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Gaming in the USSR

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GAMING IN THE USSR

Vadim Marshev

April 1981
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PREFACE

At a workshop on "The use of Operational Gaming as an Aid in Policy Formulation and Implementation", held at IIASA in August 1978, it was found that the very substantial work on gaming carried out by the socialist countries seemed to be little known in the west. It therefore seemed fitting that IIASA, with its unique position as regards scientific east-west cooperation, should incorporate a report on gaming activities in socialist countries as part of its 1980/1981 research program.

The following collaborative paper by Dr. V. Marshev, Head of the Laboratory for Simulated Methods for the Management of the National Economy at the Moscow State University, is part of this report. It was written during Dr. Marshev's visit to IIASA in October/November 1980, and can be seen as complement to a working paper "Management Simulation Games for Educational and Research Purposes--A Comparative Study of Gaming in the Socialist Countries", WP-81-18, by Dr. I. Assa, scientific secretary of the Institute for Social Management, Sofia, Bulgaria, who has been working at IIASA since September 1980.

Ingolf Ståhl

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Vadim Marshev

INTRODUCTION

Man has devised many useful techniques for dealing with behavioral problems connected with the management of socio-economic processes. Most of these methods are based on formal logic, and their formal structures have become progressively more complicated in an attempt to model real-life situations more closely. However, throughout this period of increasing formal complexity, specialists in decision making were aware that there are also many human factors, which normally end up in the Procrustean bed of the formal models because they are very difficult (and often impossible) to incorporate in the framework of the models.

Gradually it occurred to model designers that it would be sensible to incorporate people within the models, and, in a new type of combined model, people were invited to act out their real-life roles and to recreate their behavioral patterns under experimental conditions. The term "games"* (for example, business or production games) soon came into use to describe these combined "formal logic and people" models.

Attempts to deal with management problems therefore led directly to the concept of "formal logic and people" models, which are now used widely to explain the behavior of socio-economic systems. There is a body of opinion that in the future it will be possible to explain these systems by formal logic alone (i.e., without considering people). However, it appears to the author that philosophical principles, such as Niels Bohr's

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* More complete and correct definitions of the terms "game" and "gaming" will be presented later.

Principle of Complementarity, indicate that this will never be possible.

Gaming techniques are rapidly gaining in popularity. Hundreds of business and management games* have already been designed, scientific investigations of gaming are taking place throughout the world, and the number of articles on the subject continues to grow. The following sections present a brief history of gaming in the USSR and discuss the current state of Soviet studies.

A BRIEF HISTORY OF GAMING IN THE USSR

The first publications on business and educational games appeared in the USSR in the 1930s. (Ostrovsky, J. 1933 & Birstein M. 1938.) The first Soviet business game--an "organization of production" experiment--was carried out at the Leningrad Engineering and Economic Institute in 1932 by M. Birstein. The purpose of the game was the rapid preparation of a program to introduce new technology in the Leningrad Textile Factory (LTF). The managers of some subdivisions of the LTF were included as players of this game. At the same time, discussions were being held among the senior officials of the factory about the best methods of implementing the new system. It was found that the game produced a program four times more quickly than the high-level discussions and that it required only half as much labor (Birstein, M. 1976). An additional advantage of the gaming approach was that the players assimilated some of the skills associated with the new technological system while the game was in progress.

There were no large-scale computers or other means of rapid calculation available in the early days of gaming. The gaming approach generally requires a considerable amount of routine calculation, and in the absence of computational aids it was necessary to carry out these calculations manually. This quickly acted as a strong disincentive to the use of gaming and for the next twenty years the subject all but disappeared. Interest in gaming eventually reawakened in the USA around 1955 and in the USSR during the 1960s; this coincided with the increasing availability of large computers which removed some of the constraints on calculation. Since then interest in gaming has been growing rapidly in the USSR. More than 200 articles and monographs on gaming have already been published in the Soviet Union, and a number of professorships and laboratories for gaming studies have been created in universities and institutes for technical education. The number of organizations and specialists involved in the design and use of gaming continues

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* War games, card games, board games, children's games,etc., are not included in this analysis.

to increase. There has been some success in using gaming both as a method of teaching and as a means of designing and implementing management information systems (MIS) and new organizational structure for various scientific and production industries, though a number of research problems still remain.

All gaming activities in the USSR are centralized and coordinated by the Coordinating Council on Gaming, based at the Ministry of Higher Education,* and by the Scientific Council on Cybernetics, of the Academy of Sciences. An annual conference, the All-Union Conference on Gaming, is held in the USSR under the leadership of the two Councils mentioned above, and Soviet experts also take part in international conferences on gaming which are held by the socialist countries. There are two distinct types of conferences on gaming in the USSR. The first considers the design of software for gaming. Conferences of the second type deal with the problems of gaming as a method of decision making and teaching. The most recent Soviet conferences were attended by more than 100 participants representing many research institutes and universities.** The next Soviet conference on gaming will take place at Novosibirsk in September 1981.

There is no general agreement between Soviet scientists on all aspects of gaming (from definitions, through the evaluation of efficiency, to effectiveness) but at present four main methodological approaches may be distinguished. The similarities and differences between these four approaches may be deduced from the descriptions given in the following section.

THE FOUR MAIN APPROACHES TO GAMING USED IN THE USSR

The Syroezhin approach

The group of scientists led by I. Syroezhin at the Leningrad Financial and Economic Institute (LFEI) considers that there are three different and sometimes "non-coincident" economic interests# in socialist economic systems, namely, private, collective, and social interests. The Syroezhin group see management games as a unique tool for revealing and reconciling the non-coincident economic interests of the parties concerned. The basis of any game, in Syroezhin's opinion, is the relationship between the different kinds of resources and the information about these resources.

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* The author is the Head of the "Foreign Experience in Gaming" subdivision of the Council.

** The most important reports from these conferences are given in Collected Business Games, (1978), Simulation Games for both Training and for Mastering of Management Innovation, (1976), Business Games and it Computer Program Supplies, (1980), and Birstein, M and A. Timofievsky, (1980) which contains short descriptions of 136 Soviet games.

\# "Non-coincident" here implies interests which are slightly different but not diametrically opposed.

According to this group the structural elements of any game are:

1. The players, who represent various economic interests.

2. The rules, which regulate and direct the prominence and interaction of economic interests according to the ideas of the designer about the object of the game.

3. The information, which provides details about the changing status of resources during the game.

Syroezhin believes that replacing this information by data on real resources will turn any game into a natural experiment.

The LFEI group classifies games into four groups:

1. Educational games

2. Games for testing managers

3. Games for operational decision making

4. Research games

Syroezhin considers that the results of research games are especially valuable if the players are those people who will actually be applying the results of the game in the future, and this is also the impression gained by the author.

According to Syroehzin, each of the four classes of games has specific distinguishing features. The rules of the game and the algorithms for handling both the data base and information are of great importance in educational games, while the selection of members of the control and game teams are more important for the games designed to test managers. Similarly, the structure and rules of the game are of great significance for operational decision making, whereas the research games place more emphasis on the structure of the data base.

Syroezhin's group has designed many games, including IMPULS, ASTRA, EPOS, AND LOTOS. These games involve variations in the organizational structure of different scientific and production industries, (Gidrovich, S. and J. Syroezhin, 1976). The conceptual basis (a theory of socio-economic organizations) underlying all the games designed by the Syroezhin group is described in Syroezhin, I. (1970). The most recent big game developed by the group is named "NAUTILUS" and was designed on instructions from the Russian Ministry of Higher Education*. In this game, players are asked to allocate research projects, money, and other resources to different scientific institutes and universities for the planning period under consideration.

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* Russian here refers only to the RSFSR (Russian Soviet Federated Socialist Republic) and not to the complete Soviet Union.

The Marshev approach

The group led by the author at Moscow University defines a management game as a representation of management processes composed of the following elements:

1. A model of interrelated dynamic sequences of economic (or business) event

2. A set of participants - the players

3. A set of goals and rules

4. A set of symbolic actions made by participants according to the goals and rules of the game: in other words, experimenting with the players and the model according to the rules.

Gaming here includes the design and use of management games for the education and training of managerial staff, for operational decision making, and for research into the problems of management.

Figure 1 illustrates the group's view of the general structure of a management game.*

All of the Moscow University games are designed on the basis of the semiotic theory of gaming, (Marshev V. and A. Popov, 1974, and Marshev, V. 1980), which considers the management game from three points of view:

1. Syntax (the mathematical structure of the game)

2. Semantics (the interpretation of the game)

3. Pragmatics (the design and use of the game)

The foundations of the semiotic theory of gaming and the multidimensional classification of games used by the Marshev group is described in detail in Marshev, V., (1980); the main elements of this theory are outlined in Figure 2.

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* In the USSR, a management game is used for research in the field of management; design and implementation of new scientific results in management practice; and training of managerial staff.

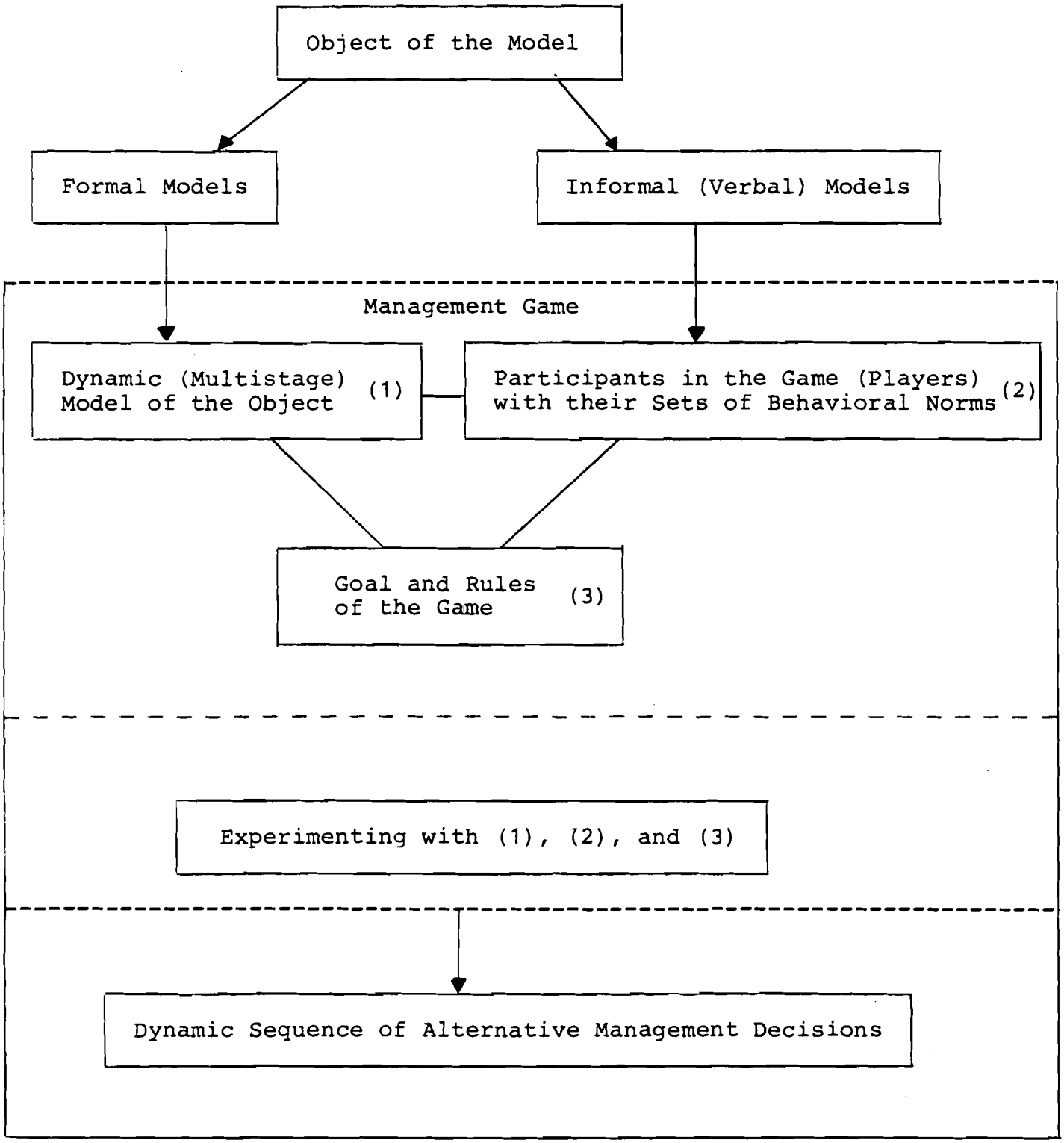

Figure 1. The structure of the management game according to the Marshev group.

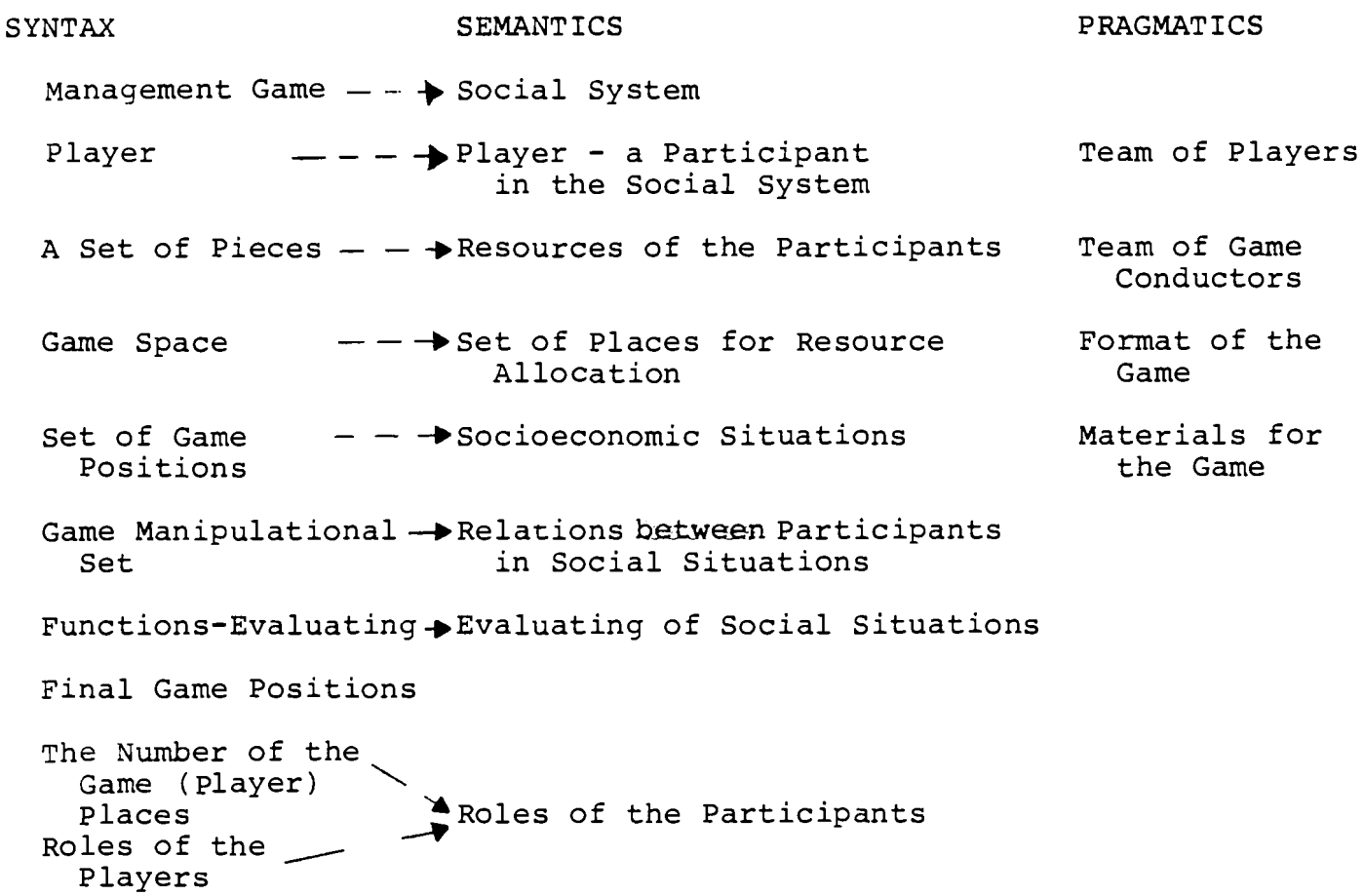

Figure 2. The elements of the semiotic theory of gaming.

The group led by V. Marshev, (the author) started designing educational games in 1972 and then later, with increasing experience, turned to the design of operational games. Various parts of the educational games were included as formal models of subsystems in the later operational games when appropriate. In particular, the educational game "Milk" (which represents the planning and production processes at the Moscow Milk Factory, see Collected Business Games, 1978) was used in designing the subsystems for the factory's Management Information System (MIS); on completion, the subsystems were included in the MIS of the largest milk factory in Moscow. More information about this game is given in Appendix A.

The author's group is currently under contract to design parts of the MIS for two Moscow motor plants (ZIL and AZLK), in particular to prepare subsystems for production, quality control, accounting, and analysis. With this in mind, the group concentrated on the technical aspects of the game, designing models of car production and working environment, as well as deciding on the main roles to be played and the rules of the game. It is hoped that the ZIL and AZLK games will be played for the first time during the next All-Union Conference on Gaming in Novosibirsk in 1981. It will also be played in Moscow by the managers of the car plants concerned.

In addition, the Moscow University group has started to design an operational game called "Post" under a contract with the Ministry of Communications. Some drivers, postal workers, and managers actually working at Moscow Post Offices will be invited to take part in the game. By playing the game it is hoped to obtain a simulation model of the optimal distribution of postal vehicles between the various post offices in Moscow, and to ensure efficient transport of parcels between Moscow rail stations, bus stations, and the post offices themselves. Under the terms of the contract, this game should be completed in 1982.

The Efimov and Komarov approach

V. Efimov of Moscow University and V. Komarov of the Novosibirsk Institute of Management Systems define a management simulation game in stages, by defining firstly a "game", then a "simulation model", and finally a "management simulation game".

A game is defined as a type of human activity in which other types of human activity are recreated. The game is played under artificial, experimental conditions.

A simulation model is a model of a system which can be used to conduct investigations into that system and which can simulate the functioning of the system over an extended period of time.

A management simulation game is a game which contains a simulation model describing an organization active in the production sector of the economy.

The structure of a management simulation game according to this group, is shown in Figure 3. (see Efimov, V and V Komarov, 1980).

This group classifies games into four categories:

1. Educational games
2. Decison-making games
3. Projection games
4. Research games

The Efimov games are characterized by the fact that they operate in real time and that they involve real managers, i.e., future users of Management Information Systems (MIS).

The researchers realize that under the conditions described above it will become almost as difficult to design games to model the MIS as to design the MIS itself. With this in mind, the Efimov group proposes to design simple invariant or frame games on the basis of the "Software Package for Production Management" and other standard MIS subsystems. The group would like to explore new aspects of MIS design in their choice of players and in the rules of the game.

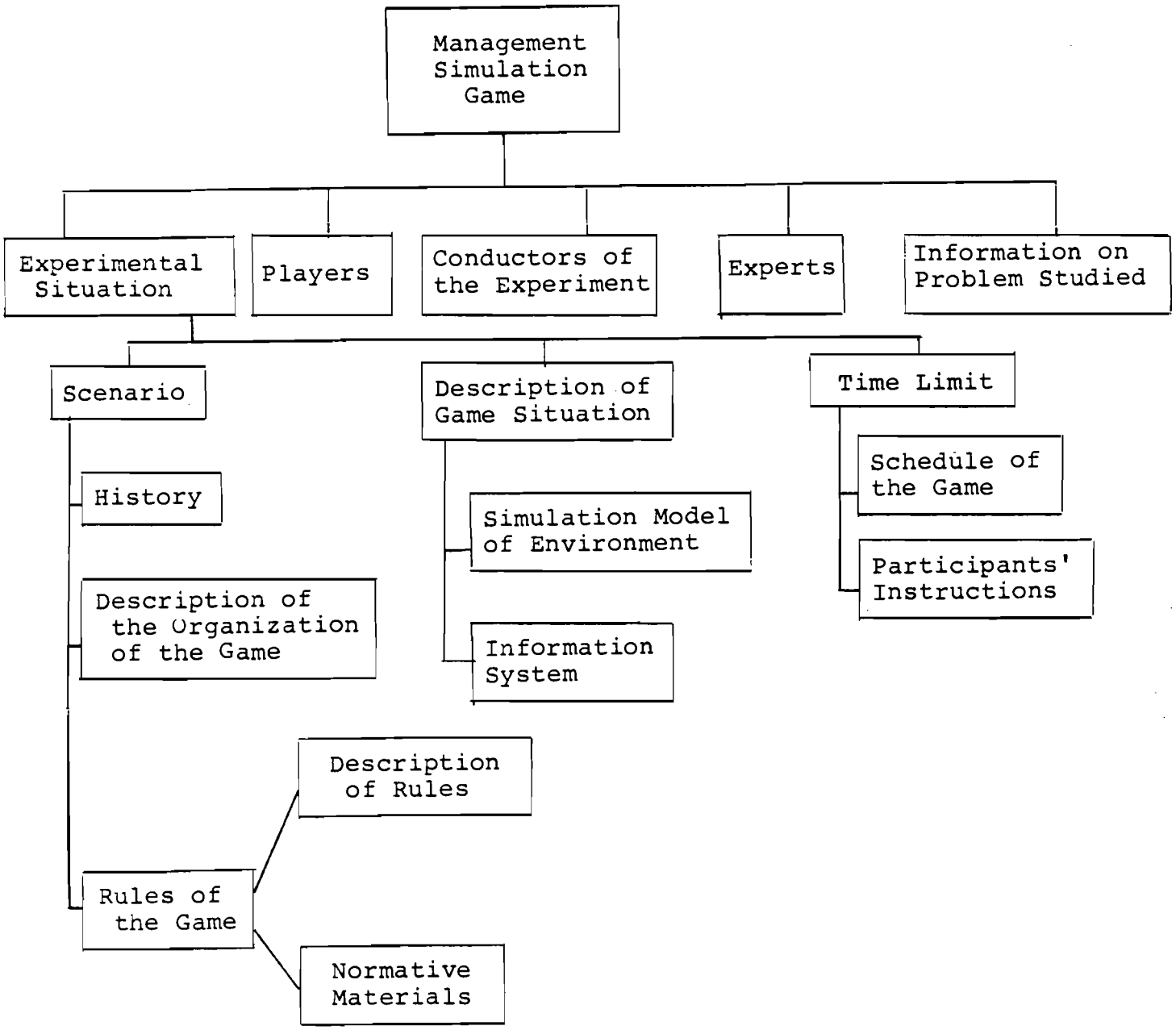

Figure 3. The structure of the management simulation game according to Efimov and Komarov.

The Efimov group has constructed many games, including "Production Subsection" and "Red Weaver II",(see Efimov, V. and V. Komarov, 1980), though their best known and most successful product is the "Management Project" game,(see Komarov, V. 1979). This game was intended to provide an MIS for a research institute, and was especially interesting because the potential users of the MIS took part as players. The game involved the participants in the design of the MIS and took them through the procedure for approving operational control systems (all in accordance with the rules of the game). The result was the procedure necessary to develop a real MIS.

In a sense, this game is an invariant or frame game, and has been used to design many other new games for MIS development. In particular, V. Komarov based the new game "MIS R&D" for the Research Institute of the Ministry of Forest Industry on the "Management Project" game, (see Komarov, V. 1979). V. Shtytman and others from the Cheljabinsk Project Bureau for MIS have used the game to approve and implement a new MIS project for the Cheljabinsk Building Organization. (see Business Games and its Computer Program Supplies, 1980.)

The Burkov approach

The group led by V. Burkov at the Institute of Management Problems of the Academy of Sciences defines a management game as a model of human interaction culminating in the achievement of certain economic or political goals.

The game has the following structure:

1. Purpose
2. A method for estimating the extent to which the game has achieved its purpose
3. Formal rules
4. Informal rules

Points 1-3 correspond to the definition of an ordinary formal model. The last item, however, is one of the basic characteristics of a management game in that it reflects the human element. The fourth point represents active competition between people attempting to reach elevated goals. The methodology of Burkov games is described in Burkov, V. (1977), Assa, I. (1981) and Burkov V. (1977).

The Burkov classification of games includes the usual categories of educational, operational, and research games, but also defines a class which has complete information and one which has not.

This group of scientists has constructed many games which are basically designed to verify the results of the active system theory, as in Burkov, V. (1977), but which are not currently used in practice.

OTHER GAMING ACTIVITIES IN THE USSR

Only the more interesting aspects of other work on gaming carried out in the USSR will be considered here.

A group of scientists from the Central Economic-Mathematical Institute of the Academy of Sciences of the USSR (I. Oleinik, L. Krukova, and others) has been very active in this field. They have designed a system of games called "PAUTINA" which is intended to investigate the problems involved in road haulage of furniture in Moscow, (see Krukova, L. and J. Oleinik, 1980). The game represents management activities in a motor transport enterprise, in furniture factories, and in furniture shops. The PAUTINA system consists of three big games:

1. The yearly planning game
2. The game dealing with operative planning and management of road haulage processes
3. The accounting game

The first experiment with the PAUTINA system was carried out in the spring of 1979 and work on the project continues.

V. Rybalsky from the Kiev Engineering and Building Institute has designed an operational game system called "KROSS", which consists of four big games. This game was used as a means of training managers in the new building management system introduced for the construction of the Moscow and Kiev Olympic facilities, (see Rybalsky, V. 1980). In this game the players design a network representing the construction of the Olympic buildings and choose the path which optimizes certain criteria (critical path analysis). The game lasts for three days and is played for six hours each day.

The gaming group from Novosibirsk University (N. Syskina, N. Anochin, and others) has developed a game called "Sajans". See Malov, V. and N. Syskina, (1976). This game is concerned with the optimal siting and building of industrial plants in the large Siberian region of Sajans. The Novosibirsk group os now designing a system of games, based on the World Global Model, which simulates trade between the four regions of the world. See Business Games and its Computer Program Supplies (1980). The Academy of Foreign Trade is continuing to work on the USA-USSR trade game. See Uretsky, M. (1980).

FINAL REMARKS

An increasing number of articles on the problems of effective evaluation of economic-mathematical models and the problem of verification, validation, and transferability of the results from models simulating society have appeared in the scientific literature in recent years.* There have also been a number of international conferences and workshops on these topics.

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* See the journals Economic-Mathematical Methods (USSR), Simulation, and Simulation and Games (1975-1980).

These problems are relevant to this discussion because gaming is open to the same criticisms as pure modeling, as far as the final users are concerned. It would obviously be desirable to prevent this critique by taking appropriate action in the early stages of game design. The introduction of people as players in the game goes a long way toward overcoming the problems of verification, validation, and transfer, in that the people then "represent themselves" while playing the game. However, this solution just leads to the creation of a number of new problems:

1. The motivation of the players

2. The psychological compatability of the players

3. The removed or secondary problems of verification, validation, and transferability of the results of the game, which arise from the two points listed above.

Furthermore, the original or primary problems of verification, validation, and transfer remain in the game even after the introduction of people as players. The secondary problems are actually caused by this change. But what are these secondary problems?

The designers of "pure" economic-mathematical models (which exclude people) consider their results in the same light as the results of an experiment in classical physics: the results should be independent of the time and place of the experiment, and should not depend on the experimenters. The criticisms levelled at these models have been, are, and will be based on the unreal nature of the axioms and logic incorporated in the models. However, the results of "formal logic + people" models can be criticized for completely different reasons. The sort of questions that will be asked are:

1. Who prepared the game? When? Where?

2. Where and when was the game played?
   Where and when were the results of the game obtained?

3. Who were the players in the game?

These questions are connected with the secondary problems of validity, verification and transfer discussed above.

The real managers, i.e., the future users of such systems as the MIS, take part in most of the operational games designed in the USSR by different scientific groups, which means that the designers are more able to take into account the limitations of the "pure logic" models on the one hand, and motivate the players on the other. A preliminary evaluation of the psychological compatability of the players has also been carried out, see Krukova, L. (1979).

Finally, it is hoped that, among other things, the international collaboration on gaming techniques being coordinated at IIASA will help to answer many questions related to the design of games and the use of their results in solving practical social and economic problems.

APPENDIX A: THE GAME "MILK"

The game "Milk" was designed at Moscow University by the author and I. Markin, (see Collected Business Games, 1978). It represents the planning procedures and processes used for the production of milk products (milk, cheese, yoghourt, ice cream, etc.) at the Moscow Milk Factory, (MMF).

The MMF consists of two enterprises, each of which is composed of two sections (production lines) producing various kinds of milk products. The players of the game "Milk" assume the following roles:

- Director of the game. At different points in the game the director will play the role of a Minister, a Consumer, and a Supplier.
- Director of the MMF (DMMF).
- Chief Engineer of the MMF (CE).
- Chief of the Planning Department of the MMF (CP).
- Chief of the Mathematical and Technical Supply Department of the MMF (CMTS).
- Two Deputy Directors of the MMF (Directors of the Enterprises) (DD).
- Four Chiefs of Sections (CS).

The game is played in three stages:

1. The five-year plan is drawn up. This shows the total amount of each product required for each of the five years separately, with no disaggregation into size or type of product (e.g., only the total amount of ice cream is specified--not whether it should be chocolate or strawberry, or whether it should be sold in large or small cartons).
2. The factory's operational plans "Techpromfinplan" (technical-production-financial plan) are designed. These deal with the disaggregation of the totals given in the five-year plan into the specific types and sizes of product, and cover various periods of time. Operational plans are designed for periods of one year, one quarter, and one month, for ten-day periods and for single days.

3. The operational plans are implemented and evaluated.

In the first stage the Ministry of the Meat and Milk Industry provides the DMMF with the aggregate totals proposed by the five-year plan. The MMF then designs a "counter plan". This is prepared by the CP, together with the CE, the CMTS, and the DDs. Taking into account the real production capacity of the MMF, the CP calculates the additional requirements (raw materials, etc.) needed to fulfil the five-year plan and sends them to the Ministry. If the Minister satisfies these requirements the five-year plan is ratified and the first stage of the game is completed. However, if the Minister does not meet the requirements, the MMF must find other ways of fulfilling the five-year plan. This may involve a few iterations within this first stage.

In the second stage the CP, the CMTS, and the CSs prepare the detailed (disaggregated) plan "Techpromfinplan" for various periods up to and including one year. The operational plans for the enterprises and the sections are finalized.

In the third stage the operational plans for various periods are implemented and evaluated. This means that the real production processes are represented by a system of models which are then solved using standard software packages.

This game was initially played at Moscow University with the students taking the roles described above. After several experiments with the "educational" game, the designers decided to invite the real managers from the MMF to participate as experts, and to evaluate the decision making processes and decisions involved in the game.

Together with the managers of the MMF Computer Center the researchers then decided to use the gaming approach and this particular game to design a Management Information System for the MMF, roughly as described in Efimov, V. and V. Komarov (1980), Komarov, V. (1979), and Davis, R. and B. Taylor (1975). This decision was made primarily because no one was happy with the usual procedure for designing and implementing a MIS. This procedure takes place in a number of stages (see The General Branch Methods MIS design 1972):

1. Before the project starts, there is an investigation of the existing management and production systems used by the organization being modeled (in this case the MMF).

2. The technical aims of the MIS are decided upon.

3. Drafts of the MIS are drawn up.

4. MIS technical project (resource requirements, cost assessment, etc., for various drafts) is carried out.

5. MIS working project (construction of the final draft) is carried out.

6. MIS is put into experimental operation.

7. MIS is implemented.

Practical experience has shown that in many cases the future users of the MIS do not take part in the designing process. Furthermore, the MIS is usually tested only in the final "implementation" stage. This means that users' suggestions for improving the MIS or eliminating any faults which may be noticed during testing can be incorporated only in the final stage, i.e., long after the designing phase has been completed. These problems increase the time taken to put the MIS into operation and reduce the overall efficiency of the system because designers are not usually interested in making changes once the MIS has been implemented.

A new procedure for MIS design was therefore developed, as follows:

1. Before the project starts there is an investigation of the management and production systems in use at the MMF.

2. The game "Milk" is played with the managers of the MMF.

3. The technical aims of the MIS are worked out by comparison of the real system with the game management system.

4. Variants of the game management system are generated using the software package for the production and accounting processes. These variants must be compatible with the technical requirements outlined in point 3 above.

5. Decisions are projected and adjusted under the conditions laid down by the game management system.

6. The game "Milk" is played with the future users in order to train them.

7. The MIS is put into operation at the MMF.

During the game the players introduced many changes, particularly in the production models and the procedures used to collect and utilize information. The players also told the designers of the game about the problems which could arise when innovating the MIS in the MMF. This was very helpful in designing both the game and the MIS. Playing the game "Milk" as one of the first stages in the MIS design procedure has also benefited the users. First, the MMF workers obtained a better idea of the changes in management that would result from the use of the MIS. During the game they experimented with new planning

and accounting methods so that after the game they could suggest constructive improvements in the design of the MIS. The second advantage was that many new types of MIS planning and accounting documents were adopted by MIS users after playing the game. Further information about the use of MIS in the milk industry is given in Markin, I. (1979).

APPENDIX B: SOVIET SCIENTISTS WORKING ON GAMING

1. The Leningrad Financial-Economic Institute

   I. Syroezhin
   S. Gidrovich

2. Moscow University

   V. Marshev
   I. Markin
   V. Efimov
   A. Berkovich
   N. Berkovich
   N. Smirnova
   A. Popov

3. Novosibirsk University and the Novosibirsk Institute of Management Systems

   N. Syskina
   N. Anochin
   V. Malov
   V. Komarov
   P. Ginsburg

4. The Institute of Management Problems, Academy of Sciences of the USSR

   V. Burkov
   A. Ivanovsky

5. The Central Economic-Mathematical Institute Academy of Sciences of the USSR

   I. Oleinik
   L. Krukova
   I. Geronimus
   I. Saltukov

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