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KEY DETERMINANTS AND DECISION PERFORMANCE IN A BUSINESS SIMULATION AND EXPERIENTIAL LEARNING ENVIRONMENT

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ABSTRACT

Development in training technology over the past few years has produced many new ways of using computers to assist learning. Business simulations provide opportunities to manage a company or build a million-dollar portfolio risk-free in a computer-simulated environment. The quality revolution ushered in the need for total quality programs to improve management skills.

This paper describes a model of the major variables affecting business simulation and experiential learning in a computer-simulated environment. The key variables and their relationships in the model are discussed. Each of the variables are pertinent in understanding and conceptualizing the decision-making process which leads to the best simulation outcomes.

INTRODUCTION

Development in training technology over the past few years has produced many new ways of using computers to assist learning. Simulation games and other experiential exercises are techniques for developing management skills that involve higher levels of learning (Keys and Wolfe, 1990). This gaming approach has been adopted to train people in a number of areas as diverse as politics, the military, science, history, geography, languages, and business (Larreche, 1987). Business simulations provide opportunities to manage a company or build a million-dollar portfolio risk-free in a computerized setting. The lessons learned can pay off in the real world (Glazer, Steckel, and Winer, 1987). There are others who contend that simulation results are not totally externally valid due to the multitude of complicating factors that are present in the real world (Plott, 1982).

The quality revolution ushered in the need for total quality (TQ) programs to improve management skills (Senge and Lannon, 1990). Such trends as TQ are mandating that organizations and business schools develop alternative methods for developing management skills. Consequently, simulation games will play a more significant role in management development and assessment effort in business organizations and business schools (Albanese, 1989).

Organizational learning facilitated through computer business simulations could help managers and students reverse their tendency to focus on immediate goals at the expense of long-term strengths. By creating “microworlds,” an interactive computer environment that simulates a real world situation can transform the organizational learning process (Senge and Lannon, 1990). Microworlds permit individuals to make decisions in a simulated environment risk-free of real world consequences. Thereby, the learning experience improves individuals’ management skills and effectiveness to the organization.

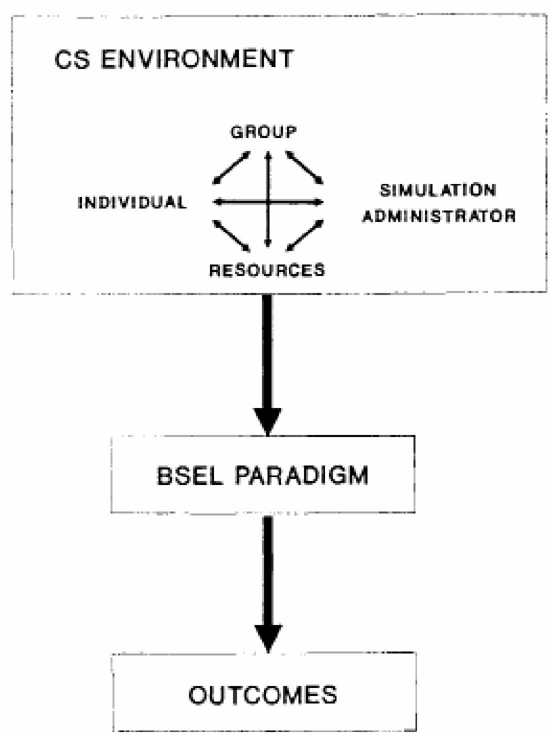
The purpose of this paper is to describe a model of the major variables affecting business simulation and experiential learning in a computer simulated environment. The conceptual model contains several key variables: environment, group, individual, resources, simulation administrator, business simulation and experiential learning (BSEL) determinants, and outcomes. Each of these variables are pertinent in understanding and conceptualizing the decision-making process which leads to the best computer simulation outcomes. The interaction of key variables in a computer-simulated environment are discussed. The impact of these variables on the BSEL determinants are further developed. The presentation starts with a general model and then offers researchable propositions from applying the model.

A MODEL OF THE MAJOR VARIABLES AFFECTING BSEL

In the model there are several major variables identified for helping to understand the computer simulation experience and outcomes (see Figure 1). These variables are the simulation administrator, resources, individual, group, BSEL determinants, and outcomes. The first four variables are developed in the context of the computer simulation environment (CSE).

FIGURE 1

A MODEL OF THE MAJOR VARIABLES AFFECTING BSEL



COMPUTER SIMULATION ENVIRONMENT (CSE)

The computer simulation environment (CSE) consists of four major variables: individual, group, resources, and the simulation administrator. The interaction of these variables are pertinent to the type of CSE that evolves. A CSE can be described according to the nature of competition and influence of technology that is generated. A highly competitive and advanced technological influence is indicative of a more positive CSE for organizational learning or business simulation. Conversely, the opposite is true of CSE's with a lower competitive emphasis and nominal technological influence.

INDIVIDUAL

One important variable in the CSE is the individual. Individual members' background, experience, and intelligence will affect their approach in the computer simulation activity. An individual's depth and breadth of business experience, computer literacy, and strategic decision insight will affect their level of participation as well as influence in the CSE.

Individuals who are computer literate will transform that knowledge into a technological influence that will affect their performance positively in the simulation (McKenney and Dill, 1966; Patz, 1989). Likewise, individuals who are less computer competent will be more reluctant to participate and perhaps even less competitive in the CSE.

The background and experiences of the individual will also affect the CSE. Generally, the more experienced the individual is, the more confident they are in their ability to participate (Butler, Pray, and Strang, 1979). Butler, et al. (1979) found that the learning from the simulation was a function of the students themselves. Likewise, individual confidence tends to encourage competition among other confident participants.

GROUP

Group dynamics is another important variable that will affect the CSE. Group characteristics include: cohesiveness, size, structure, and philosophy (Glazer, et al., 1987). Group performance in the computer simulation is generally believed to be a positive function and balance of the characteristics identified above. Groups that evolve to a cohesive unit will be more effective than other groups who are lacking in these characteristics (Davis, 1969; Norris and Niebuhr, 1980). A cohesive unit for purposes of the CSE is defined as sharing a mutual understanding of tasks and responsibilities within mutually negotiated guidelines that are uniformly applicable.

Essentially, group behavior and dynamics will affect the CSE positively or negatively (Gentry, 1980; Miesing, 1982). A positive effect is likely when groups are active in the simulation activity. Group activity becomes a function of the four primary characteristics discussed as well as the interaction with the other CSE variables. A negative effect is the result of low group activity and low group dynamics. Consequently, groups can affect the performance of not only the group itself but the individual members as well (Gentry, 1980; Wolfe, Bowen, and Roberts, 1989).

RESOURCES

The resources that are most critical in the CSE are computer technology, budgets, and training/learning facilities. Resources can impact the CSE positively or negatively (Affisco and Chanin, 1989; Keys, Burns, Case, and Well, 1988). Abundant computer technology resources include hardware and software. Computer hardware is essential and inherent in the CSE. Software packages further influence the CSE and outcomes. Simulations that do not facilitate scenario analysis are often limiting the development of management skills. Computer spreadsheets that facilitate interactive decision-making by simulating 'what if' scenarios offer the best results. Computer software packages that are interactive can positively affect the CSE (Wolfe and Gregg, 1989).

SIMULATION ADMINISTRATOR

Another important variable influencing the CSE includes the simulation administrator. A simulation administrator's involvement, philosophy, and experience in computer simulation will affect the CSE. An administrator's involvement in terms of rewarding and interacting with the participants playing the game is important (Keys and Wolfe, 1990). The comprehensiveness of the research concerning the administrator's role is rather spotty (Keys and Wolfe, 1990). Some claimed that the experiential method was self-teaching and therefore the administrator's role was less important (Kolb, Rubin, and McIntyre, 1971). Wolfe (1975) found that an administrator's guidance was necessary for learning to occur in simulations. Likewise, others have suggested that an administrator's guidance is essential at crucial stages in the development of teams and debriefing stage to insure closure and summary insights are obtained from the simulation experience (Certo, 1976; Keys, 1977). Generally, it can be concluded that simulations and experiential methods are more involving that require an administrator for best results.

Other studies have further supported the idea that simulation administrators influence simulations. Dill, Hoffman, Leavitt, and O'Mara (1961) found that players could be influenced by simulation administrators. The results of Starbuck and Kobrow's (1966) study indicated that simulation administrators' suggestions must reinforce the group's economic self-interest. DiBattista (1986) found that learning was greatest when weekly structured feedback was administered over the simulation period rather than occurring randomly. These studies help to substantiate the role and influence of administrators in simulation exercises.

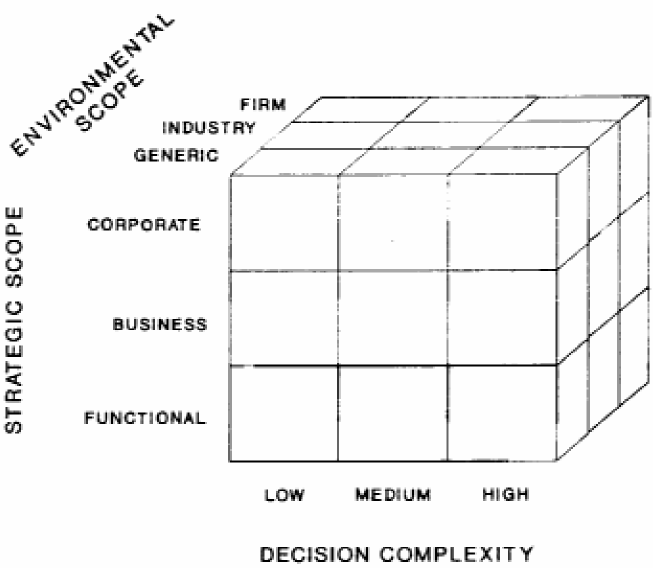
Finally, all of the variables interact with one another to determine the competitiveness of the CSE. Figure 1 indicates the interrelatedness of the variables and their relationship to the BSEL. According to the model, the CSE helps determine the BSEL.

BSEL PARADIGM

The Business Simulation and Experiential Learning (BSEL) paradigm is necessary in the identification and selection of simulation games to match the desired CSE. In the context of a simulation, it is important that the level of information provided to simulation participants is appropriate for the target audience. The BSEL paradigm offers a method to screen and identify a specific simulation for a target audience. The BSEL paradigm is based on three primary dimensions: strategic scope, environmental scope, and decision complexity. A proposed typology is illustrated in Figure 2.

FIGURE 2

PROPOSED TYPOLOGY OF BUSINESS SIMULATION AND EXPERIENTIAL LEARNING PROCESS



STRATEGIC SCOPE

Three levels of strategic scope are identified: corporate, business, and functional. A corporate strategy simulation contains a broader coverage of many business functions and industry-related factors associated with higher levels of management in an organization. Business-strategy simulation concentrates on the management of the primary business, in addition to determining resources, products/services, and business-level strategies appropriate to insure success. A functional-strategy simulation tends to concentrate on the more narrow business functions such as manufacturing, finance, and marketing. The intended strategy focus of the simulation determines the strategic scope of the simulation.

ENVIRONMENTAL SCOPE

The environmental scope of a simulation is generic when the concepts learned are not limited to a specific environment, rather they have a more universal appeal. Simulations are also developed to represent specific industries such as banking, airline, or retailing. Likewise, simulations can be even more directed to a specific firm and the business decisions necessary to operate the organization. However, the validity of such simulations that have a narrow environmental scope are limited to the specific firm for which they are developed (Larreche, 1987).

DECISION COMPLEX ITT

For consistency, three levels of decision complexity are developed ranging from low to high. Not all simulations' decision-making criterion can be easily categorized into one of three cells, but it does represent a method for screening the decision complexity. Decision complexity represents the depth and breadth of the decisions that are contained in simulations (Wolfe, 1978). Simulations that have few decisions based on aggregate response categories have low decision complexity. Similarly, the more decisions and the greater depth of the decision hierarchy indicates a higher decision complexity.

The BSEL paradigm represents a method for screening simulations and selecting one that matches the scope (strategic, environmental, and decision) of the targeted audience. A number of simulations are available corresponding to several of the cells in the paradigm (Keys and Wolfe, 1990). Also, there is the potential for new simulation projects to be developed. Their development can better meet the diverse training and educational needs of the business and academic environment.

OUTCOMES

Simulation outcomes can be separated into quantitative and nonquantitative measures. The main quantitative outcomes include performance ranking based on criterion of market share, profitability, return on investment, sales, and efficiency ratios that are general standards for business organizations. Key nonquanti tative outcomes are the improved management skills, psychological feelings of satisfaction from the simulation experience, and increased confidence in the decision-making process involved in managing businesses. Clearly, the outcomes of simulation are tied to the BSEL paradigm, the computer simulation environment (CSE), and their interaction.

RESEARCH PROPOSITIONS

Figure 1 depicts the variables in the model, which provide a framework to generate researchable propositions. The following propositions are developed from several key relationships contained within the model.

P1: The degree of congruence among the key determinants in a computer simulation environment (CSE) will affect the BSEL paradigm and outcomes.

P1A: In a highly competitive CSE individuals will rely more on the group and will resort more to resources to achieve outcomes.

P1B: In a lesser competitive CSE individuals will rely less on the group and will resort less to resources to achieve outcomes.

High (low) competition in a computer simulation environment (CSE) will impact the BSEL paradigm and ultimately outcomes. Several studies have examined such key variables as individual characteristics (Vance and Gray, 1967; VanSlyke, 1964), group dynamics (Cozan, 1984; Keys and Leftwich, 1985), resources (Lucas and Nielsen, 1980; Schubert, 1973; Smith and Golden, 1990), and simulation administrator (DiBattista, 1986; Starbuck and Kobrow, 1966; Wolfe, 1975) on simulation performance. All of the variables have not been examined congruently to their impact on performance.

P2: The key determinants of CSE will affect the Perceived importance of BSEL and outcomes.

P2A: Higher individual expectations will perceive a higher importance of the BSEL paradigm and higher outcomes.

P2B: Lower individual expectations will perceive a lower importance of the BSEL paradigm and lower outcomes.

A fundamental tenet of the human-relations theory of management is that favorable attitudes toward a task leads to more effective performance (Likert, 1961). Others have found a relationship between individual attitudes and perceptions about tasks that are manifested in performance (Rokeach, 1973; Walker, Churchill, and Ford, 1977). Consequently, the determinants of CSE are expected to influence the BSEL paradigm and outcomes. Individuals' expectations are expected to be directly correlated to their perceptions about the simulation exercise and outcomes.

P3: The decision complexity in the BSEL paradigm will affect simulation.

P3A: More decision complexity in the BSEL paradigm will cause higher outcomes.

P3B: Less decision complexity in the BSEL paradigm will cause lower outcomes.

Simulation outcomes are generally a result of the complexity associated with the simulation chosen (Smith and Golden, 1990). The BSEL paradigm provides a means of determining that complexity. A few studies have indicated that complexity produced the highest learning levels in simulation exercises (Schellenberger, 1965; Wolfe, 1978). Butler, Pray, and Strang (1979) found that a simulation with intermediate complexity produced high levels of perceived learning. The literature notes that complexity impacts learning. It follows that more complexity in the BSEL paradigm will lead to higher outcomes generally.

P4: The individual's experience and intelligence will affect simulation outcomes.

P4A: The greater an individual's experience and intelligence, the higher will be the outcomes.

P4B: The lower an individual's experience and intelligence, the lower will be the outcomes.

The results of a few studies have been contradictory in establishing a relationship between an individual's experience and intelligence and outcomes. Some have found little correlations between aptitude and rate of return on investment (Potter, 1965) and grade point averages and economic performance (Vance and Gray, 1967). The results of other studies found more positive correlations between grade point averages and an economic performance index (Estes and Smith, 1979; Gray, 1972). Single member teams may need to be established to further examine the relationship between an individual's experience and intelligence that affect outcomes.

P5: The complexity of computer resources will influence the individual's required computer skills in the CSE.

P5A: The sore user friendly the computer resources, the lower are ***individual computer skills that will be required in the CSE to achieve outcomes.***

P5B: The less user friendly the computer resources, the higher are individual computer skills that will be required in the CSE to achieve outcomes.

Computer resources can influence an individual's computer skills required to be effective in the simulation exercise. Keys (1987) suggests that a new generation of PC-based general management simulations require little computer aptitude on the part of simulation participants. Similarly, Smith and Golden (1990) concur that computer aptitude regarding computer resources can influence simulation outcomes.

P6: The complexity of computer resources will Influence an individual 's performance.

P6A: The more user friendly the computer resources, the higher is an individual's performance.

P6B: The less user friendly the computer sources, the lower is an individual's performance.

The use of computer resources over hand-scored work sheets have led to only a marginal profit improvement, but significant attitudinal differences were noted (Keys, Burns, Case, and Wells, 1988). One other study fund significant behavioral results for the use of a Decision Science System (DSS) after controlling for a grand strategy (Wolfe and Gregg, 1989). The efficacy of computer resources in achieving outcomes may well be determined by an individual's behavior working with them. User friendliness of computer resources may be a key determinant for individual performance.

CONCLUSIONS

Pursuant to Keys and Wolfe's (1990) recognition for research continuity and design to fill gaps in the management simulation area, a model has been developed. In the model on business simulation and experiential learning, four key determinants interact to influence the ABSEL paradigm and outcomes. The four key determinants of individual, group, resources, and simulation administrator evolve to develop the computer simulation environment (CSE). Ideally, the model will provide a useful framework for researching and understanding business simulations.

By developing our understanding of business simulations and the variables that influence performance, better teaching and training strategies can be developed. Similarly, building confidence in simulation techniques can create safe environments for individuals to improve management skills and greater effectiveness in a business organization.

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