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CONCEPTUAL MODEL OF DSS MANAGEMENT GAME TYPE CREATION

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Abstract:
User training for operation on decision making systems support means facing the problem in education form, that could be solved by using management games. The paper presents model and methodological basis of DSS management games type and elaborates effects which could be achieved through it in the field of education and training of future and existing management personnel.

Key words: DSS, Management games, Education, Training.

Introduction

Why DSS as a management game?

Basic reason for attempt of conceptualization of DSS as a management game is a real need for good decision-making in complex dynamic environment.

The idea of creating DSS as a part of complex management game seems natural, if we consider DSS essence and its results on one hand and management game characteristics on the other.

Obvious quality of DSS management games type application is also possibility of complex systems dynamic analysis; by DSS basis model involving, a management game is fulfilled and its complexity which is nearer to a real system is achieved. Consideration can encompass large number of variables and parameters. System complexity can be controllable extended as much as needed, i.e. as much as user team is able to accept. DSS models enable rafined controllability multi-level games, greater number of autonomy levels gives user an impression of considered system realistic representation. Combination of DSS management game, greatest effect is obtained in the field of users interactive acting, where they can simultaneously make decisions and monitor its evaluation, in interaction with other participants in the game. There were some attempts in the field (Ambrosiadou, Singh, 1985) although they present isolated applicative realization of a similar concept. The idea is formalized in a sense of the model conceptualization, which is a basis for any particular DSS of management game type application.

DSS is by its essence prediction oriented, so it can implicate simulation concept as a logical instance in process of preparation for decision making. Even mere use of simulation concept places DSS domain in management-game environment. In fact, is particular DSS going to be management game in the same time or not, depends not on the DSS essence, but on environment in which is used. This thesis can be described through the following conceptual model.

Design of Conceptual Model of DSS/MG Type

The model description

Figure 1. represents graphical interpretation of conceptual model intended ether for training or education. So, goal of the model function can be as follows:

- forming of a game that is to increase level of participants knowledge and experience, or
- forming of a game whose purpose is creation of conditions for real decision making.

The model layers

The model consists of three layers, each of which has its characteristics in structure, relations with other layers and environment, layer of impact on the whole model in case of changes, as well as position on DSS management game creation time axis.

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Game creation process starts from outer towards inner layers. Logically, if some deficiencies are noted, a control feed-back reverses the process to the previous layer.

DSS MG planning first (outer) model layer. Through elaboration of the game goal, its concretization and application field selection are accomplished. This layer roughly defines the model data base (meta-base), function of real data base copying into meta-base, and all other necessary sources. DSS management planning is first in sequence, with poorly distinguished from its environment, but with best amortization of changes.

DSS MG modeling model middle layer where game outlines are designed, scenery is specified in details and model from DSS MODEL BASE is chosen. All of these actions are completed with fully consideration of the game educative goals and general didactical rules of management games. This layer of the model exists in the core of time-axis of the whole model creation. It depends on previous outer (DSS/MG PLANNING) and precedes the following the lowest model layer. Potential changes in goals, data type or structure, etc., that could happen in this layer of creation, doubtlessly would influence on total time predicted for DSS/MG type creation.

DSS MG generation is the most narrow model layer. It contains model generator (CASE, tools kit, DSS generator) which generates new DSS management game type through DSS model adaptation from model base, with detailed input and output specification. If tools kit is used for game generation, this model layer should not occupy some large space on time axis of model creation. In case that previous layers are properly realized, the testing time should not be considerable. However, changes of rules, data structure or applicated model type, that could arise during creation of the model third layer, doubtlessly would bring consequences of great impact on total duration time and costs of DSS/MG type creation.
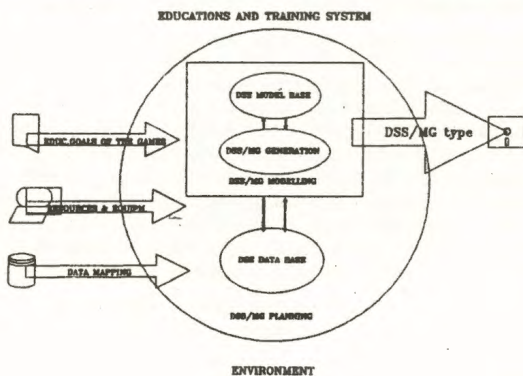

Figure 1

The model inputs

Four sets differing in structure and sensibility on model influences are as follows:

- Global educative/training goals of a game.
- Mapping function of data from DSS data-base, defined according to data structure represented by real system.
- Resources, as actually limiting element concerning hardware, software, supplementary equipment, site, orgware, ... that are available for DSS/MG type planning.

Information on changes in available sources that could be planned for a game.

Constitutive model elements

DATA BASE, DSS MODEL BASE and DSS/MG GENERATOR are constitutive model elements, each

with its characteristics.

Data base is in fact meta-base, created in one of following two ways:

- mapping from a real data-base, where mapping function values are defined by selection of particular field of model application;
- directly, by selection of data from a larger set of available information, on the basis on existing rules.

DSS model base base of developed and/or ready made models in the field of DSS. (This base could be used for purposes other than DSS/MG also.)

DSS model game generator is in DSS/MG GENERATION layer. It is a set of tools, CASE, IV generation language, that are used for fast (and simple) modification of model chosen from DSS base, according to need defined through modeling.

Model outputs

Model output for DSS/MG type creation is set of application connected by MG scenery, usable both for education and for training in the field selected as a representative one for previously defined goal realization. Moreover, there are no constraints for application of DSS/MG designed in such a way for real situations simulation, i.e., as direct decision-making support.

Application - Example

Validation of the presented methodology was completed on an management game example in the field of strategic decision making support, where its benefits are the most obvious, because strategic decision making is representative of a type of problems for solving of which we use the DSS.

Design of management game model for strategic decision making support

According to the presented methodology management game intended for strategic decision making support was designed through three layers: PLANNING, MODELING, GENERATING.

Layer: Planning

Global educative/training goal for the game is *to acquire the basic knowledges and experiences for usage of system for decision making support in the field of strategic decision making*. This goal is to be realised through a game conducted as a course, with emphasis on new DSS models that includes 'soft' data into decision making process and stressing the partial decisions impact on output results.

* The Model Base definition

According to the game global goal, the model base is roughly defined and it consists of models seldom used in our practice, which facilitate attractive presentation of qualitative DSS usage in strategic decision making:

- MODEL SCENARIO - on the basis of the defined goals of production programmes, trends and possible events, it generates a rank of production programmes according to its sensibility to the environment.
- PORTFOLIO ANALYSIS - enables analysis of the production programmes feasibility, and accordingly suggests directions of resources.
- HIERARCHICAL PROCESSES ANALYSIS MODEL - as an general model, that enables analysis of alternatives on the basis of ranking of decision making criteria, and as a separate model variant, for deciding on adoption of new technology.

* Data for DSS Data Base

Respecting the game goal (acquireing the basic experiences in work with the DSS) and the chosen models, data base of the game comprises the following:

- 'hard' data (unchanged): production programmes and middle-term goals of the current system;
- 'hard' data (after aggregation): total realised income from the production programmes, total material expences for the production programmes;
- 'soft' data about the expected competitors and expected market and environment movements, about the production programmes investments as an estimate of quantitatively unmeasurable investments (knowledges, experiences...);

Available resources

The game goal and chosen models demand minimum of the available resources: a site, at least one PC with a printer, coppier, overhead projector.

Layer: Modeling

Rough game outlines are designed and its scenario is elaborated in details. The game modular structure is presented in Fig. 2.

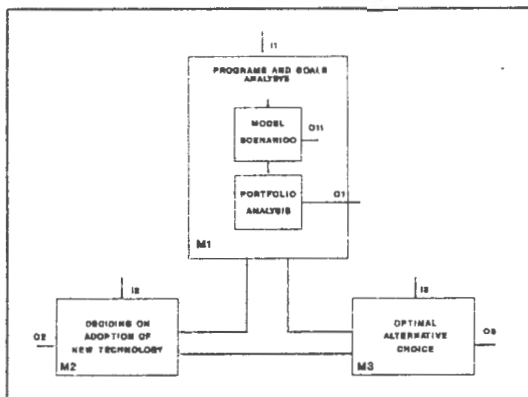Several scenaria are possible in conducting the game from Fig. 2.

Figure. 2 Modular structure of a management game for strategic decision making support

Layer: Generation

In the actual case of the management game for strategic decision making support, the game generation means writing a programm - an user interface to connect the module and the user communication.

The output from the model for DSS management game type generation is an global management game - an organized set of models connected by the managemeng game scenario, thus enabling the attendants to obtain some experiences in the field of strategic decision making.

Conducting the management game

The complete game flow is assumed in the followng way:

All the necessary imputs for the first game module are defined and the programs and goals are analysed by scenario model. Data obtained by scenario model are forwarded to the Portfolio model, for further analysis from standpoint of production programmes structure control. By running the first module from the beginning to the end, analysis of the program and goals is finished and programs that are attractive for future development are highlited. The second game module (M2) is testing the decision to procure new technology for programme of primary importance. After this testing, the third module (M3) choses the optimal alternative for the mentioned procurement. The game is finished at the exit O3.

The software modules of the Managemeng game for strategic decision making support comprise the following:

– its own software products,
– commercial software products and
– combination of commercial and own software.

I that form the Managemeng game for strategic decision making support is an original software product.

Dynamics of game flow

PHASE I - ANALYSIS

● GAME SCENARIO SELECTION - one of seven available paths is chosen through the game:

Scenario S1 - a run through all three modules (M1, M2, M3)
Scenario S2 - a run through modules M1 and M2
Scenario S3 - a run through modules M1 and M3
Scenario S4 - a run through first part of module M1
Scenario S5 - a run through modules M2 and M3
Scenario S6 - a run through module M2
Scenario S7 - a run through module M3

● SELECTION OF THE GAME MODERATOR

PHASE II - INPUT DATA GENERATION AND PREPARATION

● DATA SOURCE TYPE AND SOURCE DEFINITION
● EXPERT EVALUATIONS
● GENERATION OF THE GAME DATA BASE
● DEFINITION OF APPROACH OF RESULTS VALIDATION

PHASE III - RUNNING THE GAME

● SITE PREPARATION
● TIME SCHEDULE
● INTRODUCTIONARY RUNNING THE GAME
● RUNNING THE GAME - attendants, on the computer, interactively are running the game according to the scenario through DECISION MAKING and ANALYSING the effects of the decsions. Through the game they obtain an experience in impact of different actions on the final decisions and its consequences
● OBSERVATION
● GAME CONCLUSION AND COMMENTING

PHASE IV - MAINTENANCE

● CHANGES AND INOVATIONS - independent from work with the group

Conclusion - Some Results of the Proposed Methodology

Management Game for strategic decision support is intended for teaching process with regular students as well as student who work and paralelly study at Faculty of Organizational Sciences. The game is also accepted as a tutorial support in the scope of managers seminars at Management Development Centre in Belgrade.

Positive Experiences

* *Benefits obtained using the new design method*

● By addopting a new design approach based on the system for decision making support, and using the rules of DSS design, a management game is designed in more versatile and sistematic way, so that many of the activities usually present before or during the game, can be completed in the design phase, or even avoided completely.
● Management game designed with these high standards can be conducted many times with minimal moderator training, because all the complex issues concerning the game flow were solved in the design phase. So, a game is mobile and transitive.
● Modifications and adaptations are not lethal for a game, because it is designed (as every DSS) to be resistant on necessary modifications (model base or data base filling in seldom cause minor changes in user interface).

* *Benefits obtained by adopting new educative forms in the field of strategic management*

● Some of the elements relevant for strategic decision making could not be expressed verbally.
● Studying on the basis of case solutions is the nearest to the real experience.
● Along with basic education goal, some positive side effects are obtained: creativity development, decision making flexibility, solution between important and less important, argumented definition of pros and contras, etc. - all of which are necessary features for strategic decisions maker.

* *Other benefits for game players*

● Familiarisation with new models and techniques of decision making.
● Experience in direct interactive work with computer (which is still one of tabues for majority of our managers).

Restrictions and Problems

● Need for smaller groups of students
● Need for sufficient number of qualified fellow-workers, i.e. game coordinators, and suitable hardware.

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