

THE EFFECT OF LEADERSHIP STYLE
ON THE PERCEIVED ENVIRONMENTAL UNCERTAINTY
AND ON LEARNING

by

ALİ BATU KARAALİ

B.S. in I.E., Boğaziçi University, 1984

Submitted to the Institute for Graduate Studies
in Science and Engineering in partial fulfillment of the
requirements for the degree of
Master of Science
in
Industrial Engineering

Bogazici University Library



39001100314122

14

Boğaziçi University

1986

ACKNOWLEDGEMENTS

This study was conducted under the supervision of Prof.Dr.Ibrahim Kavrakoglu to whom I wish to express my deep gratitude for his invaluable guidance and support.

I want also to express my deep gratitude Yrd.Doç.Dr.Hayat Enbiyaoğlu Kabasakal for her invaluable guidance. I would like to express my sincere thanks to Doç.Dr.Akif Eyler for serving on my thesis committee, and also I wish to thank to Turgay Aytaç and Dr.Gülây Doğu for their invaluable support, to the third and fourth year industrial engineering students and Şişe Cam Managers for their participations in the experiments.

In particular, I want to thank to Ümran Bıyık and Bülent Kutgün for their help in the evaluation and documentation phases.

A B S T R A C T

In the research reported here, the perceived environmental uncertainty and the effectiveness of the games as training devices are studied in a simulated environment.

To date, the perceived environmental uncertainty construct is believed to be related to the information load and specificity, to the organizational structure, to the individual characteristics and finally to the environment it self. Apart from these variables leadership style—autocracy and democracy— and life cycle stages of the organizations are identified to affect the dynamism and complexity components of the uncertainty construct.

Moreover, leadership style has found to have influences on the educational effectiveness of the games. In other words its effects on the democratic group members is observed to be more significant than that on the autocratically ruled ones.

Ö Z E T

Bu tez çerçevesinde, çevresel belirsizliğin algılanmasında etkili olabilecek yeni iki değişken; yönetim şekli ve örgütlerin hayatlarındaki aşamalar ile yönetim oyunlarının etkinliği eğitim açısından incelenmiştir.

Bugüne kadar; bilgi akışının yoğunluğu ve açıklığı, örgütün yapısı, bireylerin kişilik yapıları ve çevrenin kendisinin, belirsizliğin algılanmasında etkin olacakları düşünülmüştür. Bu araştırmada yukarıda sözü geçen iki değişkeninde çevresel belirsizliğin iki ögesi olan dinamizmin ve karmaşanın algılanmalarında etkili olabilecekleri sonucuna varılmıştır.

Ayrıca yönetim oyununa katılan grupların yönetim biçimlerinin oyunun eğiticiliği üzerinde etkilerinin olduğu saptanmıştır. Demokratik yönetimin eğitim açısından en fazla faydayı sağladıkları izlenimi elde edilmiştir.

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
ÖZET	iv
LIST OF TABLES	vii
I. INTRODUCTION	1
II. LITERATURE SURVEY	3
2.1. Management Games	3
2.1.1. Management Games as Training Devices	4
2.1.2. Management Games as Experimental Devices	4
2.2. Life Cycle Stages of Organizations	5
2.3. Environments of Organizations	6
2.4. Environmental Uncertainty	7
2.5. Leadership	9
III. METHOD	11
3.1. Research Setting	11
3.2. Experimental Design	11
IV. PILOT STUDY	15
V. VALIDATION	17
5.1. Role Assignment	17
5.2. Life Cycle Stages	19
VI. RESULTS	21
6.1. Results Related to The Perceptions of The Environ- mental Complexity of The Leaders and The Individuals	21
6.2. Results Related to The Perceptions of The Environmental Complexity of The Other Members and Individuals	23
6.3. Results Related to The Perceptions of The Environmental Dynamism of The Leaders and The Individuals	25
6.4. Results Related to The Perceptions of The Environmental Dynamism of The Group Members and The Individuals	27
6.5. Comparison of The Perceived Environmental Uncertainty Scores of The Group Members and The Leaders	30

	<u>Page</u>
6.5.1. In Autocracy	30
6.5.2. In Democracy	30
6.6. Results Related to The Testing of The Organizational Simulations as Training Devices With The Students	31
6.7. Summary for The Results of The Experiments With Students	34
6.8. Results Related to The Perception of The Environmental Complexity of The Managers	36
6.9. Results Related to The Perception of The Environmental Dynamism of The Managers	38
6.10. Results Related to The Testing of The Organizational Simulations as Training Devices With Şişe Cam Managers	39
6.11. Results Related to The Ranking of The Four Financial Statements	41
6.12. Summary for The Results of The Experiments With Managers	42
6.13. Comparison of The Results of The Experiments With The Industrial Engineering Students and The Şişe Cam Managers	44
6.13.1. Perceived Environmental Complexity	44
6.13.2. Perceived Environmental Dynamism	45
6.13.3. Game as a Training Device	46
6.13.3.1. The Comparisons Regarding The Opinions of The Managers and The Students	46
6.13.3.2. The Comparisons Regarding The Differences in the Rankings of The Students and That The Managers	47
VII. CONCLUSION	48
APPENDIX A. Game Descriptions	51
APPENDIX B. Questionnaire to Measure The Environmental Uncertainty	
APPENDIX C. Questionnaire to Measure The Leader Behavior	56
REFERENCES	57

LIST OF TABLES

		<u>Page</u>
TABLE 5.1.1.	Leader Behavior Scores of The Autocratic and the Democratic Leaders	18
TABLE 5.2.1.	Percentages Showing Life Cycle Stage Characteristics of the Simulated Organizations	19
TABLE 6.1.1.	Mean Scores for The Perception of the Environmental Complexity	22
TABLE 6.1.2.	The ANOVA Table for The Perception of The Environmental Complexity in The First Period for The Autocratic, Democratic Leaders and The Individuals	22
TABLE 6.1.3.	The ANOVA Table for The Perception of The Environmental Complexity in The Second Period for The Autocratic, Democratic Leaders and The Individuals	23
TABLE 6.2.1.	Mean Scores for the Perception of The Environmental Complexity	24
TABLE 6.2.2.	The ANOVA Table for The Perception of The Environmental Complexity of The Autocratic, Democratic Group Members and Individuals in the First Period	24
TABLE 6.2.3.	The ANOVA Table for The Perception of The Environmental Complexity of Autocratic and Democratic Group Members in The Second Period	24
TABLE 6.3.1.	Mean Scores for The Perception of The Environmental Dynamism	26
TABLE 6.3.2.	The ANOVA Table for The Perception of The Environmental Dynamism of the Autocratic Leaders and The Individuals during the first period	27
TABLE 6.3.3.	The ANOVA Table for The Perception of The Environmental Dynamism of The Autocratic, Democratic Leaders and The Individuals in The Second Period	27
TABLE 6.4.1.	Mean Scores for The Perception of The Environmental Dynamism	28

	<u>Page</u>	
TABLE 6.4.2.	The ANOVA Table for The Perception of The Environmental Dynamism in the First Period of The Autocratic, Democratic Group Members and The Individuals	28
TABLE 6.4.3.	The ANOVA Table for The Perception of The Environmental Dynamism in The Second Period of The Autocratic Group Members and The Individuals	29
TABLE 6.5.1.	Comparison Regarding The Perceived Complexity and Dynamism of The Group Leaders and The Members	30
TABLE 6.6.1.	Mean Scores of The Group Members Opinions	31
TABLE 6.6.2.	Mean Scores of The Leaders' Opinion	32
TABLE 6.6.3.	The Means Regarding The Change in The Rankings of The Four Financial Statements for The Group Members and Individuals	33
TABLE 6.6.4.	The Means Regarding The Change in The Rankings of The Four Financial Statements for The Group Leaders and Individuals	33
TABLE 6.7.1.	The Differences in The Perception of The Complexity and Dynamism, and on The Opinions on The Effectiveness of Gaming as Training Tools for Leaders and Individuals	34
TABLE 6.7.2.	The Differences in The Perceptions of The Complexity and Dynamism, and on The Opinions on The Effectiveness of Gaming as Training Tools for Group Members and Individuals	35
TABLE 6.7.3.	The Change in The Perceptions of The Complexity and The Dynamism, and in The Opinions on The Effectiveness of Gaming for The Leaders and Individuals	35
TABLE 6.7.4.	The Change in The Perceptions of The Complexity and The Dynamism, and in The Opinions on The Effectiveness of Gaming for The Group Members and Individuals	36
TABLE 6.8.1.	Mean Scores of The Managers for The Perception of The Environmental Complexity	36

	<u>Page</u>	
TABLE 6.8.2.	The ANOVA Table for The Environmental Complexity Perception of The Şişe Cam Managers in The First Period	37
TABLE 6.8.3.	The ANOVA Table for The Environmental Complexity Perception of The Şişe Cam Managers in The Second Period	37
TABLE 6.9.1.	Mean Scores for The Environmental Dynamism Perception of The Şişe Cam Managers	38
TABLE 6.9.2.	The ANOVA Table for The Environmental Dynamism Perceptions of The Şişe Cam Managers in The First Period	39
TABLE 6.9.3.	The ANOVA Table for The Environmental Dynamism Perceptions of The Şişe Cam Managers in The Second Period	39
TABLE 6.10.1.	Mean Scores Regarding The Opinions of Şişe Cam Managers on The Validity of The Game as a Training Device	40
TABLE 6.10.2.	The ANOVA Table for The Opinions of The Şişe Cam Managers on The Validity of The Game as a Training Device in The First Period	41
TABLE 6.10.3.	The ANOVA Table for The Opinions of The Şişe Cam Managers on The Validity of The Game as a Training Device in The Second Period	41
TABLE 6.11.1.	The Mean Changes in The Rankings of The Four Financial Statements for The Şişe Cam Managers in Between The Two Periods	42
TABLE 6.12.1.	The Difference in The Perception of The Complexity and Dynamism and on The Opinions on The Effectiveness of Gaming as Training Tools of Group Members	43
TABLE 6.12.2.	The Change in The Perception of The Complexity and The Dynamism and in The Opinions on The Effectiveness of Gaming of Group Members	43
TABLE 6.13.1.1.	The Differences Between The Mean Scores for The Environmental Complexity Perceptions of The Students and That of The Managers	44

	<u>Page</u>
TABLE 6.13.2.1. The Mean Scores Obtained From The Answers of The Students to The Question on The Perception of The Environmental Dynamism	45
TABLE 6.13.2.2. The Difference Between The Mean Scores for The Environmental Dynamism Perceptions of The Students and That of The Managers	46
TABLE 6.13.3.1.1. The Differences Between The Mean Opinion Scores for The Effectiveness of The Game as a Training Tool of The Students and That of The Managers	47

I. INTRODUCTION

The widening use of organizational simulations after their first implementation in 1957 seems to be an evidence for their valuable contribution to both the training programmes and to organizational theory. As experimental devices, not only they have facilitated longitudinal research in controlled environments but also they made clear definition of the direction of causality possible. Cameron and Whetten (1981) state the existence of some evidence to suggest that the simulated organizations progress through the similar stages as their real life counterparts. In contrast, the validity of the games as training devices are supported only by the subjective opinions of the participants.

The primary objective of the thesis is to investigate how perceived environmental uncertainty, an attribute of organizational climate, is related to managerial style, an element of psychosocial subsystem.

The contingency view, treats organizations as systems composed of subsystems and delineated by identifiable boundaries from its environmental suprasystem. It tries to understand not only the interrelationships within and among subsystems, between the organization and its environment but also the way they operate under varying conditions.

In the context of the system approach, the above mentioned subsystems are tried to be classified by Kast and Rosenzweig (1979) as technical, structural, psychosocial and managerial systems. In turn

psychosocial system consists of individual behavior and motivation, status and role relationships, group dynamics and influence systems. Being a part of influence system leadership might be seen as an element of psychosocial subsystem.

In general it is believed that psychosocial subsystem is affected by external forces as well as by the task, technology and structure of the internal organization. In summary, the influence of the organizational climate on psychosocial subsystem is commonly accepted.

However, some recent studies have showed that in contrary to the above statement, organizational structure and individual characteristics might affect perceived environmental uncertainty. Could the managerial style be another administratively controlabel variable affecting the perception of the environmental uncertainty? The answer will be studied at different points of time so as to be able to identify, also the effect of the life cycle stages.

The secondary aim of the thesis is the testing of the management games as training tools. Apart from the subjective opinions of the participants, an objective criterion will tried to be developed and used to check their educational validity. Moreover the influence of the leadership style of the participating teams will also be investigated.

II. LITERATURE SURVEY

2.1. Management Games

War games, modeling real wars, have been extensively used in military for training purposes. Being free from any kind of losses (monetary or other); they have been used for centuries. Their history and a detailed story of business games are summarized by Kibbee, Craft and Nanus (1961). In contrast to the long history of war games, the management game concept is quite recent. Two games, the computerized one used in American Management Association's Top Management Decision Simulation Seminar in 1957 and the other manual one described in the Harvard Business Review for March-April, 1958; might be considered as the first two full scale business simulation models.

Stanley C.Vance (1970) identifies three uses of models; analysis, experimentation and comprehension (or training). Cameron and Whetten (1981), in their article on organizational effectiveness over organizational life cycles, define the organizational simulations as the models of the behaviors, processes and outcomes occurring in real organizations, or in other words as the models of reality. Thus one can suggest that games may also be used for the same objectives.

However, Stanley C.Vance (1970) points out that the use of business games (or organizational simulations) as analytical devices is not meaningful, because of the multiplicity of variables in the business sphere and in contrast he adds that they have great potential when used

as training and research devices.

2.1.1. Management Games as Training Devices

Increasing number and variety of games and their widening use as training tools soon after their first implementation in the A.M.A.'s Top Management Decision Simulation Seminar may be considered as evidences for the acceptance of their educational effectiveness.

University of California at Los Angeles, University of Washington, Camegie Institute of Technology, Pillsbury Company, Westinghouse, General Electric, Remington Rand Univac and International Business Machines Corporation are named by Kibbee, Craft and Nanus (1961) as the first game building institutions. Stanley C.Vance (1970) states the fact that practically every major university and every dynamic corporation is involved to some extent in business simulation as an evidence to support their worthwhileness as training tools.

However, it has been agreed that very little scientific research has thus far been done on the validity of their usage in this perspective. Moreover, the claim that the use of simulation models broadens participants' business view is supported subjectively. There is certainly a need for objectivity.

2.1.2. Management Games as Experimental Devices

Management games (or organizational simulations) as experimental devices might be claimed to have two major advantages over descriptive studies of real organizations.

First, the study of organizational issues over organizational life cycle stages might require tracking of organizations over long periods of time. Thus, as pointed out by Cameron and Whetten (1981), longitudinal researches are rare, primarily because researchers have difficulty in gathering the necessary resources. Since organizational simulations give

the opportunity to do experiments in compressed time frames, longitudinal researchers no longer face the above mentioned difficulties. Cameron and Whetten (1981) state the existence of some evidence to suggest that although simulated groups and organizations have a definite termination point, and although developmental stages are speeded up, these organizations may still progress through the similar stages as their real life counterparts.

Second, the possibility to do controlled laboratory experiments with simulated models give the opportunity to isolate the organizational variable in question and then to study it directly. For example, the identification of all strategic constituencies for an organization and the determination of their relative power is a very difficult task. However, this becomes unnecessary with a simulation allowing the identification and investigation of a limited set of constituencies that are by design the most important and relevant to the organization in question.

Besides, the mentioned advantages, the direction of causality might be defined better in an experimental research than in a cross-sectional field research. The contradictory findings of the experimental research of Huber, O'Connell and Cummings (1975) and Duncan's (1973) cross-sectional research on perceived uncertainty and organizational structure is a good example for the need to define clearly the direction of causality.

2.2. Life Cycle Stages of Organizations

Cameron and Whetten (1981) based on a review of nine models of organizational life cycles have identified four common stages of development. A particular combination of major characteristics typified those four life cycle stages. The first stage is labelled as "creativity and entrepreneurship". During this period allocation of resources, creation of an ideology and formation of an ecological niche are the major

characteristics. In the second stage, known as "collectivity stage", high commitment and cohesion among members, long hours of dedicated service, and emerging sense of collectivity and mission are emphasized. The attention is devoted more to the internal processes of the organization rather than to the external contingencies. The third stage, "formalization and control" stage, includes institutionalization of the procedures and policies; formalization of the goals. Thus conservatism predominates and flexibility is reduced. The efficiency in production is emphasized. During the last stage, known as "elaboration of structure", decentralization, domain expansion, renewed adaptability and the establishment of the new multipurpose subsystems are the major characteristics to be emphasized. However, it has been stated that these four stages belonged to the early stages of development of organizations.

2.3. Environments of Organizations

The system approach in organizational theory marked the end of the panacea of the one best way to organize under all conditions. Organizations have come to be viewed as open systems that must be designed with respect to the circumstances upon which they are contingent. Consequently, considerable research has been directed toward isolating those factors in order to design an organization's structure so as to handle its respective contingencies. Ford and Slocum (1977) have pointed out that although a number of such variables have been identified, the vast majority of research has focused on the respective roles of size, technology and environment. Later, in the same article, they have stated that the relationship between an organization and its environment was one of the most widely discussed and least understood concept in the organizational theory.

Aldrich and Pfeffer (1976), have identified two basic approaches to the environments of the organizations with their respective conceptualization. The approach treating the organizational environment as the resource available used primarily the concept of dependence.

The other approach treated the environments of organizations as the flow of information perceived by members at the organization's boundaries and focused especially on the concept of environmental uncertainty.

To date, much of the research on the environment has investigated the uncertainty element.

2.4. Environmental Uncertainty

According to Downey, Hellriegel and Slocum (1975); two uncertainty instruments and conceptualizations have received widespread attention. They are those of Lawrence and Lorsch and Duncan. As Üsdiken (1980) states Lawrence and Lorsch's instrument intends to measure environmental uncertainty directly; whilst, with the Duncan's instrument, uncertainty have been tried to be measured in terms of its two dimension; complexity and dynamism. The first one comprise the number of factors considered in decision making and their degree of similarity while the second one concerns the degree to which those factors change.

It has been suggested that the use of uncertainty to specify the environment's effects on organizations, is not the same as using uncertainty to describe the environment itself. As noted more fully by Downey, Hellriegel and Slocum (1975) perception of uncertainty can be considered as an individual psychological trait rather than simply as an environmental attribute. As a result the objective physical environment should be differentiated from the environment which is perceived and reacted to by an individual. In this regard, the uncertainty is more likely to be an attribute of the individual behavioral environment rather than that of the objective one.

As a result, many researches have been directed to identify variables, especially administratively controlable ones, affecting perceived environmental uncertainty. Those variables might be classified as follows;

- i- Individual characteristics
- ii- Organizational structure
- iii- Information Road and specificity
- iv- Environment itself

Downey, Hellriegel and Slocum (1977) in studying how individual characteristics affect the perceived environmental uncertainty, propose that organization founders tend to define their organization domains based on their perceptions of environmental attributes; after these domain decisions are made, the organization tasks required by them define a set of relevant environmental attributes and in return they create an uncertainty set for the organization as a whole. Thus member uncertainty perception is drawn out by (a) attributes of environments that are created and defined for organizational members and (b) characteristics of the member's perceptual processes.

In another research Huber, O'Connell and Cumming (1975) found that information specificity and organizational structure has important impact on perceived environmental uncertainty. They stated that information specificity will be positively associated with perceived uncertainty in loosely structured groups and negatively associated with perceived uncertainty in tightly structured groups. They also found that the background of experimental subjects, duration of participation in experimental task and perhaps physical environment as other variables affecting the perceived uncertainty.

As it has been noted, most of the constructs (environment, technology, even goals) used as independent variables in organizational theory are not easily shaped by administrative action. Since it appears that it is partially through member perceptions that these constructs act upon organizational structure, behavioral scientists interested in changing organizational structure should not only increase their use of phenomenological constructs to understand and predict the impact of structural and environmental variables upon administrative processes but also take into consideration that the managerial processes might

affect the perception of the structural and environmental variables.

2.5. Leadership

Stoner (1978), points out that there are almost as many different definitions of leadership as there are persons who have attempted to define the concept.

However, it is generally agreed that leadership concept has three implications. First there should be others (followers or subordinates), second an influence system is needed and finally an unequal distribution of power is required. Stoner's (1978) definition of leadership as the process of directing and influencing task related activities of group members takes the above three implications into consideration.

In general, leadership styles are classified as autocratic, democratic and laissez-faire. However; as Maier and Verser (1982) have stated, the specific definition of these terms, is a complex matter involving many differences of opinion over the meanings inherent in them.

Since definitions involving complex concepts are not suitable for simple experimental designs, the location of the authority is advised as a critical experimental variable by Maier and Verser(1982). Theoretically they claim, the authority could be located in (a) the leader (autocracy), (b) the group (democracy), (c) the individuals (laissez-faire).

To date, many research on the forms of leadership have been concentrated on how it affects the satisfaction of the subordinates and their performances. Even though it has been agreed that the satisfaction of the subordinates seems to be higher in democratically managed groups than in the autocracies; as Dilber (1976) states there is no unanimity, between researches, for a significant difference in the productivities of the members of both kinds of groups.

In contrary to the bulkiness of the comparative researches on leadership styles in terms of satisfaction and productivity, almost no research has been carried to investigated how forms of leadership might affect contextual variables - i.e. environmental uncertainty.

III. METHOD

3.1. Research Setting

In order to rigorously control the objective environment, and to study the effects of the organizational life cycle stages on the perceived environmental uncertainty a computerized simulation is chosen. During five hours simulating five months in game time, two teams of usually four players or a team against an individual representing two firms in an oligopolistic market played under closely controlled conditions. (For details of the game refer to appendix A).

To identify the various life cycle stages of the two simulated organizations and to do the final calibrations on the initial parameters of the simulation a pilot study with the participation of 12 industrial engineering master students is suggested. Two sets of final experiments are designed, one with the participation of 69 third year industrial engineering students and the other with the participation of 16 managers from Şişe Cam A.Ş. The second set of experiments is proposed especially to check the validity of business games as training devices.

3.2. Experimental Design

The location of decision making (or authority) is used as the critical experimental variable. In this way, autocratic and democratic leadership styles are defined. However, laissez faire is not taken into

consideration during the study.

A role (either democratic or autocratic) is assigned to the randomly selected leaders of the randomly formed groups. The autocratic leaders are informed that they may consult, assign tasks to other group members but only they are to decide. In contrast, the democratic leaders are reminded that the group is to decide and they are only to coordinate the decision process and activities of group members.

In order not to complicate the experimental design, Maier and Verser (1982) suggested that the laboratory investigator of leadership styles must study the subject with only one hierarchical level present; that between the leader and group members. In conformity with it, no other hierarchical level is defined between the leader and the members.

The five variables stated in Huber, O'Connell and Cummings's (1975) article namely information load and especially specificity, organization structure, backgrounds of experimental subjects, duration of participation in experimental task, and the physical environment are tried to be kept constant. Since the same financial statements and performance indicators are presented to both kinds of groups at the same frequency, it would not be misleading to assume that the information load and specificity is kept constant throughout the experiments. Although their managerial styles have been different, both kinds of teams have been loosely structured. The participation of only third year industrial engineering students has given the opportunity to control the background of the experimental subjects. The duration of the experiment and the physical environment have been the same for both kinds of groups.

During the experiments perceived environmental uncertainty of differently managed groups is tried to be measured at two different points of time representing two different life cycle stages. Although life cycle stages of the two simulated organizations have been tentatively identified during the pilot study, their conformity with those of their real counterparts will again be checked during the final sets of

experiments. A check for the performances of the leaders in role playing is also needed.

The questionnaire used by Üsdiken (1980) in a research, on the measurement of the attributes of organizational environment will be presented to the participants to measure their perception of the environmental uncertainty in terms of both the complexity and the dynamism (the questionnaire is presented in Appendix B).

In order to check the validity of the game as an organizational simulation, the subjects have been requested to point out the simulated months in which they have extensively dealt with internal processes, external environment, establishment of uniform procedures, efficiency of production and finally with diverse ideas. Those items are thought to be the characteristics of different life cycle stages.

Another crucial issue has been the check for the performances of the leaders in role playing. In this respect, the other group members are requested to evaluate their leader with an integer number from "one" denoting autocratic to "four" denoting democratic. Moreover, a questionnaire to evaluate the leader behavior in terms of initiating structure (whether he (or she) clearly defines his or her own role, and lets the followers know what is expected of them); tolerance of freedom (whether he (or she) allows followers scope for initiative, decision and action); role assumption (whether he (or she) actively exercises the leadership role rather than surrendering leadership to others); consideration (whether he (or she) has regard for the comfort, well-being and contribution of his or her followers); integration (whether he (or she) maintains a close knit group and resolves intermember conflicts) is given to the other group members at the end of the simulation (The questionnaire is presented in appendix C). The questionnaire is advised by Cook, Hepworth, Wall and Warr (1981).

In order to investigate the effects of organizational simulations as training devices, not only the participants opinions are asked but also they are requested to rank the four financial statements presented

in the game in accordance with the importance of their impacts on decision - making processes. Those questions are presented to the participants both at the beginning and at the end of the simulation.

Although the first question asks the participants subjective opinion, the differences between the first and second rankings of the financial statements is believed to be an objective measure.

IV. PILOT STUDY

In order to have an idea about the duration of the simulation, to observe when the simulation reaches the steady state, to identify life cycle stages of the two simulated organizations, to check how well leaders perform their role assignment especially the autocratic one, and to do final calibrations on the game scenario; a pilot study is seen indispensable.

As mentioned earlier the subjects for the pilot study have been chosen from the students of a master course in Industrial Engineering Departement. Four teams of three players have been formed from a total of twelve students.

Each experiment of the pilot study has taken approximately five hours and only five simulated months have been covered. The major part of the total simulation time has been spent during the first two months (approximately one hour for the first month and forty five minutes for the second month). Whereas the third month has lasted about half an hour. The decision in the remaining months have been taken in about fifteen minutes. It seems that the simulation reaches its steady state after the third month.

The interviews to identify life cycle stages have showed that although the third stage, "formalization and control" could be distinguished from the first and second stages, "creativity and entrepreneurship" and "collectivity" stages; the identification of the

boundaries between the first and second stages has not been possible. Indeed the "collectivity" stage characterized by the high commitment and cohesion among the members has not appeared during the experiments because of the already existing close friendship between the group members (the four teams had been formed long before the pilot study for the accomplishment of other course projects). However, the prolonged discussions between the months when the players have been waiting for the outputs, especially during the first two months, might be considered as an evidence for the high commitment to the organization. It has been stated that during those early two months the emphasis had been on the internal processes of the firm; and after the third month it had been shifted to the use of uniform procedures in decision making, which is the characteristic of the third stage, "formalization and control" stage. Taking into consideration that the game could not simulate the fourth stage, "elaboration" stage; it has been concluded that the questionnaires should be presented to the participants after the second and fourth months representing the first two stages and the third stage respectively.

Another equally important issue had been the check for the performances of the roles assigned to the leaders. The results of the check have been catastrophic. The existing close friendship between the group members, and probably the loose structure of the groups have been considered as two major factors that have impeded the actualization of the autocratic role assignments.

In order to assure the leader's position in the group and to facilitate the actualization of the autocratic leader role, it is decided that the groups should be formed randomly, the rules of the game and the scenario should be presented only to the leaders and finally any contact between the coordinator and the players should take place only through the leader.

V. VALIDATION

5.1. Role Assignment

The check for the performances of the leaders in role playing during final experiments have been crucial for the validation of the research.

Five scores designed to measure leader behavior in terms of the five attributes (initiating structure, tolerance of freedom, role assumption, consideration and integration) and their score from the question asking the evaluation of their leadership style as autocratic and democratic in terms of the location of decision making or authority have been compared.

In accordance with the location of authority, six autocratic and nine democratic leaders have been identified. In turn, those two groups of leaders are compared on the basis of the above mentioned five attributes denoting their leader behavior. The comparisons have shown that the autocratic leaders have defined their roles more clearly, have let the others know what have been expected of them (initiating structure); have allowed less initiative for the followers (tolerance of freedom); have more actively exercised the leadership role (role assumption); have less regard for the comfort and well-being of the others. The differences in these four attributes are statistically significant. The only attribute that both groups of leaders behavior showed no statistical difference has been the integrative activity. In Table 5.1.1. mean scores and the variances of the autocratic and democratic leaders for the above mentioned five attributes are given (one has to remember that the less the score, the more actively the attribute is exercised).

TABLE 5.1.1. Leader Behavior Scores of the Autocratic and The Democratic Leaders

		INITIATING STRUCTURE	TOLERANCE OF FREEDOM	ROLE ASSUMPTION	CONSIDERATION	INTEGRATION
Autocratic Leaders	mean	2.1863	2.3772	2.0303	2.0733	2.1198
	standard deviation	0.1713	0.1669	0.3136	0.1382	0.1211
Democratic Leaders	mean	2.4546	2.0902	2.2582	1.8241	2.1439
	standard deviation	0.1975	0.2306	0.2272	0.1730	0.2212
Differences of the mean scores		-0.2683	0.2870	-0.2279	0.2492	-0.0241
Statistical results		$t_{\text{calculated}}$ = 2.71 SIGNIFICANT for = 0.01	$t_{\text{calculated}}$ = 2.6128 SIGNIFICANT for = 0.05	$t_{\text{calculated}}$ = 1.6392 SIGNIFICANT for = 0.10	$t_{\text{calculated}}$ = 2.6940 SIGNIFICANT for = 0.01	$t_{\text{calculated}}$ = 0.2418 NOT SIGNIFICANT

5.2. Life Cycle Stages

In order to check the validity of the game as an organizational simulation, life cycle stages are tried to be identified not only during the pilot study (by means of observation and interviews) but also during the final experiments with the third year industrial engineering students. However, this time a questionnaire requesting the participants to indicate the simulated months during which the emphasis has been on the internal processes of the firm, on the external environment, on the efficiency of production, on the different ideas discussed and finally on the establishment of the uniform procedures in decision making.

The important features of each month is tried to be identified with respect to the percentages of the above mentioned five items obtained from the indications of the participants for the months during which they have been emphasized. The Table 5.2.1. summarizes those percentages.

TABLE 5.2.1. Percentages Showing Life Cycle Stage Characteristics of the Simulated Organizations

Months	ITEMS				
	Internal Processes of the Firm	External Environment	Diversity of the Ideas	Uniform Procedures	Efficiency Inproduction
1	34	19	23	18	6
2	22	27	16	18	17
3	11	23	24	20	22
4	8	12	26	28	26
5	9	9	26	30	26

In accordance with the table;

i- The Internal Processes of the Firms: In real organizations the interest on the internal processes might be considered as an attribute of the first two stages. It also holds true for the simulated organizations of the game.

ii- The External Environments of the Firms: In real organizations it is expected that the interest on external contingencies remains as of secondary importance during the first two stages when compared with the interest on the internal processes. However, in the game the above expectation holds true only for the first month.

iii- Diversity of the Ideas Discussed: Creativity is seen as an attribute of the first life cycle stage in real organizations. The intensity of the discussions on different ideas is assumed to be a measure for it. Thus, it is expected that the peak level of the discussions takes place during the first months. However; apart from the second month the discussions on the diverse ideas seem to be an outstanding feature for the remaining four months.

iv- The Establishment of the Uniform Procedures in Decision Making: In real organizations, "formalization and control" stage the third stage is characterized by the institutionalization of the procedures and policies. In their simulated counterparts, in the game, the formalization of the procedures in decision making is especially discussed during the fourth and fifth months.

v- Efficiency in Production: In real organizations, the emphasis is given to the efficiency of production after the procedures and policies are institutionalized, goals are formalized. In the simulated counterparts, the emphasis have been on the efficiency of production especially after the fourth month.

In summary, it has been concluded that the above evidences supported the findings of the pilot study, that is, the first two months have corresponded in the game to the first and second stages however, the months after the third one is suggested to be the third stage.

VI. RESULTS

Data related to the perception of the environmental uncertainty and the effectiveness of the game as a training tool are examined separately not only for the leaders and members of differently managed teams but also for the individuals.

6.1. Results Related to The Perceptions of the Environmental Complexity of The Leaders and The Individuals

The mean scores recorded from the answers to the question related to the perception of the environmental complexity of the autocratic, democratic leaders and the individuals are summarized in Table 6.1.1. It has to be known that "one" stands for the simple whilst "five" for the complex environments in the answers to the question.

It can be suggested from the table that the perceptions of the environmental complexity of the leaders and the individuals are close to each other both in the first and second periods. The suggestion is supported by the ANOVA results. It is hypothesized separately for both stages that the mean scores related to perceived complexity for the autocratic, democratic leaders and that for the individuals are equal to each other.

TABLE 6.1.1. Mean Scores for The Perception of The Environmental Complexity

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Leaders	Mean	2.000	2.500	-0.500
	Standard deviation	0.6325	0.5477	0.5477
	Sample size	6	6	6
Democratic Leaders	Mean	2.333	2.111	0.222
	Standard deviation	0.7071	0.601	0.9718
	Sample size	9	9	9
Individuals	Mean	2.444	2.375	0.000
	Standard deviation	0.527	0.518	0.756
	Sample size	9	8	8

The two ANOVA tables for the two stages are give below. Since the resulting F-ratios are not significantly greater than one the above hypotheses are accepted.

TABLE 6.1.2. The ANOVA Table for The Perception of The Environmental Complexity in The First Period for The Autocratic, Democratic Leaders and The Individuals

	SSq	df	MSSq	F-ratio
mean	137.1	1	137.1	1.2442
technic	0.9743	2	0.48715	
error	8.222	21	0.3915	
Total	146.3	24		

TABLE 6.1.3. The ANOVA Table for The Perception of The Environmental Complexity in The Second Period for The Autocratic, Democratic Leaders and The Individuals

	SSq	df	MSSq	F-ratio
mean	122.1	1	122.1	0.9677
technic	0.6061	2	0.3031	
error	6.2632	20	0.3132	
Total	128.97	23		

Moreover, when the changes in the complexity perceptions are compared separately for autocratic, democratic leaders and individuals, only the change in the perception of autocratic leaders from simple to complex is supported by the one tailed paired t-test for a significance level of $\alpha=0.10$.

6.2. Results Related to The Perceptions of The Environmental Complexity of The Other Group Members and Individuals

It has been stated in the previous topic that one and five have denoted the simple and complex environments in the answers for the question related to the perception of the environmental complexity. With this in mind, after the examination of the Table 6.2.1. where the mean scores for the perception of the environmental complexity of both group members and individuals are given, one can suggest that autocratic group members perceive environmental complexity less than the democratic ones at the end of the fourth month.

Even though, during the first period the perceived complexity of the both group members and the individuals have not been significantly different (it is supported by the ANOVA shown on Table 6.2.2 the above suggestion is supported by the ANOVA presented in Table 6.2.3).

TABLE 6.2.1. Mean Scores for The Perception of The Environmental Complexity

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	2.730	2.267	0.463
	Standard deviation	0.7073	0.4577	0.9155
	Sample size	15	15	15
Democratic Group Members	Mean	2.68	2.6	0.08
	Standard deviation	0.8021	0.500	0.7023
	Sample size	25	25	25
Individuals	Mean	2.444	2.375	0.000
	Standard deviation	0.527	0.5175	0.7560
	Sample size	9	8	8

In the Table 6.2.2. it is hypothesized that the mean scores for perceived complexity of both group members and that of the individuals are equal at the end of the second month. Since the resulting F-ratio is not significantly greater than one the above hypothesis is accepted.

TABLE 6.2.2. The ANOVA Table for The Perception of The Environmental Complexity of The Autocratic, Democratic Group Members and Individuals in The First Period

	SSq	df	MSSq	F-ratio
mean	344.9	1	344.9	0.4665
technic	0.500	2	0.250	
error	24.66	46	0.5362	
Total	370.1	49		

During the second period simulating the third life cycle stage the only significant difference for the perception of the environmental complexity has been the one between the democratic group members and the autocratic ones. It is hypothesized that the mean scores of both group members have been the same. However the hypothesis is rejected since the F-ratio calculated as a result of the ANOVA shown in Table 6.2.3. is significantly greater than one for $\alpha=0.05$.

TABLE 6.2.3. The ANOVA Table for The Perception of The Environmental Complexity of Autocratic and Democratic Group Members in The Second Period

	SSq	df	MSSq	F-ratio
mean	245	1	245	4.4254
technic	1.040	1	1.040	
error	8.933	38	0.2351	
Total	254.97	40		

Moreover, when the changes in the complexity perceptions are compared separately for autocratic, democratic group members and individuals only the change in the perception of the autocratic group members, from complex to simple (in contrast to their leaders) is supported by the two tailed paired t-test at a significance level of $\alpha=0.10$.

6.3. Results Related to The Perceptions of The Environmental Dynamism of The Leaders and The Individuals

The mean scores, recorded from the answers to the questionnaire measuring the perception of the environmental dynamism, of the autocratic, democratic leaders and the individuals are summarized in Table 6.3.1. It has to be known that "one" stands for the static whilst "five" for the dynamic environments in the answers.

TABLE 6.3.1. Mean Scores for The Perception of The Environmental Dynamism

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Leaders	Mean	2.852	2.9998	-0.1478
	Standard deviation	0.3766	0.4819	0.3418
	Sample size	6	6	6
Democratic Leaders	Mean	2.995	2.9505	0.0445
	Standard deviation	0.4079	0.3812	0.3204
	Sample size	9	9	9
Individuals	Mean	3.1256	3.1387	-0.1005
	Standard deviation	0.2784	0.4392	0.4286
	Sample size	9	8	8

After a detailed examination of the above table one can suggest that the perception of the environmental dynamism of the leaders and that of the individuals are close to each other in both during the first and second periods. The suggestion is statistically supported separately for both periods. It is hypothesized that the mean perceived environmental dynamism scores of the autocratic, democratic leaders and that of the individuals are equal to each other.

Since the resulting two F-ratios of the two ANOVA's are not significantly greater than one, the above hypothesis is accepted. The ANOVA results for the first and second periods are given in Tables 6.3.2. and 6.3.3. respectively.

TABLE 6.3.2. The ANOVA Table for The Perception of The Environmental Dynamism of The Autocratic Leaders and The Individuals During The First Period

	SSq	df	MSSq	F-ratio
mean	217.18	1	217.18	1.0736
technic	0.272	2	0.1360	
error	2.660	21	0.1267	
Total				

TABLE 6.3.3. The ANOVA Table for The Perception of The Environmental Dynamism of The Autocratic, Democratic Leaders and The Individuals in The Second Period

	SSq	df	MSSq	F-ratio
mean	211	1	211	0.4268
technic	0.1568	2	0.0784	
error	3.674	20	0.1837	
Total	214.83	23		

Moreover, the results of the paired t-tests have shown that there are no statistically significant changes in the perception of the environmental uncertainty of the autocratic, democratic leaders and the individuals in between the two periods.

6.4. Results Related to The Perceptions of The Environmental Dynamism of The Group Members and The Individuals

The mean scores, recorded from the answers to the questionnaire measuring the perception of the environmental dynamism, of the both group members and the individuals are summarized in Table 6.4.1. Again "one" stands for the static whilst "five" for the dynamic environments in the answers.

TABLE 6.4.1. Mean Scores for The Perception of The Environmental Dynamism

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	3.163	2.698	0.4602
	Standard deviation	0.3406	0.3068	0.5562
	Sample size	15	14	14
Democratic Group Members	Mean	3.1954	2.905	0.2904
	Standard deviation	0.4310	0.4376	0.3252
	Sample size	25	25	25
Individuals	Mean	3.1256	3.1387	-0.1005
	Standard deviation	0.2784	0.4392	0.4286
	Sample size	9	8	8

The examination of the mean scores belonging to the first period showed no statistically significant differences between the autocratic, democratic group members and the individuals. The null hypothesis of the ANOVA shown on Table 6.4.2. is that those three mean scores are equal; and since the calculated F statistics is not significantly greater than one, it is accepted as true.

TABLE 6.4.2. The ANOVA Table for The Perception of The Environmental Dynamism in The First Period of The Autocratic, Democratic Group Members and The Individuals

	SSq	df	MSSq	F-ratio
mean	493.21	1	493.21	0.1177
technic	0.0343	2	0.01715	
error	6.7024	46	0.1457	
Total	499.9	49		

It seems that during the second period the autocratic group members perceived their environment as more static than both the democratic group members and the individuals. The difference between the autocratic group members and the democratic ones is supported by one tailed independent t-test for a significance level of $\alpha=0.10$. Whereas the difference between them and the individuals is supported by the ANOVA. The null hypothesis stating that the mean scores of the autocratic group members and the individuals are equal, has been rejected by ANOVA shown in Table 6.4.3.

TABLE 6.4.3. The ANOVA Table for The Perception of The Environmental Dynamism in The Second Period of The Autocratic Group Members and The Individuals

	SSq	df	MSSq	F-ratio
mean	179.76	1	179.76	8.5947
technic	0.9870	1	0.9870	
error	2.2969	20	0.1148	
Total	183.04	22		

The comparisons regarding the mean scores of the both group members showed highly significant changes in between the two periods. Not only the autocratic group members but also the democratic ones perceived the environment as more static during the second period simulating the third stage. The results are supported by two tailed paired t-tests for the significance level of $\alpha=0.01$ for both cases. No statistically significant change has occurred in the dynamism perception of the individuals.

6.5. Comparison of The Perceived Environmental Uncertainty Scores of The Group Members and Their Leaders

6.5.1. In Autocracy

The changes in the perceptions of the environmental complexity and dynamism of the leaders and the group members have two contradictory orientations. Although the leaders perceived the environment more complex (statistically supported) and slightly more dynamic at the end of the second period, the group members perceived the same environment less complex and less dynamic both being statistically supported.

6.5.2. In Democracy

The changes in the perceptions of the environmental complexity and dynamism of the leaders and the group members have shown no significant differences except for the perception of complexity at the end of the second period in which the group members perceived the environment as more complex than the leaders.

Related results are summarized in Table 6.5.1.

TABLE 6.5.1. Comparison Regarding The Perceived Complexity and Dynamism of The Group Leaders and The Members

	Complexity		Dynamism	
Autocracy	Players perceives the environment as more complex than the leaders $\alpha=0.025$ $t_{cal}=2.1953$	No Significant Difference Between Players and Leaders	Players perceives the environment as more dynamic than the leaders $\alpha=0.05$ $t_{cal}=1.8372$	Players perceives the environment as less dynamic than the leaders $\alpha=0.10$ $t_{cal}=1.7001$
Democracy	No Significant Difference Between Players and Leaders	Players perceives the environment as more complex than the leaders $\alpha=0.05$ $t_{cal}=2.3868$	No Significant Difference Between Players and Leaders	No Significant Difference Between Players and Leaders

6.6. Results Related to The Testing of The Organizational Simulations as Training Devices With The Students

As mentioned earlier, the validity of the game as a training device has been tested both subjectively that is, by asking the opinion of the participants and objectively that is, by comparing the first and second rankings of the participants for the four financial statements presented in the game.

The opinion of the participants is measured by means of a likert scale question, in which one denotes that the educative effectiveness of the game is extremely low, in contrast, five denotes that it is extremely high. The results are shown on Table 6.6.1. and 6.6.2. The third column shows the change in the opinions of the participants and it represents the mean of those changes. (Not a mere subtraction of first and second columns).

TABLE 6.6.1. Mean Scores of The Group Members Opinions

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocracy	Mean	3.23	3.43	0.2105
	Standard deviation	0.9144	1.0164	0.855
	Sample size	13	14	13
Democracy	Mean	3.117	3.524	0.5
	Standard deviation	0.6002	0.686	0.7223
	Sample size	17	21	
Individuals	Mean	3.000	3.43	0.428
	Standard deviation	1.225	1.272	1.512
	Sample size	9	8	8

TABLE 6.6.2. Mean Scores of The Leaders' Opinions

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocracy	Mean	3.33	3.5	0.1667
	Standard deviation	1.033	1.512	0.7527
	Sample size	6	6	6
Democracy	Mean	2.777	3.25	0.5
	Standard deviation	0.6667	0.7066	0.7559
	Sample size	9	8	8
Individuals	Mean	3.000	3.43	0.428
	Standard deviation	1.225	1.272	1.512
	Sample size	9	8	8

In accordance with the above tables, it can be stated that the participants have found the game as a quite effective training device. Moreover, it seemed that their opinions have been positively changed during the game. However, only the changes in the democratic group members' opinion and those of their leaders are statistically supported by one tailed paired t-tests for significance levels of $\alpha=0.01$ and $\alpha=0.10$ respectively.

When the changes in the first and second rankings of the participants are considered, the changes related to the democratic group members and their leaders are statistically supported. The results given in Tables 6.6.3. and 6.6.4. The examination of these tables show that the significant changes have occurred only in the rankings of the democratic group members and their leaders (a part from the exception of the individuals ranking change for the Cost of Good Sold Statement). The changes in the rankings of the democratic group members are significantly different for all of the statements. However, their leaders' opinion have changed in the two (Balance Sheet and Profit/Loss Statement) of the four statements.

TABLE 6.6.3. The Means Regarding The Change in The Rankings of The Four Financial Statements for The Group Members and Individuals

		CGM	B/Sheet	P/Loss	Cash Flow
Autocratic	Mean	-0.1875	-0.0625	0.125	0.25
	Statistical results	Not Significant	Not Significant	Not Significant	Not Significant
Democratic	Mean	-0.3913	0.5455	0.4091	-0.4783
	Statistical results	$t_{cal}=1.6042$ SIGNIFICANT at $\alpha=0.10$	$t_{cal}=1.8667$ SIGNIFICANT at $\alpha=0.05$	$t_{cal}=2.4097$ SIGNIFICANT at $\alpha=0.05$	$t_{cal}=2.1208$ SIGNIFICANT at $\alpha=0.05$
Individuals	Mean	-0.375	-0.25	0.125	0.5
	Statistical results	$t_{cal}=1.4256$ SIGNIFICANT at $\alpha=0.10$	Not Significant	Not Significant	Not Significant

TABLE 6.6.4. The Means Regarding The Changes in The Rankings of The Four Financial Statements for The Group Leaders and Individuals

		CGM	B/Sheet	P/Loss	Cash Flow
Autocratic	Mean	-0.6667	0.5	-0.16667	0.3611
	Statistical results	Not Significant	Not Significant	Not Significant	Not Significant
Democratic	Mean	-0.2857	-0.2857	0.5714	-0.25
	Statistical results	Not Significant	$t_{cal}=1.5493$ SIGNIFICANT at $\alpha=0.10$	$t_{cal}=1.9215$ SIGNIFICANT at $\alpha=0.05$	Not Significant
Individuals	Mean	-0.375	-0.25	0.125	0.5
	Statistical Results	$t_{cal}=1.4256$ SIGNIFICANT at $\alpha=0.10$	Not Significant	Not Significant	Not Significant

6.7. Summary For The Results of The Experiments With Students

The results of the experiments with the students are summarized in the following four tables. Table 6.7.1 and Table 6.7.2 show the differences not only in the complexity and dynamism perceptions but also in the opinions on the effectiveness of the game in accordance with the leadership style for the leaders and group members respectively.

In tables 6.7.3. and 6.7.4., the differences in the perceptions and the opinions between the two stages of the simulated organizations are given for the leaders and the group members it should be noticed that empty entries of the tables mean no significant differences exist.

TABLE 6.7.1. The Differences in The Perceptions of The Complexity and Dynamism, and on The Opinions on The Effectiveness of Gaming as Training Tools for Leaders and Individuals

		COMPLEXITY		DYNAMISM		EDUCATIONAL EFFECTIVENESS	
		FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD
AUTOCRATIC LEADERS When compared with	Democratic Leaders						
	Individuals			MORE STATIC			
DEMOCRATIC LEADERS When compared with	Autocratic Leaders						
	Individuals						
INDIVIDUALS When compared with	Autocratic Leader			MORE DYNAMIC			
	Democratic Leader						

TABLE 6.7.2. The Differences in The Perceptions of The Complexity and Dynamism, and on The Opinions on The Effectiveness of Gaming as Training Tool for Group Members and Individuals

		COMPLEXITY		DYNAMISM		EDUCATIONAL EFFECTIVENESS	
		FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD
AUTOCRATIC GROUP MEMBERS When compared with	Democratic Group Members		SIMPLER		MORE STATIC		
	Individuals				MORE STATIC		
DEMOCRATIC GROUP MEMBERS When compared with	Autocratic Group Members		MORE COMPLEX		MORE DYNAMIC		
	Individuals						
INDIVIDUALS When compared with	Autocratic Group Members				MORE DYNAMIC		
	Democratic Group Members						

TABLE 6.7.3. The Change in The Perceptions of The Complexity and The Dynamism, and in The Opinions on The Effectiveness of Gaming for The Leaders and Individuals

	Change in the COMPLEXITY PERCEPTION	Change in the DYNAMISM PERCEPTION	Change in the OPINIONS ON THE EFFECTIVENESS
AUTOCRATIC LEADERS	SIMPLER		
DEMOCRATIC LEADERS			MORE EFFECTIVE
INDIVIDUALS			

TABLE 6.7.4. The Change in The Perceptions of the Complexity and The Dynamism, and in The Opinions on The Effectiveness of Gaming for The Group Members and Individuals

	Change in the COMPLEXITY PERCEPTION	Change in the DYNAMISM PERCEPTION	Change in the OPINIONS ON THE EFFECTIVENESS
AUTOCRATIC GROUP MEMBERS	SIMPLER	MORE STATIC	
DEMOCRATIC GROUP MEMBERS		MORE STATIC	MORE EFFECTIVE
INDIVIDUALS			

6.3. Results Related to The Perception of The Environmental Complexity of The Managers

The mean scores recorded from the answers to the question related to the perception of the environmental complexity of the managers are summarized in Table 6.8.1. The question was the same with the one which had been asked to the students. Thus the same likert scale is used for the answers. In other words "one" stands for the simple whilst "five" for the complex environments in the answers to the question.

TABLE 6.8.1. Mean Scores of The Managers for The Perception of The Environmental Complexity

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	2.000	1.833	0.167
	Standard deviation	0.6324	0.8428	0.4082
	Sample size	6	6	6
Democratic Group Members	Mean	1.833	1.667	0.167
	Standard deviation	0.4082	0.5477	0.4082
	Sample size	6	6	6

One can suggest from the above table that the perceptions of the environmental complexity of the two group members are not significantly different in both periods. In order to support statistically the above suggestion it is hypothesized separately for both stages that the mean scores for the perceived complexity of the autocratic and democratic group members are equal. The ANOVA tables (Table 6.8.2. and 6.8.3) for the two stages are given below. Since the resulting F-ratios are not significantly greater than one the above hypotheses are accepted.

TABLE 6.8.2. The ANOVA Table for The Environmental Complexity Perception of The Şişe Cam Managers in The First Period

	SSq	df	MSSq	F-ratio
mean	44.07	1	44.07	0.2954
technic	0.083	1	0.08367	
error	2.833	10	0.2833	
Total	46.99	12		

TABLE 6.8.3. The ANOVA Table for The Environmental Complexity Perception of The Şişe Cam Managers in The Second Period

	SSq	df	MSSq	F-ratio
mean	36.75	1	36.75	0.1643
technic	0.083	1	0.083	
error	5.0514	10	0.505	
Total	41.88	12		

In turn, when the changes in the complexity perceptions are compared separately for the autocratic and democratic group members, no statistically significant differences are found.

6.9. Results Related to The Perception of The Environmental Dynamism of The Managers

The mean scores recorded from the answers to the question related to the perception of the environmental dynamism for the Şişe Cam managers under the autocratic and democratic managerial styles are summarized in Table 6.9.1. It has to be taken into consideration that the closer the score to one means the more static the environment is.

TABLE 6.9.1. Mean Scores for The Environmental Dynamism Perception of The Şişe Cam Managers

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	3.2	2.6	0.6
	Standard deviation	0.4714	0.5477	0.5477
	Sample size	5	5	5
Democratic Group Members	Mean	2.333	2.167	0.167
	Standard deviation	0.5164	0.4082	0.4082
	Sample size	6	6	6

One can notice that although the difference between the dynamism perceptions of the autocratic and democratic group members is large at the end of the first period, it reduces during the second period. The above observation is statistically supported. In accordance with the results of the ANOVA shown in Tables 6.9.2. and 6.9.3. it can be stated that although the difference between the perceptions of the members for both groups is statistically significant in the first period, it is not for the second period. It seems that the change from dynamic to static in the perceptions of the environmental dynamism of the autocratic group members is statistically significant. The proposition is supported by the two tailed paired t-test for a significance level of $\alpha=0.10$.

TABLE 6.9.2. The ANOVA Table for The Environmental Dynamism Perceptions of The Şişe Cam Managers in The First Period

	SSq	df	MSSq	F-ratio
mean	81.8	1	81.8	8.6498
technic	2.05	1	2.05	
error	2.13	9	0.237	
Total	85.98	11		

TABLE 6.9.3. The ANOVA Table for The Environmental Dynamism Perceptions of The Şişe Cam Managers in The Second Period

	SSq	df	MSSq	F-ratio
mean	61.45	1	61.45	2.268
technic	0.5124	1	0.5124	
error	2.033	9	0.2259	
Total	63.99	11		

6.10. Results Related to The Testing of The Organizational Simulations as Training Devices With Şişe Cam Managers

To test the validity of the organizational simulations as training devices, not only the opinions of the participants are asked but also they are requested to rank the four financial statements presented in the game according to their importance in their decisions after the first and second periods. As it has been stated the opinions of the participants seem to be a subjective measure whereas the differences between the two rankings of the financial statements is believed to be an objective one.

The opinions of the participants are measured by a likert scale question, in which "one" denotes that the educative effectiveness of the game is extremely low, while "five" denotes that it is extremely high. The mean scores are shown on Table 6.10.1.

TABLE 6.10.1. Mean Scores Regarding The Opinions of The Şişe Cam Managers On The Validity of The Game As A Training Device

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	3.8	3.6	-0.2
	Standard deviation	1.0954	1.1402	1.0954
	Sample size	5	5	5
Democratic Group Members	Mean	4.167	4.167	0.0
	Standard deviation	0.4082	0.4082	0.0
	Sample size	6	6	6

One can suggest from the above table that the opinions of the autocratic and democratic group members are not significantly different in either period. In order to support statistically the above suggestion it is hypothesized separately for both stages that the mean scores for the opinion of the members in both groups are equal. The ANOVA tables (Table 6.10.2 and 6.10.3) for the two periods are given below. Since the resulting F-ratios are not significantly greater than one the above hypotheses are accepted.

TABLE 6.10.2. The ANOVA Table for The Opinions of The Şişe Cam Managers on The Validity of The Game as A Training Device in The First Period

	SSq	df	MSSq	F-ratio
mean	176	1	176	0.5699
technic	0.367	1	0.367	
error	5.799	9	0.644	
Total	182.17	11		

TABLE 6.10.3. The ANOVA Table for The Opinions of The Şişe Cam Managers on The Validity of The Game As A Training Device in The Second Period

	SSq	df	MSSq	F-ratio
mean	168.17	1	168.17	1.3079
technic	0.8768	1	0.8768	
error	6.0334	9	0.6704	
Total	175.08	11		

The changes in the opinions between two periods are not statistically significant.

6.11. Results Related to The Ranking of The Four Financial Statements

It has been stated that the differences between the ranking, after the first and third months, of the four financial statements presented in the game is believed to be an objective measure for the effectiveness of the game as a training tool.

When these differences are considered; only the changes in the rankings of the democratic group members are statistically supported. The mean changes in the rankings of the financial statements can be seen in Table 6.11.1.

TABLE 6.11.1. The Mean Changes in The Ranking of The Four Financial Statements for The Şişe Cam Managers in Between The Two Periods

		Cast of Good Manufactured	Balance Sheet	Income Statement	Cash Flow Statement
Autocratic Group Members	Mean	-0.1667	0.1667	0	0
	Standard deviation	0.4082	0.4082	0	0.6325
	Sample size	6	6	6	6
	Statist. result	Not Significant	Not Significant	Not Significant	Not Significant
Democratic Group Members	Mean	0.333	-0.333	0.1667	-0.1667
	Standard deviation	0.5164	0.5164	0.4082	0.4082
	Sample size	6	6	6	6
	Statist. result	$t_{cal}=1.5796$ Significant at $\alpha=0.10$	$t_{cal}=1.5796$ Significant at $\alpha=0.10$	Not Significant	Not Significant

The examination of the table indicates that significant changes have only occurred in the rankings of the democratic group members.

6.12. Summary for The Results of The Experiments With Managers

The results of the experiments with the managers are summarized in the following two tables. Table 6.12.1. show the differences not only in the complexity and dynamism perceptions but also in the opinions on the effectiveness of the game in accordance with the leadership style.

In Table 6.12.2. the difference in the perceptions and the opinions between the two stages of the simulated organizations are given. It should be noticed that empty entries of the tables mean no significant differences exist.

TABLE 6.12.1. The Difference in The Perception of The Complexity and Dynamism and on The Opinions on the Effectiveness of Gaming as Training Tools of Group Members

		COMPLEXITY		DYNAMISM		EDUCATIONAL EFFECTIVENESS	
		FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD	FIRST PERIOD	SECOND PERIOD
AUTOCRATIC GROUP MEMBERS When compared with	Democratic Group Members			MORE DYNAMIC			
	Individuals						
DEMOCRATIC GROUP MEMBERS When compared with	Autocratic Group Members			MORE STATIC			
	Individuals						
INDIVIDUALS When compared with	Autocratic Group Members						
	Democratic Group Members						

TABLE 6.12.2. The Change in The Perceptions of The Complexity and The Dynamism; and in The Opinions on The Effectiveness of The Gaming of Group Members

	Change in the COMPLEXITY PERCEPTION	Change in the DYNAMISM PERCEPTION	Change in the OPINIONS ON THE EFFECTIVENESS
AUTOCRATIC GROUP MEMBERS		MORE STATIC	
DEMOCRATIC GROUP MEMBERS			
INDIVIDUALS			

6.13. Comparison of The Results of The Experiments With The Industrial Engineering Students and The Şişe Cam Managers

6.13.1. Perceived Environmental Complexity

The differences between the mean scores for the perceived environmental complexity of the students and that of the managers are given in Table 6.13.1.1. Since the entries of the table is obtained by subtracting the managers' score from that of the students, a positive difference indicates that the managers have perceived the environment less complex and vice versa.

TABLE 6.13.1.1. The Differences Between The Mean Scores for The Environmental Complexity Perceptions of the Students and That of The Managers

		Period I	Period II
Autocracy	difference	0.730	0.434
	statistical result	$t_{cal}=2.1954$ Significant for $\alpha=0.05$ (two tailed)	$t_{cal}=1.5379$ Significant for $\alpha=0.10$ (one tailed)
Democracy	difference	0.847	0.933
	statistical result	$t_{cal}=2.4871$ Significant for $\alpha=0.02$ (two tailed)	$t_{cal}=4.0357$ Significant for $\alpha=0.01$ (two tailed)

The table shows that the managers qualified the same environment as much simpler than the students. This might explain why managers' complexity perception does not change between the two periods of the game in contrast to the change (from complex to simple) of the perception for the students in autocratic groups.

6.13.2. Perceived Environmental Dynamism

The previously given results for the perception of the environmental dynamism for the students have been obtained from a questionnaire. However, the dynamism perception of the managers are tried to be measured by only one question which has also existed in the questionnaire presented to the students. In order to compare the differences in the environmental dynamism perceptions of the subjects in both groups, the answers of the students to this question are reevaluated. The means for the answers of the students to the question are given in the Table 6.13.2.1. The below Table 6.13.2.2. shows the differences between the mean scores for the environmental dynamism perceptions of the students and that of the managers. The entries of the table are obtained in a similar manner described in the previous title.

TABLE 6.13.2.1. The Mean Scores Obtained from The Answers of The Students to The Question on The Perception of The Environmental Dynamism

		Period I After The Second Month	Period II After The Fourth Month	I-II Difference
Autocratic Group Members	Mean	3.267	2.571	0.714
	Standard deviation	0.5936	0.5136	0.6112
	Sample size	15	14	14
Democratic Group Members	Mean	3.12	2.75	0.375
	Standard deviation	0.781	0.6079	0.711
	Sample size	25	24	24
Individuals	Mean	2.556	2.625	-0.125
	Standard deviation	0.5270	0.7440	0.8345
	Sample size	9	8	8

TABLE 6.13.2.2. The Difference Between The Mean Scores for The Environmental Dynamism Perceptions of The Students and That of The Managers

		Period I	Period II
Autocracy	difference	0.067	-0.029
	statistical result	Not Significant	Not Significant
Democracy	difference	0.787	0.583
	statistical result	$t_{cal}=2.3327$ Significant for $\alpha=0.05$ (two tailed)	$t_{cal}=2.2124$ Significant for $\alpha=0.05$ (two tailed)

The above table shows that although the dynamism perceptions of the students and managers have not been different under autocracy, the managers under democracy perceived the environment much more static than the students in both periods.

6.13.3. Game as a Training Device

It has been stated that the effectiveness of the game as an educational device has been checked subjectively by asking the opinion of the participants and objectively by the differences in the rankings of the four financial statements during the two periods.

6.13.3.1. The Comparisons Regarding The Opinions of The Managers and The Students

The differences between the mean scores of the opinions on the educational effectiveness of the game for the students and that for the managers are given in Table 6.13.3.1.1. The entries of the table are obtained in a similar way described previously. A negative difference shows

that the managers have found the game more effective than the students.

TABLE 6.13.3.1.1. The Differences Between The Mean Opinion Scores for The Effectiveness of The Game As a Training Tool of The Students and That of The Managers

		Period I	Period II
Autocracy	difference	-0.57	-0.17
	statistical result	Not Significant	Not Significant
Democracy	difference	-1.05	-0.643
	statistical result	$t_{cal}=4.0380$ Significant For $\alpha=0.01$ (two tailed)	$t_{cal}=2.1698$ Significant For $\alpha=0.05$ (two tailed)

The table shows that the managers, especially the ones under democracy, have found the game educationally more effective than the students.

6.13.3.2. The Comparisons Regarding The Differences in The Rankings of The Students And That of The Managers

There are statistically significant differences in the rankings of the four financial statements in accordance with their importance on the decisions both during the first and second periods for the students and the managers under democracy.

VII. CONCLUSION

In the research reported here, the perceived environmental uncertainty and the educational effectiveness of the games are investigated in a simulated environment. Although the two subjects seem to be unrelated, the research findings show similarities. The effects of the leadership style both on the educational effectiveness of the game and on the perceived environmental uncertainty are studied during the two different life cycle stages of the simulated organizations.

Perceived environmental uncertainty is studied in terms of two components; complexity and dynamism. The managerial style of an organization is found to be effective for both components especially during the "formalization and control" stage; the third stage. The experiments with the students show that during the third stage, the members of the autocratically ruled teams have perceived the environment as simpler and more static than those of the democratically ruled ones.

No statistically supported differences are observed for the complexity perceptions of the group members and those of the individuals. Moreover the environmental complexity and dynamism perceptions of the individuals have shown no difference between the two periods. The drastic change in the autocratic group members' perception of dynamism (from dynamic to static) have resulted in a significant difference between the individuals and them in the second period.

The above findings are not strongly supported by the experiments directed with Şişe Cam managers. In accordance with the second set of

experiments; the perceived environmental complexity is not affected by the leadership style of the group. No significant differences between the perceptions of the two differently managed teams are observed neither during the first nor the second period.

However, perceived environmental dynamism is found to be affected by the managerial style of the organizations. In contrary to the findings of the experiments with the students, the members of the autocratically ruled teams have perceived their environment as more dynamic than the democratic group members especially during the first period.

A possible explanation for the contradictory findings on the perceived dynamism of the two sets of experiments might be the significant differences in the perceptions of the environment complexity of the students and that of the managers. The comparison of the perceptions of the subjects shows that the Şişe Cam managers have found the simulated environment much simpler than the students. The relationships between the complexity and uncertainty perceptions are studied both by Duncan and by Downey, Hellriegel and Slocum. Positive and negative associations are found by respective researchers. However, no research on the interactions between the complexity and the dynamism components of the uncertainty construct has been directed. The subject opens up further research areas.

It seems that apart from leadership style, the life cycle stage of the organization also affects the perceived environmental uncertainty of the members. Significant changes from complex to simple in the environmental complexity perceptions of the autocratic group members during the formalization and control stage are observed in the student group. However, among the Şişe Cam managers significant changes are not observed during different life cycle stages in the perceptions of neither the autocratic nor the democratic group members. Their extremely low perceptions of the environmental complexity might be the cause. In turn significant differences in the perceptions of the environmental dynamism are statistically supported not only for the autocratic and democratic groups formed by the students but also for the autocratic group members

in the experiments with Şişe Cam managers during the third stage.

When the effectiveness of the game as an educational device is evaluated, the opinions of the participants especially those of the managers have shown that the game is a really usefull device. Moreover a positive change in the opinions of the democratic group members between the two stages is observed in both experiments with the students and with the managers. It has been stated that the changes in the rankings for the four financial statements of the participants are believed to be an objective measure for the educational effectiveness of the game. In this regard changes have occured only in the rankings of the democratic group members in both sets of experiments.

In summary, apart from organizational structure, information load and specify, individual characteristics and the environment itself; leadership style and the life cycle stages of the organizations are identified as the two variables affecting the perceived environmental uncertainty. Moreover it has been observed that the leadership style influences the educational effectiveness of the games. In other words the opinions of the democratic group members and are more likely to be changed than both autocratic group members and individuals by business games.

APPENDIX

APPENDIX A - Game Description

The game simulates the top managements of two competing firms in an oligopolistic market.

Since there are two separate firms, at least two players or groups of players apart from the game instructor are needed. The market conditions, the initial states of the firms, and the financial environment are defined by the game instructor. The scenario constructed is presented to the participants before the start of the simulation.

As it is intended that the rules of the game are understood by the players after a short presentation (no more than one hour) the game is designed to be as easily as possible. In this regard no governmental intervention apart from thirty percent income tax, no transportation cost, no inflationary (or deflationary) trends in both factors (labor, capital) and inputs (raw material, overheads) of production and full information about the price, the quality and the advertisement media of the competitors are assumed.

Moreover, one kind of final product (with four different qualities) produced from one kind of raw material through a process technology with no work-in-progress inventory is thought in order not to complicate computations related to the production.

Furthermore, one financial institution (bank with only one interest rate) and one financial instrument (purchases of raw materials may be on credit with a prefixed discount rate) are available as financial environment of the two simulated firms.

Decisions on price, quality, the amount of salesmen and their premiums, the advertisement media and the durations are the major factors in the determination of the demands for the two firms.

Technically the game has three sections;

- 1- FIRM REVIEW
- 2- MARKET REVIEW
- 3- DECISIONS

The third part covers the decisions on production duration and quantity, product price and quality, advertisement media and durations, the amount of salesman and their premium, purchasing policy (in cash or on loan); how much to borrow, when to pay and where to expend (capital investment or research and development).

The above decisions has to be taken after the examination of the first two parts which are classified in accordance with the commonality of the information. In other words, if the information is only accessible by the firm members it is classified as "internal information" and presented to the players in the Firm Review Section. However if it may be accessible by the members of both firms it is classified as "external information" and presented to both players or teams of player in the Market Review Section.

In general, Firm Review Section consists of financial statements, and of all production information; However Market Review Section comprises the information about the price, the quality and the advertisement media of the competitors.

APPENDIX B - Questionnaire to Measure The Environmental Uncertainty

Environmental Factors

- 1- Demand of the industry
- 2- Price of the competitor
- 3- Quality offered by the competitor
- 4- Advertisements of the competitor
- 5- Number of retailers (for/of) the competitor
- 6- Salaries
- 7- Price of raw material
- 8- Interest rate
- 9- Tax rate

1- How many of the above environmental factors do you feel obliged to take into consideration when you are deciding?

- 1- None 2- A few 3- Some 4- Most 5- All

2- How many of the above environmental factors are important in realizing the objectives of your firm?

- 1- None 2- A few 3- Some 4- Most 5- All

3- To what extent are the environmental factors that are important for realizing the objectives of your firm, related?

- 1- No relationship
- 2- A limited relationship
- 3- Some relationship
- 4- Close relationship
- 5- Very close relationship

4- To what extent does the competitor limit the activities and the freedom in decision making for your firm?

- 1- No influence 2- A little 3- Some 4- Quite much 5- Very much

5- Is the pattern of the changes in the external environment regular enough to be foreseen?

- 1- Very irregular 2- Irregular 3- Not bad 4- Regular
5- Very regular

6- To what extent is it possible to forecast the changes in the external environment?

- 1- Not possible 2- With a great error 3- With error 4- With a small error 5- Exactly

7- To what extent are you able to forecast and understand the reasons of the environmental changes

- 1- Not at all 2- A little 3- Some 4- Not bad 5- A lot

8- To what extent is the information related to the external environment adequate for the decision making

- 1- Not at all 2- Not adequate 3- Not bad 4- Adequate
5- Very adequate

9- Do you have enough information on the effects of the environmental factors, on your firm?

- 1- A little 2- Some 3- Not bad 4- A lot 5- Too much

10- Do you have enough information about the effects of your decision on the environmental factors and their responses?

- 1- A little 2- Some 3- Not bad 4- A lot 5- Too much

11- Do the problems and opportunities created by the external environment fit your forecasts?

- 1- Very few of them 2- Few of them 3- Some of them 4- Most of them
5- Approximately all of them

12- How hard is it to forecast the results of a decision affecting the external environment of a decision which will be affected by this environment?

1- Impossible 2- Extremely hard 3- Hard 4- Easy 5- Very easy

13- In general quality to what extent can you (qualify) the external environment of your firm as complex?

1- Not complex 2- Complex to some extent 3- Complex 4- Very complex 5- Extremely complex

14- Please specify the degree of the environmental uncertainty for your firm?

1- Extremely uncertain

2- Very uncertain

3- Uncertain

4- Certain

5- Very certain

APPENDIX C - Questionnaire to Measure The Leader Behavior

SA: Strongly Agree, A: Agree, D: Disagree, SD: Strongly Disagree

	<u>SA</u>	<u>A</u>	<u>D</u>	<u>SD</u>
1- Lets group members know what is expected of them	-	-	-	-
2- Allows the members complete freedom in their work	-	-	-	-
3- Is hesitant about taking initiative in the group	-	-	-	-
4- Is friendly and approachable	-	-	-	-
5- Encourages the use of uniform procedures	-	-	-	-
6- Permits the members to use their own judgement in solving problems	-	-	-	-
7- Fails to take necessary action	-	-	-	-
8- Keeps the group working together as a team	-	-	-	-
9- Tries out his or her ideas in the group	-	-	-	-
10- Encourages initiative in the group members	-	-	-	-
11- Lets other persons take away his or her leadership in the group	-	-	-	-
12- Puts suggestions made by the group into operation	-	-	-	-
13- Makes his or her attitudes clear to the group	-	-	-	-
14- Lets the members do their work the way they think best	-	-	-	-
15- Theats all group members as his or her equals	-	-	-	-
16- Settles conflicts when they occur in the group	-	-	-	-
17- Decides what shall be done and how it will be done	-	-	-	-
18- Assigns a task, then lets the members handle it	-	-	-	-
19- Is the leader of the group in name only	-	-	-	-
20- Assigns group members to particular tasks	-	-	-	-
21- Backs down when he or she ought to stand firm	-	-	-	-
22- Keeps to himself or herself	-	-	-	-
23- Is reluctant to allow the members any freedom of action	-	-	-	-
24- Lets some members have authority that he or she should keep	-	-	-	-
25- Sees to it that the work of the group is co-ordinated	-	-	-	-
26- Schedules the work to be done	-	-	-	-
27- Allows the group a high degree of initiative	-	-	-	-
28- Takes full charge when emergencies arise	-	-	-	-
29- Is willing to make changes	-	-	-	-
30- Helps group members settle their differences	-	-	-	-

REFERENCES

1. Aldrich, H.E., Pfeffer, J., "Environments of Organizations", Annual Review of Sociology, Vol.2, p.79, 1976.
2. Cameron, K.S. and Whetten, D.A., "Organizational Effectiveness over Life Cycles", Administrative Science Quarterly, Vol.26, pp.525-544, 1981.
3. Cook, J.D., Hepworth, S.J., Wall, T.D., Warr, P.B., The Experience of Work. Orlando, Florida: Academic Press, Inc. 1981.
4. Dilber, M., Yönetmel ve Örgütsel Etkililiğe Davranışsal Yaklaşım. İstanbul: Boğaziçi Üniversitesi Yayınları, 1976.
5. Downey, H.K., Hellriegel, D. and Slocum, J.W., "Environmental Uncertainty: The Construct and its Application", Administrative Science Quarterly, Vol.20, Decembre 1975.
6. Downey, H.K., Hellriegel, D. and Slocum, J.W., "Individual Characteristics as Sources of Perceived Uncertainty Variability", Human Relations, Vol.30, No.2, 1977.
7. Duncan, R.B., "Multiple Decision-Making Structures in Adapting to Environmental Uncertainty: The Impact on Organizational Effectiveness", Human Relations, Vol.26, pp.273-291, 1973.

8. Ford, J.D., Slocum, J.W., "Size, Technology, Environment and the Structure of Organizations", Academy of Management Review, Vol.2, No.4, October 1977.
9. Huber, G.P., O'Connell, M.J., Cummings, L.L., "Perceived Environmental Uncertainty: Effects of Information and Structure", Academy of Management Journal, Vol.18, No.4, 1975.
10. Kast, F.E. and Rosenzweig, J.E., Organizations and Management. 3rd ed. New York: McGraw Hill, 1979.
11. Kibbee, J.M., Craft, C.J., Nanus, B., Management Games. New York: Reinhold Publishing Corporation, 1961.
12. Maier, N.R.F., Verser, G.C., Psychology in Industrial Organizations. 5th ed. Boston: Houghton Mifflin Co., 1982.
13. Stoner, J.A.F., Management. New Jersey: Prentice Hall, 1978.
14. Üsdiken, B., "On the Measurement of the Attributes of Organizational Environments", İşletme Fakültesi Dergisi, Vol.9/2, pp.157-177, 1980.
15. Vance, S.C., "Business Gaming as an Aid to Manager Development", Handbook of Business Administration, (editor: H.B. Maynard), New York: McGraw Hill, 1970.