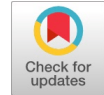


Electronic Mentoring as an Electronic Learning Technology in Public Service



A.V. Soroko, D.S. Shemonchuk, V.V. Bondaletov, N.F. Bondaletova

Abstract: *Electronic mentoring as an innovative technology in training is becoming increasingly popular in the public service. To this end, the authors of this paper have developed a conceptual framework for an intra-organizational learning environment based on the use of game modeling that would promote professional development and personnel evaluation. The basis of the intra-organizational learning environment design is the methodology of visual graphical modeling and the method of production rules construction. The learning environment ensures the variability and continuity of educational programs organized by position and by personnel procedures. In the course of preliminary testing, an initial measurement of the employee's professional competencies is performed, followed by comparison with the professional competencies expected for that particular position and the assessment of changes. The results of the assessment are transferred to a visual graphical model. Based on the results of the assessment, the system automatically puts the employee on reserve or assigns them a training program. The training process for a particular position is based on the principles of "learning through playing" and visual imitation. The passage of personnel procedures is based on a sequence of production rules; the application of gaming techniques means that the proposed scenarios are not the product of an abstract generalization, but a real personnel procedure. The article considers the problems and features of modeling the educational environment, as well as the experience of the research team of the Moscow Technological University in the development of production rules and the creation of simulators for civil servants to develop regulations and acquire new skills.*

Index Terms: *electronic mentoring, simulation learning environment, training and assessment of public service personnel.*

I. INTRODUCTION

One of the significant trends in modern organizations is the continuous training of personnel. This trend directly affects public service. The experience of leading countries shows that the professionalism of the staff, civil servants is the key to sustainability and success not only in competing organizations but also in the state as a whole. It forms the basis for further development of society [1].

At the moment, both in Russia and abroad, one of the traditional learning models is used most actively – mentoring in its various forms.

Based on advanced Russian and foreign experience, the government agencies of the Russian Federation also decided to implement the mentoring system into their work. Even though the mentoring method and its more modern forms have a number of advantages, they also have some serious drawbacks. The most significant of them are:

- exclusion of highly professional employees, invited as a mentor, from the production process;
- lack of pedagogical teaching methods.

As a consequence, the solution to these problems is the introduction of technologies of informal, extracurricular learning (informal, non-formal education, learning), based on the wide use of electronic games.

Such practice can be observed, for example, in the following companies. At MITRE Corporation the applicants must pass the 3D game called "Job of Honor". In Renault, a special game teaches the standards of service at the car service station. The experience of St. Petersburg deserves special attention. In 2016, the Personnel Council under the Governor of St. Petersburg decided to start the "Electronic mentoring" project. The created package of e-courses allows the newly hired public servant to undergo accelerated adaptation in the government agency and significantly improve their professional knowledge and skills. Nevertheless, it does not exclude the distraction of highly professional staff involved as mentors and other equally important shortcomings, among which one can name the following: the lack of feedback and visualization of results which makes it difficult to develop a training program; the inability to eliminate the subjective factor in deciding on the further development of the employee, etc. This has predetermined the need to develop an intra-organizational simulation and educational environment that would combine all the positive aspects of mentoring on its platform, stimulate the learning process and at the same time would be clear, interesting, and with an unbiased evaluation process.

II. LITERATURE REVIEW

In the modern world, the use of gaming technology in vocational education is not something new, previously unknown. Simulation modeling appeared in the 1930s as the first developments and research projects in the form of business games and was experimentally tested by Belchikov [4] and Birnshtein [5] at the Russian enterprises of Leningrad. Unfortunately, these studies and the use of business games were banned in the USSR from 1938 to mid-1960s. This Russian experience of simulation in the development and conduct of business games was the first in the world, 26 years ahead of the emergence of business games in the United States.

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In the late 1950s, due to the developments of American scientists (C. Abt, C. Greenblatt, Ph. Gray, G. Graham, G. Dupuis, R. Duke, R. Prude, and others), business games experienced a rebirth.

Among modern Russian scientists, promotion of gaming technology in the education system and vocational training was actively performed by V.S. Dudchenko [6, 7], Yu.D. Krasovsky [8], Ye.V. Petrushinskiy [9], and Kharshan'i D., Zel'ten R. [10]. Among the foreign scientists who made a significant contribution to the formation and development of gaming technology, one can name J. Newstrom [11], D. Turner [12], R. Luce [13], and D. Neuman [14].

A new round in the development of simulation games modeling occurred in the 1970s, with the introduction of personal computers into the educational process. The introduction of computers opened the possibility of widespread use of intelligent systems based on production rules, which were first used in artificial intelligence systems in 1972. The products, introduced by the American mathematician E. Post in 1943, nowadays are the most popular forms of knowledge representation in the construction of training systems. The model built on these rules most fully satisfies the representation of knowledge in the training system since training is built in a certain sequence of studying the material and going through personnel procedures. One of the training methods is simulation training in the form of highly realistic full-scale exercises. Full-scale exercises, combined with a structured evaluation process that includes both process and outcome indicators, are often considered the best approach to learning [15]. One of the significant advantages of this approach is that it triggers the gamification potential in order to increase students' motivation and involvement [16]. In their works, such authors as J. Wasserman, W.C. Kriz, J.T. Harviainen, T.C. Clapper [2, 3] describe a huge range of game simulations, noting that this approach can be fruitful in future work for possible transfer and expansion of knowledge about real (non-game) complex systems through games.

Thus, the main advantage of game modeling is the objectification of the existing reality through game scenarios. In our case, the principles and methods of business games are used to achieve the objectives of training, in which various processes related to the activities of public authorities and employees are simulated. When developing simulation models, we used the method of visualization model

construction based on production rules. The method of modeling in the visual simulation of space-time relations was widely used by Yu.D. Krasovsky in his consulting activities [8].

III. MATERIALS AND METHODS

Despite the undeniable advantage of simulation game techniques and the "Electronic mentoring" project in comparison with other forms of personnel training, the heads of Russian companies and state authorities do not pay enough attention to the use of e-learning methods and technologies [17].

The problems are primarily associated with the complexity of the description of situations and the weakness of their modeling tools.

Due to these difficulties, simulation modeling has a proactive character. Having analyzed the market of educational simulation games, we have concluded that none of the games presented on the Russian market are aimed at improving the administrative competence of the staff. Of course, there are objective reasons, arising from the lack of a single regulation of administrative activities in the organizations of the business sector. Therefore, our choice fell on public service. Unlike the experience of St. Petersburg, we offer electronic mentoring not as an electronic advisor in certain actions, but as an electronic game containing specific scenarios (cases) that help the student acquire specific competencies by solving them. In public service, simulation modeling can be used to simulate the following management processes: personnel management; interdepartmental coordination of documents; budget planning management; budget planning and execution [18, 19].

To this end, based on the use of game modeling, we have developed the concept of an intra-organizational learning environment that would promote professional development and personnel evaluation (Figure 1).

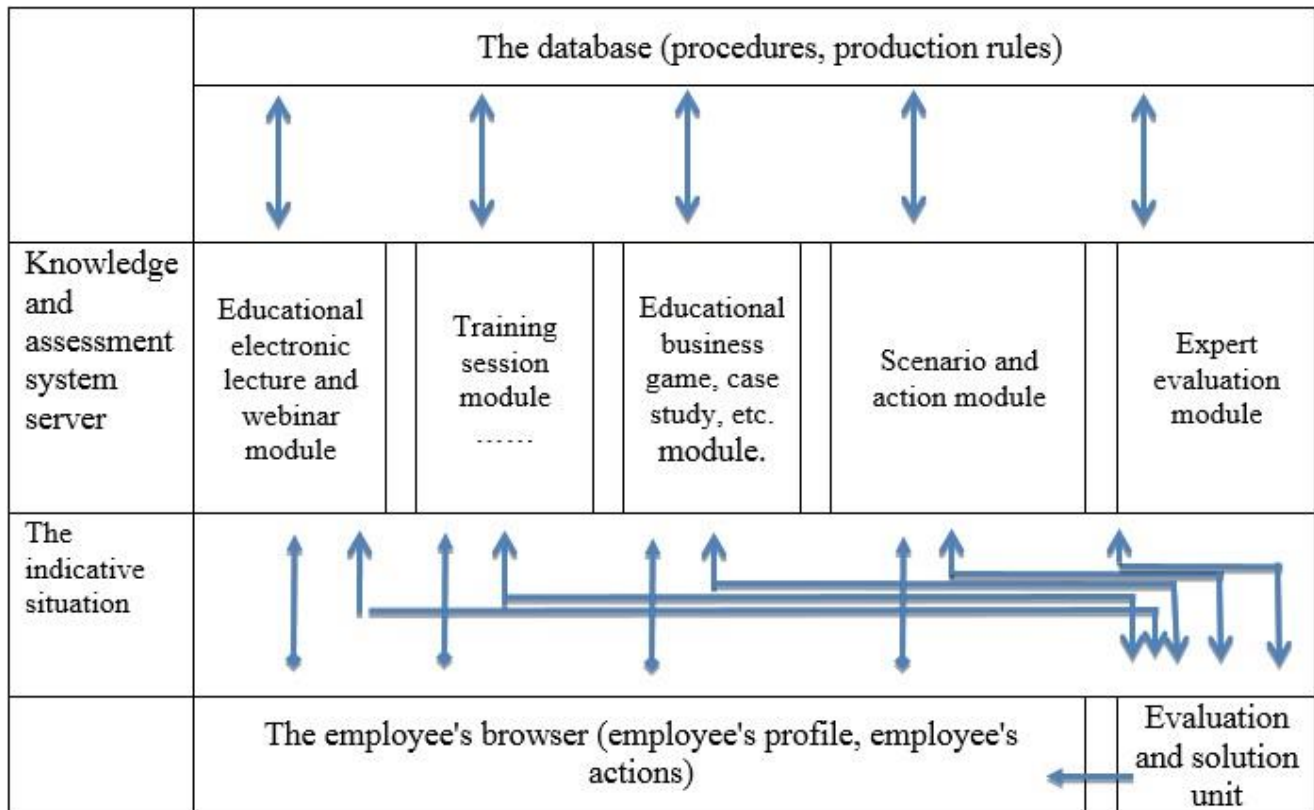


Fig. 1. Model of intra-organizational learning environment for professional development and personnel assessment based on the use of game modeling.

IV. RESULTS

As an illustration, we bring forward an element of the computer game called “Personnel management”. The example of one of the chapters of the game called “Leave management” shows the principle of setting up procedural rules that help the employees comply with the administrative regulations. The purpose of the development of such games (scenarios) is to reduce the number of incorrect or erroneous actions by public servants in the performance of their duties or personnel procedures.

The preparatory stage is the preparation of the game.

As a result of the preparatory stage, a normative reference base of the processes for holding business games will be formed. In case of any changes in normative legal acts, the normative reference base can promptly be updated.

Based on the formed normative reference base, it is formalized using a simulation model based on production rules.

In the process of formalizing the normative reference base in accordance with the principles of production rules construction a set of conditions $F = \{f_1, f_2, f_3, \dots, f_k\}$ and a set of actions $E = \{e_1, e_2, e_3, \dots, e_n\}$ need to be formed for the processes involved in the business game. Any procedure of the official regulations and the action corresponding to it can

serve as such conditions.

At the end of the process of forming a set of conditions and actions, it is necessary to check the non-contradiction and consistency of the F and E sets separately. For this purpose, one needs to use the developed specialized algorithms or apply existing methods of information processing.

Based on the prepared F and E sets, the production rules $P = \{p_1, p_2, \dots, p_i\}$ are formed in the following manner:

P1: If f_1 then e_1 ;

P1: If $f_1 \& f_2$ then e_2 ;

.....

P1: If $f_2 \vee f_2$ then e_3 ;

The production rule reflects a separate procedure in the personnel process. (Figure 2). In other words: If condition f_1 (A leave application has been submitted) takes place, then it corresponds to action e_1 (Check if the application has been signed by the managers);

If f_1 and f_2 (It has not been signed by all managers) then e_2 (Return the leave application);

If f_1 and f_2 (It has been signed by all managers) then e_3 (Approve the leave application) and so on.

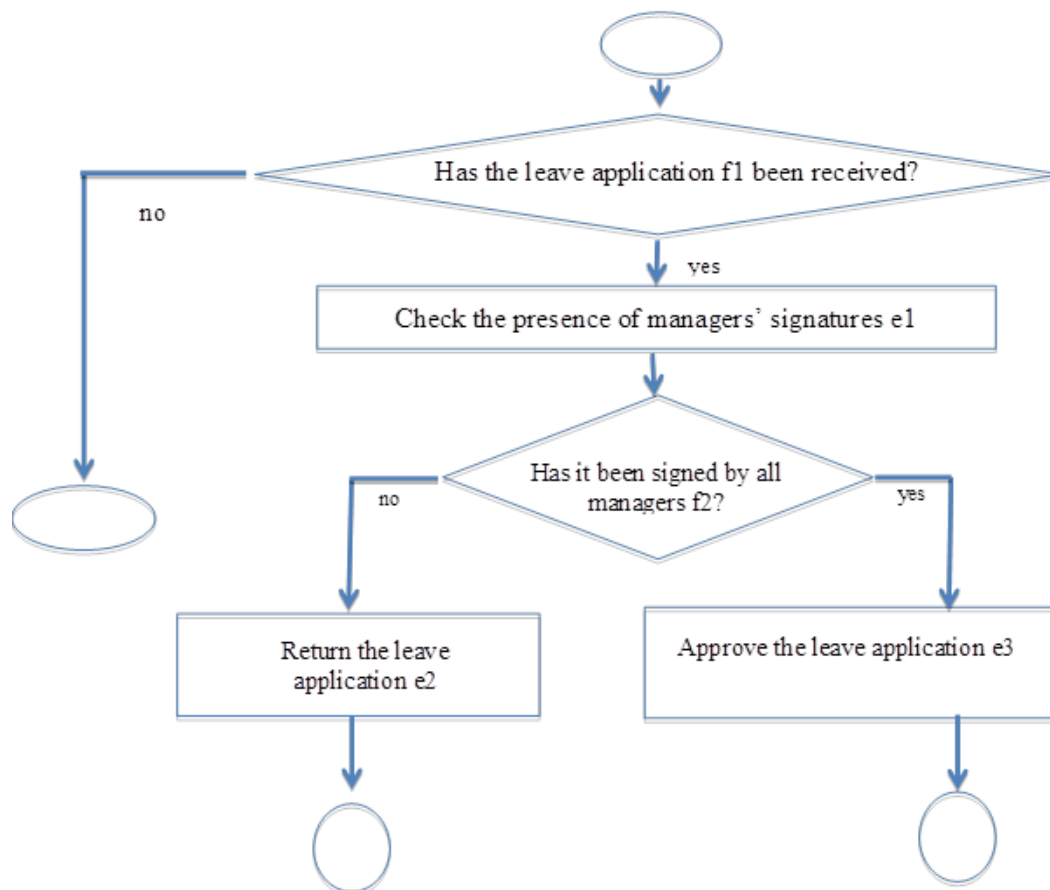


Fig. 2. Production rule p1.

From a certain sequence of production rules, a scenario, i. e. a certain set of production rules, is formed: $si = \{p1, p2, \dots pn\}$. Based on this sequence, business game scenarios are formed in the form of a set: $S = \{s1, s2, s3, \dots si\}$.

Step-by-step correct execution of scenarios during a business game forms a chain of results of positive productive rules, which leads to the acquisition of the actions algorithm by the trainees.

In the process of building production rules, the principle of the plausibility of the simulated situation must be observed. The description of the game activity should be as close as possible to real situations.

This principle is implemented through the following:

- the reaction of the external environment;
- correlation of document forms, developed for the game, with real document forms;
- the management decision-making procedures, and the ways of communicating them to the employees implementing them;
- interaction between the players in the game;
- organization of events by analogy to real practical situations.

After the creation of scenarios of the business game based on the processes and procedures, methodological materials are prepared. The methodological materials consist of the following materials:

- the training materials for the introduction to the subject area (process and procedure);
- the scenario program (the list of scenarios, the amount of time to complete the scenarios, the possible solutions);

- the materials that allow assessing the results of the scenarios.

The main stage is the active part of the game. The theoretical training of participants for the business game is carried out in accordance with the training materials developed at the preparatory stage. The acquisition of the necessary theoretical skills is carried out through various forms of training placed on the platform of the intra-organizational learning environment: lectures, webinars, seminars, training sessions, practical classes, etc.

The business game is designed in compliance with the following principles:

1. The principle of gradual immersion of participants in the training material. The principle of gradualism refers to the following provisions:

- the first stages of the business game should be carried out according to the most simplified scheme;
- adaptation and understanding of the basic principles of the business game;
- the formation of scenarios and the problem study is based on the experience of students in the business game.

2. The principle of uniform distribution of game information. This principle involves the organization of simulation games, in which the participant receives equal portions of new information on every game day.

At the beginning of the game, these are formalized scenarios (a list of procedures and processes that they must solve).

In the process of the business game, the participant is shown conditions f_j and scripts s_i . The participant in the game must choose the correct actions ez corresponding to a specified condition. The correct actions are performed by the participant independently, or they can be offered to choose from a list of possible actions.

The possible limitations in the process of passing scenarios include:

- changes in time limits for solving the scenario;
- introduction of additional scenarios in the course of the business game;
- rapid changes in the scenario solving conditions;
- changes in game settings.

Criteria for analysis and evaluation of results are as follows:

- comparison of problems and phenomena that took place in the business game;
- determination of the correspondence of the business game to the real situation;
- assessment of the competence level in the decisions made during the business game, their effectiveness, moral or value-based sense;
- identifying the causes of a particular behavior (positive or negative) shown by the participants in the business game;
- suggestions for changing the scenarios of the business game or the participants' actions in order to achieve the best result;
- suggestions for the improvement of the quality of professional activities.

Thus, we are talking about the creation of simulators, in which the trainee practices the implementation of solutions to production problems according to a strictly defined algorithm and, at the same time, acquires new knowledge and masters important professional competences [20].

V.CONCLUSION

We have used a simulation piece of one of the personnel processes called "Leave management" in the "Personnel management" computer game that is currently being developed. Of course, there is still a lot to be done before the game can be fully launched. For instance, the new stories used in the game need to be made more precise. To date, the teaching staff of the Information Technology in Public Administration Department (MIREA) is actively working on a package of different scenarios, including such modules as: "Introduction to the position", "Organization of office work in government agencies", "Procedure for the consideration of citizens' applications", "Corruption control in government agencies".

Besides that, there is a need to determine the relationship that will be copied from life, to set the rules, to define the roles, etc. However, despite the difficulties, simulation games are a very promising field [21].

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