Decision Models
 11. Distribution Decision Models
 12. Price Decision Models
 13. Sales Force Decision Models
 14. Advertising Decision Models
- III. Models of Market Behavior
 15. Sales Model for Established Products
 16. Brand Share Sales Models
 17. Sales Models for New Products

IV. From Theory to Practice

18. The Marketing Information System
19. Planning and Control Processes in the Marketing Organization
20. Implementing Management Science in Marketing
21. Developing the Corporate Marketing Model

6. Preston, Lee, E., Markets and Marketing: An Orientation, Scott, Foresman and Company, 1970, 248 pages.

This paperback takes both a macro and a micro view of marketing. It provides some decision tools and examines the basic decision areas of the marketing mix. The 12 chapters are arranged as follows:

1. Markets and Marketing
- I. Organization and Coordination in the Marketing System
 2. Scale, Productivity, and Efficiency in Marketing
 3. Patterns of Marketing Organization
 4. Coordinating Mechanisms in Marketing
- II. Buyer Behavior and Demand Analysis
 5. The Nature of Market Demand
 6. Demand Analysis: Descriptions and Interpretation
 7. Econometric Analysis and Forecasting
 8. Behavioral Aspects of Demand Analysis
- III. The Tasks of Marketing Management
 9. Goals, Strategies, and Decision Models
 10. Some Concepts for Product Planning
 11. Marketing Communication and Promotion
 12. Pricing Policies and Practices

B. Readings Books

1. Kelley, Eugene J. and William Lazer, Managerial Marketing: Policies, Strategies, and Decisions, Richard D. Irwin, Inc., 1973, 490 pages.

This readings book is particularly well suited for covering the topics that would be of interest and value to students participating in a marketing simulation. The 50 readings more than adequately cover all of the suggested lecture topics. A number of the readings are original contributions by Professors Kelley and Lazer while many other leaders in marketing thought have also contributed. The articles are grouped into the following categories:

- I. Managerial Marketing: A Conceptual Framework
 - a. Managerial Approach to Marketing
 - b. Implementing the Marketing Concept
 - c. The Concept of the Marketing Mix
 - d. A Systems Perspective
- II. Consumers and Marketing Action
 - a. Demographics
 - b. Consumer Behavior Models and Theories
 - c. Life Styles and Values
- III. Marketing Management Activities: The Systems Approach
 - a. Marketing Decisions and Information Systems
 - b. Marketing Opportunity Assessment
 - c. Planning and Programming Marketing Activities
 - d. Marketing Organization and Leadership
 - e. Controlling Marketing Performance
 - f. Multinational Marketing

2. Kraushaar, John L. and Louis H. Vorzimer, Essentials of an Effective Marketing Program: Readings, D. H. Mark Publishing Company, 1970, 289 pages.

This book contains 26 articles by many leading marketing authors and is divided into the following sections:

- I. Introduction
- II. Consumers: As Individuals and in Groups
- III. Utilities: Strategies for Their Organization, Creation and Replacement
- IV. Operations: Coordinating and Evaluating Marketing Effort

3. Meloan, Taylor, Samuel Smith and John Wheatley, Managerial Marketing Policies and Decisions, Houghton Mifflin Company, 1970, 575 pages.

This book contains 45 articles covering all elements of the marketing mix. The articles are grouped into the following ten categories:

- I. The Nature and Scope of Marketing
- II. The Marketing Environment
- III. International Markets
- IV. Behavioral Concepts and Insights
- V. Marketing Planning and Strategy
- VI. New Perspectives on the Functions of Marketing Management
- VII. Facilitating Marketing Decision Making
- VIII. Societal Aspects of Marketing
- IX. Legal Issues in Marketing
- X. Success and Failure in the Market Place

4. Taylor, Jack L. and James F. Robb, Fundamentals of Marketing: Additional Dimensions, McGraw-Hill Book Company, 1971, 561 pages.

The 54 articles in this book come from a wide variety of authors and sources and are divided into the following eight groups:

- I. Modern Marketing
- II. The Market
- III. The Product
- IV. Distribution Structure
- V. The Price System
- VI. Promotional Activities
- VII. Marketing in Special Fields
- VIII. Planning and Evaluating the Marketing Effort

5. Walters, George S., Morris L. Sweet and Max D. Snider, Marketing Management Viewpoints, South-Western Publishing Co., 1970, 536 pages.

The 41 articles in this book are divided into the following four sections:

- I. The Marketing Environment
- II. Assessing, Planning, and Organizing Marketing Goals and Strategy
- III. Developing and Implementing Tactical Programs
- IV. Measurement and Control

C. Text and Casebooks

1. Brown, Milton P., Richard N. Cardozo, Scott M. Cunningham, Walter J. Salmon and Ralph M. Sultan, Problems in Marketing, McGraw-Hill Book Company, 1968, 898 pages.

This book has less text material than the four that follow, putting more emphasis on the cases. In total, the book offers 38 cases. The cases range from 5 to 35 pages in length, averaging around 15 pages. The book and cases are divided into the following seven sections:

- I. Demand
- II. Advertising and Personal Selling
- III. Selecting Channels of Distribution
- IV. Marketing Research
- V. Pricing
- VI. Product Policy
- VII. Marketing Programs

2. Davis, Kenneth R., Marketing Management, The Ronald Press Company, 1972, 958 pages.

This book has a significant amount of text material covering all of the topics generally covered in a marketing management text. The 61 cases range in length from 2 to 25 pages. The average case is from 3 to 8 pages. The book and cases are divided into the following 17 chapters:

1. Nature and Scope of Marketing Management
2. Marketing Objectives, Strategies, and Decisions
3. Marketing Organization, Planning, and Control
4. Market Measurement

5. Analyzing Consumer Behavior
6. Sales Forecasting
7. Marketing Cost Analysis
8. Marketing Information Systems and Models
9. Marketing Research
10. Marketing Channel Policies
11. Product Policies
12. Marketing Communication Policies
13. Personal Selling Policies
14. Advertising Policies
15. Sales Promotion Policies
16. Price Policies
17. Marketing Programs

3. Hansen, Harry L., Marketing: Text, Techniques, and Cases, Richard D. Irwin, Inc., 1967, 1024 pages.

This book (along with the previous one) are relatively lengthy and might be better suited for use in semester length courses. This book has very good text material especially from the point of view of students participating in a simulation competition. The 70 cases in this book are from 1 to 45 pages in length. The average case tends to be relatively short, from 3 to 5 pages. The text and cases are divided into the following sections:

- I. Introduction
 1. Marketing: Some Preliminary Matters
 2. Analytical Use of Cost and Financial Data
- II. Markets
 3. Buying Motives and Processes
- III. Marketing Research
 4. Scope and Techniques
 5. Probability and Sampling
- IV. Elements of the Marketing Mix
 6. Marketing Functions and Marketing Organization
 7. Product
 8. Distribution Policies
 9. Advertising
 10. Personal Selling
 11. Pricing
 12. Legislative Regulation of Prices
- V. The Summing Up
 13. The Marketing Program

4. Howard, John A., Marketing Management: Operating, Strategic, and Administrative, Richard D. Irwin, Inc., 1973, 560 pages.

This book places less emphasis on cases than the other books described in this section. The seven cases in the book range in length from 3 to 36 pages. The text material is extremely good and adequately covers all areas of the marketing mix. The book is divided into the following seven sections:

- I. Marketing
 1. What Is Marketing Management?
- II. Environmental Constraints
 2. Structure of Competition
 3. Structure of Demand
 4. Structure of Cost
 5. Structure of Marketing Organization
- III. The Brand Manager
 6. Marketing Programming and Control: Marketing Information Systems
 7. Marketing Programming and Control: Formal Decision Techniques
 8. Marketing Programming and Control: Market Research
 9. Advertising Management
 10. Management of Pricing
 11. Management of the Sales Force

- IV. The Marketing Manager's View: Administrative and Strategic Marketing
 12. Long-Term Market Programming
 13. Product Innovation
 14. Channel System Management
 - V. The President's View: Strategic Marketing
 15. The President's Role in Strategic and Administrative Marketing
 - VI. Evaluation of the Marketing System
 16. Rationale for Public Policy
 - VII. Marketing Management in Non-Profit Organizations
 17. Social Marketing
5. Rewoldt, Stewart H., James D. Scott and Martin R. Warshaw, Introduction to Marketing Management: Text and Cases, Richard D. Irwin, Inc., 1973, 825 pages.
- This book again has excellent text material for use along with a simulation. The 34 cases are from 3 to 22 pages in length. The cases average about 6 to 8 pages in length. This book is divided into the following sections:
- I. Marketing Planning and Strategy
 1. Marketing and Marketing Planning
 2. Development of Marketing Strategy
 - II. Buyer Behavior
 3. Concepts of Buyer Behavior
 4. Consumer Buyer Behavior
 5. Industrial Buyer Behavior
 - III. Product Strategy
 6. Product Choice Decisions
 7. Product Management Decisions
 - IV. Distribution Strategy
 8. The Distribution Structure
 9. Distribution Policy Decisions
 10. Physical Distribution
 - V. Promotional Strategy
 11. Promotional Strategy Decisions
 12. Determining the Promotional Appropriation
 13. Brand Strategy Decisions
 - VI. Pricing Strategy
 14. Price Determination
 15. Price Policies
 - VII. Integrated Marketing Programs

The books suggested in this section by no means exhaust the possibilities for reading assignments to be used along with COMPETE. Depending on what the teacher is looking for, there are many other possible books that may fill the need. The books suggested here represent reading assignments which seem to be uniquely well suited for use along with COMPETE.

Suggested Case Assignments

There are many possible casebooks available for the teacher who would like to combine the use of cases with the COMPETE simulation. In the previous section, five combination text and casebooks were indicated. These represent good possibilities for use along with COMPETE.

If cases are to be used, the teacher must determine whether more emphasis will be placed on the simulation or whether the cases will be emphasized. A good possibility would be to have a 50-50 weighting (or emphasis) between the simulation and the cases. The teacher must then decide how many cases will be covered over the course of the quarter or semester. It has been the experience of the authors of COMPETE that covering two cases per week is about the maximum if the teacher expects the students to have ample time available to devote to the simulation.

Some possible casebooks (having cases only--no text material) that can be used along with COMPETE are as follows:

1. Boyd, Harper W. and Robert T. Davis, Marketing Management Casebook, Richard D. Irwin, Inc., 1971, 736 pages.
This book contains 45 cases. The cases range from 4 to 40 pages in length, averaging about 15 pages in length.
2. Bursk, Edward C., Cases in Marketing Management, Prentice-Hall, Inc., 1965, 116 pages.
There are 25 cases in this book. The book has a very small amount of introductory material preceding the cases, too little to be included as a text and casebook. The cases range from 1 to 11 pages, generally around 4 or 5 pages in length.
3. Clewett, Richard M., Ralph Westfall and Harper W. Boyd, Cases in Marketing Strategy, Richard D. Irwin, Inc., 1964, 324 pages.
This book contains an introductory section on how to use and analyze cases which could be of great value to the student. There are 80 cases in the book giving the teacher a wide selection to choose from. The cases range from 3 to 10 pages in length, averaging between 4 and 5 pages.
4. Greif, Edwin C., Basic Problems in Marketing Management, Wadsworth Publishing Company, 1967, 355 pages.
This book contains 82 cases, again giving the teacher a wide selection. The cases range from 3 to 6 pages in length.
5. Lipson, Harry A. and John R. Darling, Cases in Marketing: An Administrative Approach, John Wiley & Sons, Inc., 1971, 250 pages.
This book contains an introduction to the subject of marketing as well as a section on the use of cases to study marketing. The book contains 11 lengthy cases which are subdivided into a number of problems confronting the 11 firms who are the subject of the cases.
6. Lockley, Lawrence C. and Charles J. Dirksen, Cases in Marketing, Allyn and Bacon, Inc., 1968, 318 pages.
As with the previous book, this casebook also has an introduction to marketing and a section on the use of the case method. There are 101 cases in this book giving the teacher a great deal of choice as to which cases to utilize. The cases range from 1 to 8 pages, averaging around three pages in length.

Again, this by no means exhausts the list of available casebooks but simply is offered as a few possibilities for the teacher considering the use of cases.

Source : FARIA A.J., JOHNSTONE D.G., NULSEN R.O. Jr. pp. 54-62

APPENDIX 17

PROSIM V is a computer model developed at Auburn University that simulates the activities of a production system. It is intended as a learning aid in courses such as production control and production management. This manual explains what you are required to do and in general terms how the simulator works. It does not explain the details of the computer program, since you do not have to understand the computer logic in order to use PROSIM V. Indeed, you do not even need to know basic computer programming to use PROSIM V.

Section II presents an overview of PROSIM V; specific details are presented in Section III. Appendix A contains a glossary of terms that you should become familiar with immediately and refer to frequently. Four problems (hypothetical production environments) are presented in Appendices B, C, D, and E. Ordinarily, you will be concerned with only one of these problems, the particular one that your instructor chooses for the term. Your instructor may make changes in the problem, or he may devise a completely new problem that is not included in this manual. In any case, you will be given the basic information regarding the production situation with which you will be dealing.

Traditionally, production control has been taught in one of two ways. One way is the ordinary textbook-lecture-homework approach, in which production control functions are treated individually. Another way is the case-study approach, in which a real or imagined production situation is analyzed. Both of these approaches have the following disadvantages:

1. Neither emphasizes the design of production control systems.

Rather, analysis is emphasized.

2. Neither considers the dynamic nature of production environments.

3. Neither provides a conceptual understanding of the total production control system nor of the interactions between components of the system.

4. Neither stresses the decisions and their associated repercussions that must continuously and repeatedly be made in a production environment.

5. The concepts of feedback and corrective action cannot be presented adequately.

6. The relationship between production control and a total management information system is not usually stressed.

A third and new way of teaching production control is presented in this manual. The new approach complements the traditional textbook-lecture-homework approach by permitting you to interact with a dynamic simulated production system. This approach provides a means of gaining experience in controlling a total production system, of testing your ideas, and of receiving immediate feedback showing the results of your decisions.

Notice that by using PROSIM V, the tremendous power of the computer is brought directly into the learning process. The authors hope that you will find using PROSIM V an exciting and challenging way to learn production control principles.

Chapter 1

OBJECTIVES OF THE GAME

Starting a Small Business is a computer simulation game designed to introduce students to the intricacies of decision-making by providing them with an opportunity to organize and develop a small business. The game helps students to understand the various responsibilities a small businessman has to face and the challenges generated by the market place under a capitalistic economic system. Students are provided with an opportunity to test their personal theories or intuition without having to risk losing any money.

The game attempts to provide a real-life situation. It has been developed on personal firsthand experience and is very realistic. Every attempt has been made to incorporate the dynamic nature of the market place and its various business functions into the game, functions such as, marketing, production management, finance, planning, decision-making, and team effort. In addition, students will acquire skills and experience in analyzing and using critical information necessary for successful decision-making in everyday living.

Source : GUPTA S.K., HAMMAN R.T. p. 1

I

INTRODUCTION

Business students devote a large amount of class and homework time pursuing the study of the institutional structure, legal environment, channel relationships, etc., in which business operates. It is hoped that through instruction in these areas, the student of business can prepare himself for later assuming decision-making responsibilities. Although many "facts" about business can be taught in the classroom, the uncertainty and accrued responsibility of decision making is best learned through actual decision-making experience. The pressures of time, uncertainty, and responsibility to the owners create a dynamic framework within which the business executive must function. It is within this framework that the executive must make decisions requiring an ability to integrate many diverse aspects of business operation; decisions which solve not only today's problems but anticipate future problems; and decisions which often must be made on the basis of incomplete information. In some courses in which case materials are used, students are placed in a decision-making role, i.e., they are required to solve a problem, determine a strategy for a business firm to follow, etc. However, the traditional lecture and case methods of business instruction do not allow the student to "see" the effectiveness of his decisions, to recognize and react to mistakes, and to adjust to changing circumstances in a dynamic environment. In other words, traditional methods of business instruction do not generally provide the student with a true insight into the competitive environment in which business decisions are made.

As a result, the use of a technique known as simulation has been adopted as a valuable means for providing the business student with an opportunity to experience decision-making responsibility. The simulation places the student in a dynamic decision-making environment which forces the student to make decisions under many of the same pressures the business executive faces. Educational simulations capture much of the substance of real business situations by replicating the environment of a particular industry and provide valuable experience to the student in making managerial decisions. The business simulation requires the student to draw upon and integrate the knowledge he has obtained from all previous courses and requires him to put this knowledge to use in business decision making.

AN OVERVIEW OF THE BUSINESS POLICY GAME

Educational objective: A teaching aid for instruction in business policy formulation and integration of functional concepts from the viewpoint of management. The model is challenging to upper-division undergraduate and graduate students studying in a business administration curriculum.

The game: A computer-based simulation of business operations. Student teams compete with each other as members of the management of hypothetical companies producing and selling a consumer durable good. The model is interactive so that marketing decisions, for example, may influence the sales of competitors as well as those of the firm making the decision.

Course use: Business policy at the upper-level undergraduate or graduate level, suitable for use independently or as supplementary material; seminars for management development. The model also has been used successfully in intercollegiate competition.

APPENDIX 18

Marketing Problems
Summer, 1973

Instructors: R. O. Nulsen, Jr.
A. J. Faria

Course Material: COMPETE: A Dynamic Marketing Simulation, Faria, Johnstone,
and Nulsen, 1973.

<u>Date</u>	<u>Assignment</u>
June 29	1. Orientation and Introductory Lecture 2. Organize companies 3. Company and brand name selection 4. Read <u>COMPETE</u> by next class
July 5	1. Detailed explanation of game 2. Return information on names 3. Initial market research requests 4. Period 1 decisions due
July 12	1. Return decision 1 results 2. Formulate Period 1 financial statements 3. Period 2 decisions due 4. Reread <u>COMPETE</u>
July 19	1. Return Period 2 results 2. Formulate Period 2 financial statements 3. Period 3 decisions due
July 26	1. Return Period 3 results 2. Team objectives report due 3. Period 4 decisions due
August 2	1. Return Period 4 results 2. Year-end analysis 3. Revised objectives report due 4. Period 5 decisions due
August 9	1. Return Period 5 results 2. One-page report due 3. Period 6 decisions due
August 16	1. Return Period 6 results 2. One-page report due 3. Period 7 decisions due
August 23	1. Return Period 7 results 2. One-page report due 3. Period 8 decisions due
August 30	1. Return Period 8 results 2. Analysis of two years' play
Sept. 3-7	Team Final Reports Due

APPENDIX 19

LIKELY SHORT LECTURE TOPICS.

- i. Corporate Objective Setting.
- ii. Policy and Strategy Formulation, and Long Term Planning.
- iii. Cash Budgeting.
- iv. Financial Ratios.
- v. Break-even Analysis.
- vi. Sales Forecasting.
- vii. Production Planning.
- viii. Inventory Control.
- ix. The Marketing Mix.
- x. Management Information Systems.

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Source : WEGNER T., THOMSON T. INTERACT

APPENDIX 20

Critical Elements of the Management Process

Planning and innovation

- 1.1 Basic organizational objectives pursued and the form of their operational expression.
- 1.2 Types of plans utilized.
- 1.3 Time horizon of plans and planning.
- 1.4 Degree and extent to which enterprise operations are spelled out in plans (i.e., preprogrammed).
- 1.5 Flexibility of plans.
- 1.6 Methodologies, techniques and tools used in planning and decision making.
- 1.7 Extent and effectiveness of employee participation in planning.
- 1.8 Managerial behavior in the planning process.
- 1.9 Degree and extent of information distortion in planning.
- 1.10 Degree and extent to which scientific method is effectively applied by enterprise personnel—both managers and non-managers—in dealing with causation and futurity problems.
- 1.11 Nature, extent, and rate of innovation and risk taking in enterprise operations over a given period of time.
- 1.12 Ease or difficulty of introducing changes and innovation in enterprise operations.

Control

- 2.1 Types of strategic performance and control standards used in different areas; e.g., production, marketing, finance, personnel.
- 2.2 Types of control techniques used.
- 2.3 Nature and structure of information feedback systems used for control purposes.
- 2.4 Timing and procedures for corrective action.
- 2.5 Degree of looseness or tightness of control over personnel.
- 2.6 Extent and nature of unintended effects resulting from the over-all control system employed.
- 2.7 Effectiveness of the control system in compelling events to conform to plans.

Organization

- 3.1 Size of representative enterprise and its major subunits.
- 3.2 Degree of centralization or decentralization of authority.
- 3.3 Degree of work specialization (division of labor).
- 3.4 Spans of control.
- 3.5 Basic departmentation and grouping of activities. Extent and uses of service departments.
- 3.6 Extent and uses of staff generalists and specialists.
- 3.7 Extent and uses of functional authority.
- 3.8 Extent and degree of organizational confusion and friction regarding authority and responsibility relationships.
- 3.9 Extent and uses of committee and group decision making.
- 3.10 Nature, extent, and uses of the informal organization.
- 3.11 Degree and extent to which the organization structure (i.e., the formal organization) is mechanical or flexible with regard to causing and/or adapting to changing conditions.

Staffing

- 4.1 Methods used in recruiting personnel.
- 4.2 Criteria used in selecting and promoting personnel.
- 4.3 Techniques and criteria used in appraising personnel.
- 4.4 Nature and uses of job descriptions.
- 4.5 Levels of compensation.
- 4.6 Nature, extent, and time absorbed in enterprise training programs and activities.
- 4.7 Extent of informal individual development.
- 4.8 Policies and procedures regarding the layoff and dismissal of personnel.
- 4.9 Ease or difficulty in dismissing personnel no longer required or desired.
- 4.10 Ease or difficulty of obtaining and maintaining personnel of all types with desired skills and abilities.

Direction, leadership, and motivation

- 5.1 Degree and extent of authoritarian vs. participative management. (This relates to autocrats vs. consultative direction.)
- 5.2 Techniques and methods used for motivating managerial personnel.
- 5.3 Techniques and methods used for motivating nonmanagerial personnel.
- 5.4 Supervisory techniques used.
- 5.5 Communication structure and techniques.
- 5.6 Degree and extent to which communication is ineffective among personnel of all types.
- 5.7 Ease or difficulty of motivating personnel to perform efficiently, and to improve their performance and abilities over time (irrespective of the types of incentives that may be utilized for this purpose).
- 5.8 Degree and extent of identification that exists between the interests and objectives of individuals, work groups, departments, and the enterprise as a whole.
- 5.9 Degree and extent of trust and cooperation or conflict and distrust among personnel of all types.
- 5.10 Degree and extent of frustration, absenteeism, and turnover among personnel.
- 5.11 Degree and extent of wasteful time and effort, resulting from restrictive work practices, unproductive bargaining, conflicts, etc.

In addition to the management process areas and elements, Farmer and Richman expand their listing of critical elements of the management process to include major policy areas of management planning in order to obtain a view of the policies followed by various companies. These policies are classified as those related to marketing, production and procurement, research and development, finance, and external relations. Each of these in turn is broken down into a number of elements. In the area of marketing policy, for example, channels of distribution and types and location of customers are listed. In the area of production and procurement, policy with respect to making or buying items is one of those listed, and in the area of finance, policy with respect to distribution of earnings is an example.²⁸

External Environmental Constraints Farmer and Richman, as noted, divide external and environmental constraints into four classes: educational, sociological-cultural, legal-political, and economic.

Educational constraints Among the major educational constraints noted are literacy level, the availability of specialized vocational and technical training and secondary education, higher education, management development programs, the prevailing attitude toward education, and the extent to which education matches requirements for skills and abilities. Mere reference to these educational factors indicates how they may support

or limit effective management. Moreover, where education is inadequate, not only will economic enterprises themselves tend to suffer thereby, but political and legal systems are likely to be poor. Even in advanced societies, where education appears to be more closely matched with requirements, there is always the phenomenon of a shortage of educational brain power, since it is a characteristic of all societies that the more that is available, the more is needed.

Sociological-cultural constraints In the sociological-cultural area, Farmer and Richman identify a large number of factors. They name such factors as (1) the general attitude of the society toward managers (for example, is a career in the profession of medicine or law, or in government, regarded as of higher status than in business management?); (2) the dominant views of authority and subordinates (for example, are subordinates expected to follow the all-knowing, paternalistic decisions of the top manager, or is participation of subordinates accepted and encouraged?); (3) the extent to which cooperation between various groups is a way of life (for example, are class structures rigid or are the means for advancement open to a person who is capable regardless of his class affiliation?); (4) the extent of union-management cooperation; (5) the view of achievement and work (for example, does the society value economic achievement through hard work as a desirable personal trait, or is achievement in the arts or preparation for life-after-death regarded as paramount?); (6) the extent of inflexible class structure and individual mobility (for example, are individuals moved to positions on the basis of their abilities, or are they restricted by caste systems or other forms of discrimination not related to ability?); (7) the dominant view of wealth and material gain, such as attitudes toward saving and the desire for material wealth versus religious satisfaction, the "good life," or other nonmaterial stimuli; (8) the view of scientific method (for example, is the society interested in preserving traditional cultures and patterns or in following a given ideology regardless of the logic involved or the empirical evidence and new discoveries available, or does the society understand the basic relationships between such economic factors as demand, price, wages, training, absenteeism and turnover, etc.?); (9) the view of risk taking (for example, are nations, enterprises, and individuals willing to take reasonable risks?); and (10) the view of change (for example, do the people in a society maintain their basic faith in traditions—old ways of doing things—or do they embrace change which promises to improve productivity?).

Legal-political constraints The major legal-political constraints in an external environment have been identified by Farmer and Richman as falling into six categories: (1) relevant rules of the game; (2) defense policy and national security; (3) foreign policy; (4) political stability; (5) political organization; and (6) flexibility of law and legal changes.

There are, as one might expect, a number of legal rules in any business

game. One is the general business law which provides a framework within which the firm must work. Important factors in this framework are codes of fair and effective competition, the law of contracts, and laws pertaining to trademarks, copyrights, and patents. Likewise, general laws governing society, such as those affecting health, welfare, and safety, have their effect, as automobile and pharmaceutical manufacturers, among others, in the United States are well aware.

Another legal area constraining the manager is that dealing with prices and competition. The United States has been the leader in the work of framing and enforcing laws to require a responsible level of competition, and these have had both a constraining and a constructive effect on a manager's environment. But elsewhere in the world these laws differ, ranging from those coming somewhat close to American legislation in enforcing competition to laws which permit and encourage monopoly or monopolistic practices.

Still another area of law which has a far-reaching effect on management is labor law. In most countries these laws are extremely complex. They usually apply to hours and conditions of work, use of women and minors, tenure and job security, employer responsibility for health and welfare, use of nationals, and unemployment compensation. But differences in requirements may be considerable. In the United States, for example, a company manager is normally permitted to discharge or lay off an employee with little or no difficulty or cost. But in many other countries he may find it virtually impossible to do so, especially if the employee has fairly long tenure. Furthermore, in one country the cost of social benefits may be virtually nonexistent while in another it may amount to nearly half of the payroll costs.

Tax law variations are also significant. Tax regulations and the impact of taxes are different in various jurisdictions. Some may even materially affect whether a business operates as a proprietorship, partnership, or corporation. Possibilities of evasion differ considerably. It is customary for businesses in many countries to evade taxes to a great extent. This is epitomized by the statement of a Latin American business owner to one of the authors that he kept three sets of books: one for the tax collector, one for the person who might wish to buy his business, and one for himself. Also, the extent of tax benefits or penalties to encourage or discourage a business obviously has a significant effect on management policy.

Another political factor affecting management is the country's policy toward defense and national security. Where huge sums are spent toward this end, as in the United States, the effect is obvious. Defense policy often has considerable impact on the allocation of manpower and resources. Draft of manpower and allocation and rationing of materials are cases in point.

Foreign policy also has its influence on the management of enterprises. Tariffs and quotas, economic aid, protection of local businesses by restricting foreign ownership, monetary exchange controls, and control of imports or exports are conspicuous and widespread examples. Managers always have to

contend with these influences, and companies domiciled in one country and doing business in another, either through export or through license, joint venture, or wholly owned subsidiary, have special problems in dealing with them.

Still another environmental factor is the extent of political stability which a country enjoys. Where political systems and leadership are highly unstable, as has been the case in many Latin American and African nations, the manager faces an area of uncertainty which cannot help but materially affect his planning. Even moderate political uncertainties can have consequences. The changing policy in Great Britain with respect to nationalizing the steel industry, as Labor and Conservative elements come into and lose power, cannot help but have a detrimental effect on planning in this industry—planning which in many respects unavoidably involves commitments of a long-range and inflexible nature.

Likewise, the type of political organization has an important influence on managers. If a country is operated under a federal system, as are the United States and Australia, the environment is different from one operated under a highly centralized political organization, such as France. The more government levels with power to affect a manager's operation, the more complicated his task may be in meeting legal requirements. But it is also likely that he will receive more local understanding of his problems than under a highly centralized government.

Farmer and Richman further identify as an important factor in the political environment the flexibility of law—the ease with which legal changes are brought about in a society. Law is notably conservative, largely because it is designed to correct past abuses and conditions. But as conditions change, if the law itself is not flexible or cannot be changed readily, the manager may have a critical problem on his hands. Thus, many German companies find themselves hampered in their economic growth by a law—which many people agree should be changed but has not been—that a company, now organized as a proprietorship or partnership, cannot convert to the corporate form without suffering a tax to the owners for any appreciation in his equity. This has, of course, caused many family-owned companies to continue as proprietorships or partnerships rather than to gain the advantage of corporate form and additional capital through public sale of stock ownership.

Economic constraints Farmer and Richman likewise identify a number of economic constraints which differ between countries and affect the practice of managing. Among these are the basic economic system, whether predominantly private or public in ownership, whether competitive, whether exchange is based on sound money, and the extent to which the government controls economic activities.

There are economic differences in whether the central banking system and national monetary policy work to help or to thwart managers. Does the banking system provide needed money and credit expansion as businesses

grow? Does it control monetary supply to avoid unsettling inflation? Does it operate to stabilize the economy, or does it contribute to excess booms? Does it support or hinder export business? These questions are closely tied in with fiscal policy in the extent to which the public sector of an economy creates price stability, tax fluctuations, booms, and recessions. Obviously, this element of a manager's environment greatly influences his managerial policies.

Economic stability is a significant economic variable in societies. A degree of price stability is highly desirable, since a manager is required to make many fairly long-range commitments and is almost forced to rely very largely upon financial data for much of his planning and control. Utilization of production factors is an environmental matter of importance; cycles in employment of capital and land can understandably have a disturbing effect on enterprises that must use, and plan to utilize for some time, these resources. While no manager would expect perfect stability in either prices or the economy and would normally prefer a growing economy, and while he is usually able to live with moderate price changes, uncertainty in these economic elements cannot help but hinder planning effectiveness and compel shortening the time span of decision commitment.

Since capital is the lifeblood of any business enterprise, organization of capital markets is an important environmental factor. The manager operating in an environment where capital is fairly readily available at reasonable cost has, of course, a tremendous advantage over one who operates in an environment where capital is scarce and expensive. Even in completely government-planned and controlled economies, this problem exists. Capital needs may be furnished as a government service, but with all the problems of restriction and bureaucratic friction which exist.

In addition to the above economic controls, Farmer and Richman identify three all-pervasive economic constraints. One they refer to as factor endowment—the extent to which a country has available natural resources, adequate and useful labor, and capital which can be employed for efficient production. Another is the size of markets. Obviously, to take advantage of many of the economies of large-scale production, the size of a market open to a firm is important. Closely related are the extent to which competition exists and whether there are legal or other limitations on a manager reaching a market.

A third major pervasive economic constraint outlined by Farmer and Richman is the extent to which social-overhead capital is available, that is, the supply and quality of public utility-type services. These refer to a host of services necessary to support production, distribution, and consumption. They include transportation, communication, energy production and transmission, warehousing, and sewer and water facilities.

The Farmer-Richman Model From their identification of the various elements of the management process and of a manager's external environment which affect the way he manages, Farmer and Richman have constructed a model.

While new and probably subject to revision in the future, this model nonetheless distinguishes the management process from the environment of managing. In doing so, it appears to be a useful tool for evaluating management as management and for understanding what may make effective management practice differ as between varying cultures.

The model may be depicted as in Figure 33.1.

The Farmer-Richman Model and Principles of Management Farmer and Richman express the belief that external conditions of the type outlined above will affect both managerial effectiveness and the elements of the management process. Managerial effectiveness will, in turn, determine a firm's efficiency and consequently the efficiency of a given country or society (a "system").

They put it in this way. If a country has a negative attitude toward education, it presents a manager with staffing difficulties if a level of unavailable education is important to his operations. If a population has a negative attitude toward scientific method, staffing with people having abilities to analyze and act rationally will be difficult. Or if a law against pollution of streams exists in a country, this will, in turn, affect production policies and activities. A lack of an established communications system will also have an effect on the efficiency of many firms. While they may furnish their own system, this is likely to be less efficient.

Other factors may only affect the operation of the management process.

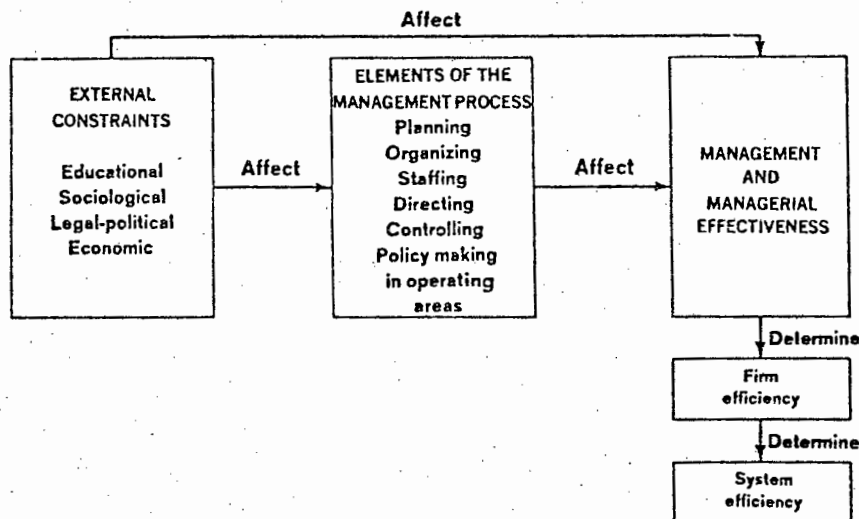


Fig. 33.1 Farmer-Richman Model for Analyzing Comparative Management
SOURCE: Adapted from R. N. Farmer and B. M. Richman, Comparative Management and Economic Progress (Homewood, Ill.: Richard D. Irwin, Inc., 1965), p. 35.

The planning time horizon may be limited by political instability or rapid inflation. A paternalistic attitude toward people may influence organizational patterns by restricting delegation. Or an accounting system based on tax evasion may so contort financial data as to make managerial control information misleading. Likewise, management development and promotion may be thwarted by a caste system or racial or religious discrimination. As can be seen, these and many other cultural variables may materially influence management functions and the way a manager undertakes them.

But there is no evidence in the Farmer-Richman model or in their study of comparative management that the *fundamentals* of managing are changed by these environmental constraints. For example, the limitation of the planning horizon caused by rapid inflation does not invalidate the principle of commitment. It only means, as many Brazilian businessmen have found, that the period and means of obtaining recovery of costs plus return-on-investment are shortened. Nor does a level of education affect the principle of job definition, although its application in terms of a given structure of roles and provisions for incentives will vary. Also, even though a caste system or an attitude of racial or religious discrimination may not permit operation of the principle of open competition and promotion, this does not mean that the principle is untrue. It means, rather, that managerial efficiency is hampered by these external constraints, since a manager is not able to apply the principles completely.

APPENDIX 21

It is suggested that you prepare an organization chart that shows the lines of authority in your company organization and the assignment of each member of your team to a position in the company.

2. Prepare a forecast of expected levels of economic activity. Your sales will be affected by the general level of economic activity, and such a forecast will be helpful to you in forecasting sales. Specific suggestions for preparing a forecast of gross national product are contained in Chapter 5.

3. Prepare a sales forecast. Your production scheduling, plans for investment in new plant and equipment, expected cash receipts, and selling expenses will be determined by the level of sales. Suggestions for preparing a sales forecast will be found in Chapter 5.

4. Prepare a production schedule for the first decision period, and plan production requirements for subsequent quarters of business operations. These plans obviously will be affected by your expectations of sales activity. Suggestions for preparing these plans will be found in Chapter 6, along with descriptions of production costs and production possibilities.

5. Prepare an investment plan and capital budget. Alternative methods of expanding your productive capacity will be found in Chapter 7, together with the costs associated with each method of expansion. The amount of expansion that you undertake will be affected by your expectations of production requirements. A decision also must be made regarding the method by which to finance your projected expansion. Alternative sources of funds are outlined in Chapter 8.

6. Prepare a cash budget. It is essential that sufficient funds be provided so that you will be able to meet the expenses and cash outlays required by your operations and investment plans. Sources of funds and cash requirements are outlined in Chapter 8, along with suggestions for preparing a cash budget.

7. Prepare pro forma financial statements. Your projected balance sheet will assist in an analysis of how the expected structure and levels of assets and liabilities may affect your financial condition. Your expected degree of profitability will be an important means of judging the success of your company's subsequent operations. You should test your decisions before submitting them by preparing a projected income statement and position statement. Suggestions for doing this will be found in Chapter 8.

8. Formulate initial strategies and policies for your company's operations. As you undertake the planning activities outlined above you should be formulating tentative policies for the operation of your company and for the decisions you must make each quarter. It is suggested that these policies be stated explicitly and written down for future reference. As the game proceeds you probably will wish to revise these policies from time to time in order to meet the changing requirements of a dynamic business situation.

It is suggested that you be very specific in your formulation of policies. You may wish to think of many of your policies as decision rules to be followed in certain situations. An example of a specific policy might be: "Ignore price reductions by competitors when they amount to less than ten cents per unit; but when the reductions are greater, match their price immediately." Avoid such generalizations as "charge a fair price that is consistent with production costs and with competitors' pricing policies." The formulation and statement of your policies will help to assure the consistency and stability of your company's operations and will save you a considerable amount of preparation time during the decision-periods as you play the game.

APPENDIX 22

The measure of consonance (derived from Festinger and Bach, 'Social Factors in Housing') is basically an analysis of the difference in perception by a group member, X, of who influenced him, and the perception of all other group members about who influenced X. Figure 16.5 shows the basic

Based on question 'who influences' (Circled numbers are read across the row and indicate response to question 'who influences you'.)

Player	1	2	3	4	Individual indices
1	x	②	1	0	$2/(3 + 1) = 0.50$
2	3	x	①	①	$1/(5 + 4) = 0.11$
3	①	②	x	0	$3/(3 + 3) = 0.50$
4	③	1	1	x	$3/(5 + 0) = 0.60$
Total					$9/24 = 0.375$

Fig. 16.5. Consonance index.

form of calculation as taken from an actual playing session. Look first at player 1. He says that he is influenced by player 2; two players say that he was influenced by player 2; and one player says that he was influenced by player 3. Our index for player 1 can now be calculated: the number in the circle is 2, i.e., two players agree with player 1 that he was influenced by player 2. This gives our numerator. Three 'votes' were cast altogether (two people thought player 1 was influenced by player 2 and one person that player 1 was influenced by player 3); in our example, we can see also that, since there were three players in addition to player 1, if that player had been completely right in his assessment, the figure circled would have been 3 rather than 2—a 'shortfall' of 1. This shortfall is added to the number of votes to give the denominator (3 + 1) and our consonance index for player 1 is $2/4 \times 0.50$. The procedure is to calculate for each individual in each period of the game. The calculation for the team is made by summing the numerators and denominators to give the team consonance index.

The consonance indices have considerable power for generating group discussions and interpreting group behaviour. Thus, it is possible to follow changes in group and individual perceptions throughout the game, and also to link this with the economic performance of a team. Figure 16.6 is an example taken from a game session played with four groups of middle managers. Five points may be made concerning this diagram:

- (a) for reasons connected with the particular game, the market share of each company was used as the key measure of economic performance;
- (b) no consonance index was calculated for period 1, since these forms are normally disregarded due to their unfamiliarity to players and to the concentration on understanding the game;

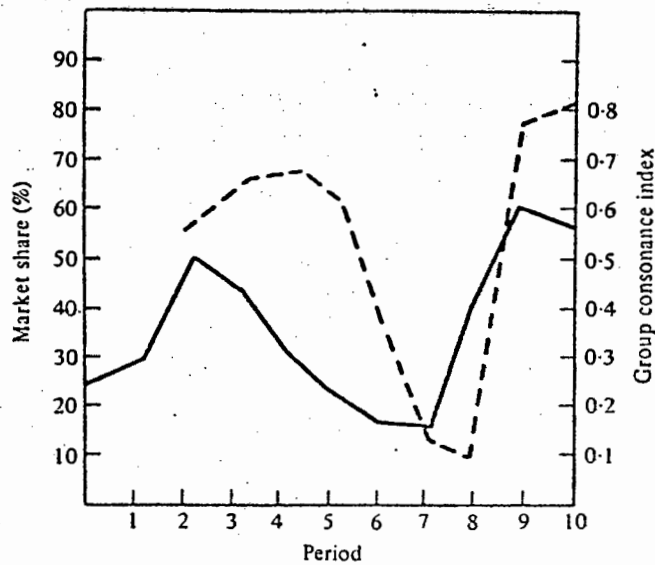


Fig. 16.6. Relationship between group consonance index and economic performance—team 1.

- (c) there is a lag effect in the relationship between the consonance index and economic performance, since the sociometric forms are handed in with normal decision forms. For this reason, group attitudes in period n are formed mainly on the basis of results of period $n - 1$;
- (d) the consonance index varies between 0 and 1; the higher the index the greater the degree of consistency within the team between individuals' perceptions of their influence, and other players' perception of that influence. In general, therefore, a high index indicates a more cohesive group;
- (e) in the particular example, period 7 saw a change in leadership.

Source : TAYLOR B., LIPPITT G.L. pp. 233-234

APPENDIX 23

SIMULATION RATING FORM
(Short Form)

Team # _____

Group Members Being Rated: 1. _____
2. _____
3. _____
(Give Names)

Name	1.	2.	3.	Total Points
Attitude				100
Meeting Attendance				100
Cooperation				100
Did Proper Share of Work				100
Quality of Work Submitted				100
Met Group Deadlines				100
Total				600

Additional Comments (use back if necessary).

Performance Evaluation

203

FIG. 35 INTOP Group Analysis *

Your Name _____

Company # _____

You are assured that all data on this sheet will be held in *strict confidence*.

Kindly list each member of your firm in alphabetical order, *including yourself*. For each of the characteristics listed, rate each member on a scale from 0 (lowest) to 100 (highest), where the number indicates your estimate of the proportion of the members of the entire class who fall below the rated individual on the given characteristic. A rating of 50 is to be regarded as average for all class members; over the entire class, *but not necessarily within any given teams*, half the members should receive lower than 50 and half higher than 50. *No two persons may receive the same rating on the same characteristic; i.e., no number may appear more than once on a given line.*

Please note that if this form is not filled in in accordance with instructions it will be disregarded.

	Name	/	/	/	/	/	/	/
1	Knowledge of INTOP Rules							
2	Use of Analytic Techniques							
3	Influence on Company Decisions							
4	Willingness to Take Risks							
5	Originality of Ideas							
6	Contribution to Group Morale							
7	Ability to Plan Ahead							
8	Ability to See Points of View Other than Own							
9	Overall Value to Company							

*Several suggestions by Professor Franklin B. Evans at Chicago are gratefully acknowledged.

APPENDIX 24 (a)

SUMMARY OF MEAN SCORES AND SIGNIFICANCE TESTS FOR KNOWLEDGE AND SKILL

EXAMINATION	MEAN SCORES			COMPARISON OF GROUPS: DIFFERENCES SIGNIFICANT AT .05 LEVEL			HYPOTHESES	
	Group NG	Group SG	Group CG	NG to SG	NG to CG	SG to CG	1(a)	2(a)
Case Analysis:								
Before game.....	43.31	45.57	44.45	No	No	No
After game.....	76.90	76.84	75.15	No	No	No	Reject	Accept
Improvement.....	33.59	31.27	30.70	No	No	No	Reject	Accept
Final Examination:								
Part I (true-false).....	53.04	54.82	55.40	Yes*	Yes*	No	Accept	Accept
Part II (break even).....	11.46	14.26	14.36	Yes*	Yes*	No	Accept	Accept
Part III (sales forecast)...	9.84	12.44	11.83	Yes*	Yes*	No	Accept	Accept
Over-all score.....	74.34	81.52	81.59	Yes*	Yes*	No	Accept	Accept

* Indicates significance at the .01 level.

APPENDIX 24 (b)

SUMMARY OF MEAN SCORES AND SIGNIFICANCE TESTS FOR ATTITUDES

CONCEPTS	MEAN SCORES			COMPARISON OF GROUPS: DIFFERENCES SIGNIFICANT AT .05 LEVEL			HYPOTHESES	
	Group NG	Group SG	Group CG	NG to SG	NG to CG	SG to CG	1(b)	2(b)
Case analysis.....	5.32	5.14	4.98	No	No	No	Reject	Accept
Business courses in general...	5.11	5.07	4.99	No	No	No	Reject	Accept
Policy course.....	5.26	5.24	5.23	No	No	No	Reject	Accept
Business instructors in general	4.86	4.70	4.66	No	No	No	Reject	Accept
Policy instructor.....	5.76	5.79	5.80	No	No	No	Reject	Accept
Practice of management.....	5.46	5.56	5.71	No	No	No	Reject	Accept
Theory of management.....	5.15	5.45	5.31	No	No	No	Reject	Accept
Over-all attitude score.....	5.27	5.28	5.24	No	No	No	Reject	Accept

APPENDIX 24 (c)

SUMMARY OF MEAN SCORES AND SIGNIFICANCE TESTS FOR INTEREST AND MOTIVATION.

DIMENSIONS	MEAN SCORES			COMPARISON OF GROUPS: DIFFERENCES SIGNIFICANT AT .05 LEVEL			HYPOTHESES	
	Group NG	Group SG	Group CG	NG to SG	NG to CG	SG to CG	1(c)	2(c)
Perception:								
1. How does this course compare to other business courses you are taking this semester?								
a) In terms of interest...	2.08	2.26	2.34	No	No	No	Reject	Accept
b) In terms of motivation.....	2.19	2.43	2.43	No	No	No	Reject	Accept
2. How does this course compare to all other business courses you have taken in the past?								
a) In terms of interest..	1.86	2.09	2.11	No	No	No	Reject	Accept
b) In terms of motivation.....	2.02	2.24	2.16	No	No	No	Reject	Accept
Perception only...	8.15	9.02	9.04	No	No	No	Reject	Accept
Behavior:								
1. Number of absences....	2.60	3.18	3.08	Yes*	Yes	No	Accept	Accept
2. Hours spent on this course.....	1.64	1.91	2.04	Yes	Yes	No	Accept	Accept
Behavior only.....	4.24	5.09	5.12	Yes	Yes	No	Accept	Accept
Combined perception and behavior.....	12.39	14.11	14.16	Yes	Yes	No	Accept	Accept

* Indicates significance at the .01 level; all other significant differences are at the .05 level.

Source : RAIA A.P. pp. 339-352

APPENDIX 25

APPENDIX

BUSINESS POLICY EXAMINATION

Please demonstrate your knowledge of the following concepts and their ramifications by explaining their meaning and providing examples of their application in a business enterprise setting.

1. The time dimension is a strategic factor in most business decisions.
2. The organization's decision makers should be aware of the relationships of measurable variables, i.e., they must not only determine the levels or rates of change but the best direction of movement in view of probable developments.
3. Management must develop the ability to collect and abstract relevant decision-making information from the environment.
4. The organization's strategy must carefully balance long- and short-run considerations.
5. Decisions made today partially create the environment faced by the organization in the future.
6. Plans or policies are carried out by a series of consistent decisions that vary in accordance with variances in the environment.
7. Functional decisions within the firm are interrelated and should be kept in dynamic balance.
8. Management must constantly reappraise its company's strategy in light of new challenges and opportunities posed by its internal and external environment.
9. The firm operates within any number of constraints which may be personal, economic, physical, technological, or social in nature.

Source : WOLFE J., GUTH G.R. p. 364

APPENDIX 26 (a)

Section Examination Scores and Significance

Learning Format	Mean Examination Scores		T ^a
	Precourse	Postcourse	
Game section (N = 39).....	10.564	25.897	34.500**
Case section (N = 21).....	10.428	19.857	7.500**
Z ^b	0.051	1.774*	...

^a Wilcoxon matched-pairs sign test.
^b Mann-Whitney U-test.
* P < .05.
** P < .01.

APPENDIX 26 (b)

Section Examination Scores on Principles

Learning Format	Mean Examination Scores		T ^a
	Precourse	Postcourse	
Game section.....	8.794	21.974	29.000**
Case section.....	9.428	16.619	18.000**
Z ^b	0.488	-0.728*	...

^a Wilcoxon matched-pairs sign test.
^b Mann-Whitney U-test.
* P < .05.
** P < .01.

APPENDIX 26 (c)

Section Examination Scores on Facts

Learning Format	Mean Examination Scores		T ^a
	Precourse	Postcourse	
Game section.....	1.666	3.923	42.000*
Case section.....	1.142	3.952	2.000*
Z ^b	-1.255	0.030	...

^a Wilcoxon matched-pairs sign test.
^b Mann-Whitney U-test.
* P < .01.

APPENDIX 27

METHOD OF CONSTRUCTION OF SENSITIVITY ANALYSIS MODEL

i. Parameter Adjustment

The writer identifies two reasons for adjusting certain appropriate parameter values:

- a. there is a need to avoid subjecting the 'real' simulation model to intense scrutiny and analysis by participants, and hence removing all uncertainty about model behaviour, and
- b. to create the impression that at best, modelling can only but be a good approximation of the object system under study.³⁸

The adjustment of parameter values, as discussed in chapter 4.3.2 must be moderated by their individual as well as combined effect upon model reaction. Also the adjusted values must not lead to the creation of an environment which is significantly different from the 'real' model's environment, otherwise sensitivity analysis is rendered useless.

ii. Economic Forecasting

In the 'real' model, the trend of economic activity is determined by parameter values interacting with certain model functions. In the sensitivity model, however, firms must input their prediction of this trend. Their strategies then, in sensitivity runs, are evaluated against their own inputted forecasts of economic activity and not against the true trend which will manifest itself in the future periods of play.

Similar results for both sensitivity runs and actual game runs will occur only when a firm's projection of future economic activity coincides with that of the 'real' model. (This forecasting function could be performed with the aid of the forecasting package).

This modification was necessitated by the fact that without it, forecasting would become superfluous - one run of the sensitivity model would reveal the future level of economic activity.

iii. Assumption concerning Competitor's Behaviour

It is generally recognized that the behaviour of competitors is an uncontrollable factor in business situations.³⁹ However, the actions and strategies of competitors is a factor which cannot be ignored in any planning process.⁴⁰

This situation calls for a company undertaking planning - the selection among alternatives of future courses of action⁴¹ - to make certain assumptions about competitor's behaviour to serve as a planning premise.⁴² Koontz and O'Donnell believe this is best achieved through the company putting itself in its competitor's place, developing a set of plans for its competitor, estimating this program in the light of objectives and the circumstances in which the competitor is operating, and then to modify their own plans accordingly.⁴³

The writer supports this approach with regard to competitive strategies. The computerization involved to permit such an approach to be adopted is, in the writer's opinion, not formidable. The present sensitivity model however, adopts the following approach vis-a-vis competitive behaviour:

- i. the company undertaking planning may manipulate the average industry price of the product, and
- ii. the behaviour of competitors with respect to all other decision areas will remain constant as of the end of the preceding actual decision period.

No attempt will be made to justify this approach. But it can be considered as a first reasonable approximation to the 'ideal' approach as advocated by Koontz and O'Donnell.

iv. Multi-Period Processing

As illustrated by exhibit 1, the planning horizon for different decision areas varies. Thus if the sensitivity model is to be used to evaluate strategies with varying time commitments, it must permit multi-period processing. In addition, the model should be designed in such a way that the choice of the planning horizon (i.e. the number of decision periods to be processed simultaneously) is at the discretion of the company planners.

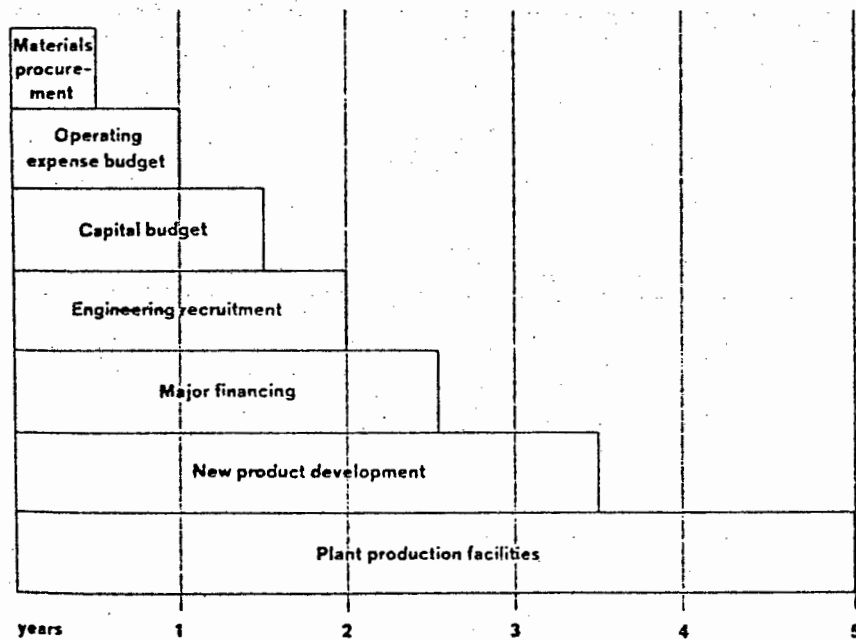
This approach is consistent with the Commitment Principle in determining the planning period as advocated by Koontz and O'Donnell. This principle states

that logical planning encompasses a period of time in the future necessary to foresee, through a series of actions, the fulfillment of commitments involved in a decision taken now.⁴⁴ Furthermore, a company should probably not plan for a longer period than is economically justifiable; yet it is risky to plan for a shorter period.

The existing sensitivity model developed and used by the writer encompasses this multi-period processing feature in the format as discussed above.

Note: References are to be found at the end of chapter 5.

TYPICAL KINDS OF COMMITMENTS



Planning Areas and Time Periods . . . Various management decision areas typically involve planning ahead for differing periods of time. New plant facilities may be planned at least five years ahead. These periods vary according to the kind of business. For instance, a large public utility may plan new power-production plants twenty-five or thirty years into the future while a small garment manufacturer may plan new production facilities only one year ahead. However, if acquired raw materials are bought, used in making the product, and sold as finished product in six months, the planning would logically be six months into the future.

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