

**MODELLING METHODS AND GAME APPROACH IN
CONTINUOUS EDUCATION****MODELĒŠANAS METODES UN SPĒĻU PIEEJA
TĀLĀKIZGLĪTĪBAS ATTĪSTĪŠANĀ**

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Modelling process, modelling methods, vocational education, gaming approach

Today people almost in all professions are faced with increasing demands on their knowledge and abilities, because the fast development of technologies and vocational demands require specialized and complex skills that need to be renewed frequently. Therefore, the role of continuing education and lifelong learning is becoming more and more important. This type of education differs from traditional academic education and requires integrated consideration of many factors to achieve timeliness and professional excellence of continuing professional courses. Some of these factors are as follows: previous education, market demands, automation of course development and delivery process, course customization possibilities, reusability of the learning objects, coherence with professional and educational standards. This paper illustrates a variety of issues to be taken into consideration in continuing education course development and suggests the training environment based on game approach for acquiring professional skills according to the market demands. Particular modelling methods are needed for designing such training environment. The modelling methods are used for the identification and representation of a large variety of concepts relevant to the problem scope. The knowledge management methods are used for the identification of market demands and for training environment design. The game-oriented approach is useful for a trainee to acquire and demonstrate professional skills according to the real life situation reflected by the game.

1. Introduction

Nowadays an ever increasing attention is paid to lifelong learning or continuing education. The necessity of continuing education is determined by fast development of technologies, working methods, and enterprise cooperation forms requiring employees to acquire novel skills and to improve knowledge of the fields that are close and not so close to their initial education. Several education institutions and training departments of organisations are involved in the design of the curriculum of continuing education. In this paper, we will focus on the situation in universities.

Universities have excellent experience of teaching academic knowledge. The knowledge allowing students to understand the most essential principles and techniques of the field that can be adopted for different situations in the field can be considered academic. It is estimated that a person with higher education can quickly master practical knowledge and successfully align with the labour market. Generally, the institutions of higher education are less experienced in implementation of continuing education where the key emphasis is put on the specific skills (not on general principles) that should be acquired at a fast pace and in high quality. It is very often necessary either to organize training courses in so called e-learning mode or to provide blended learning where the students do part of the training in the study room and spend the rest of the time working in distant way. Timely provision of the training course is one of the major difficulties because the design of the training course requires a long time. Therefore the knowledge reusability becomes more relevant issue in continuing education providing possibilities to develop training courses in a shorter period using the previously designed learning units.

In a specific context elementary unit of the course is called of the knowledge element. The knowledge element or a meaningful set of several knowledge elements is called a learning object. Selection of the learning objects for specific goals has been researched in greater detail, developing unified standards, for example, SCORM – Sharable Content Object Reference Model. At the same time, while the number of the developed learning objects has been increasing, their selection is becoming more complicated because of the necessity to take into account numerous, very often discrepant, selection criteria. The selection problem grows even more complicated in case the material of the course should be adopted to the individual requirements of each learner. In continuing training courses, that is a particularly considerable factor because the preliminary knowledge of the learners of the training group is much more distinctive than of those in academic groups.

The aim of this paper is to provide a technique for solving the three problems of the continuing education, i.e., (1) to identify the requirements of the course of continuing education taking into account the necessity of potential learner for university, standards, and the variability of the external environment, (2) to design the environment for the development of the continuing education course providing convenient formation of the training course and its modification accordingly to the changes in requirements, (3) to provide possibilities of personalized training.

In order to achieve the goal stated before, two main ideas are used:

- application of the modelling method for designing a continuing education course;
- gaming approach for the training the necessary skills.

The method is illustrated by a training course provided for developing project management skills.

2. The use of modelling methods for a design of continuing education curriculum

In order to make sense of the use of modelling methods in the continuing education training, understanding of the concept of the continuing education is very essential. The continuing education is defined [1] as education providing each participant with tune-in, specific body of knowledge. Vocational training is a process comprising instructional activities with a purpose of getting up-to-date field-specific knowledge and skills.

The vocational continuing education curriculum design process is done using the following steps [2]:

- requirement analysis of the curriculum identifying the target group and its needs as well as a training strategy for meeting the needs of the target group;
- identification of the training goals and defining training units;
- design of a training environment providing acquisition of the necessary skills;
- assessment of the results of the training activities providing continuous development of the vocational training curriculum.

A sequential design of the continuing education curriculum requires consideration of the main stages of the life-cycle of the training curriculum [3] and understanding of their interrelationships. Fig.1. shows the relationships between stages of the curriculum life-cycle and the steps of design of computer-based vocational training.

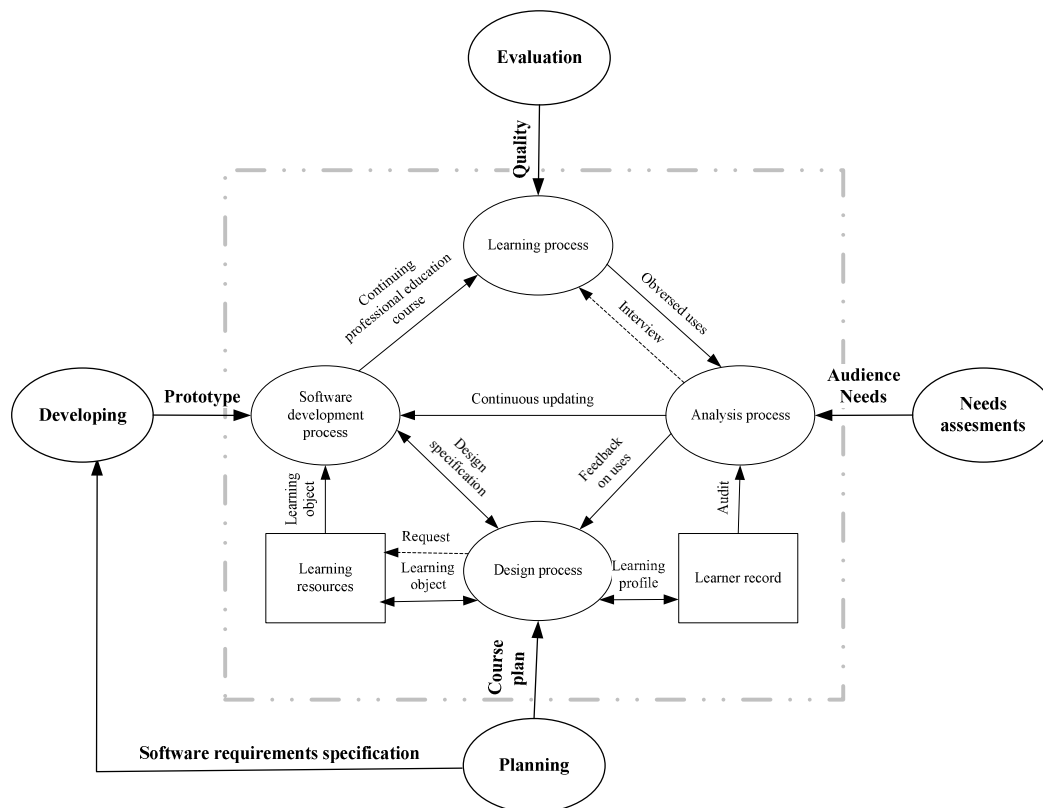


Fig.1. Relationships between the stages of the curriculum life-cycle and the steps of design of computer-based vocational training

The figure represents that the most important step of a successful development of a continuing training curriculum is identification of the needs of the target group. The continuing education course analysis is made accordingly to the requirements of the target group and the criteria for the quality assurance of the training. Developing the course, the results of the analysis described in the software requirement specifications are taken into account. In the process of the software design, the learning objects are widely used and are updated according to the field requirements and the demands of the target group.

While numerous interdependent factors should be considered for the curriculum design, it is necessary to find out a technique providing a transparent and easy understandable representation of the mentioned factors and their interactions. EKD (Enterprise Knowledge Development) is one of the most suitable techniques [8,9] (see Fig.2).

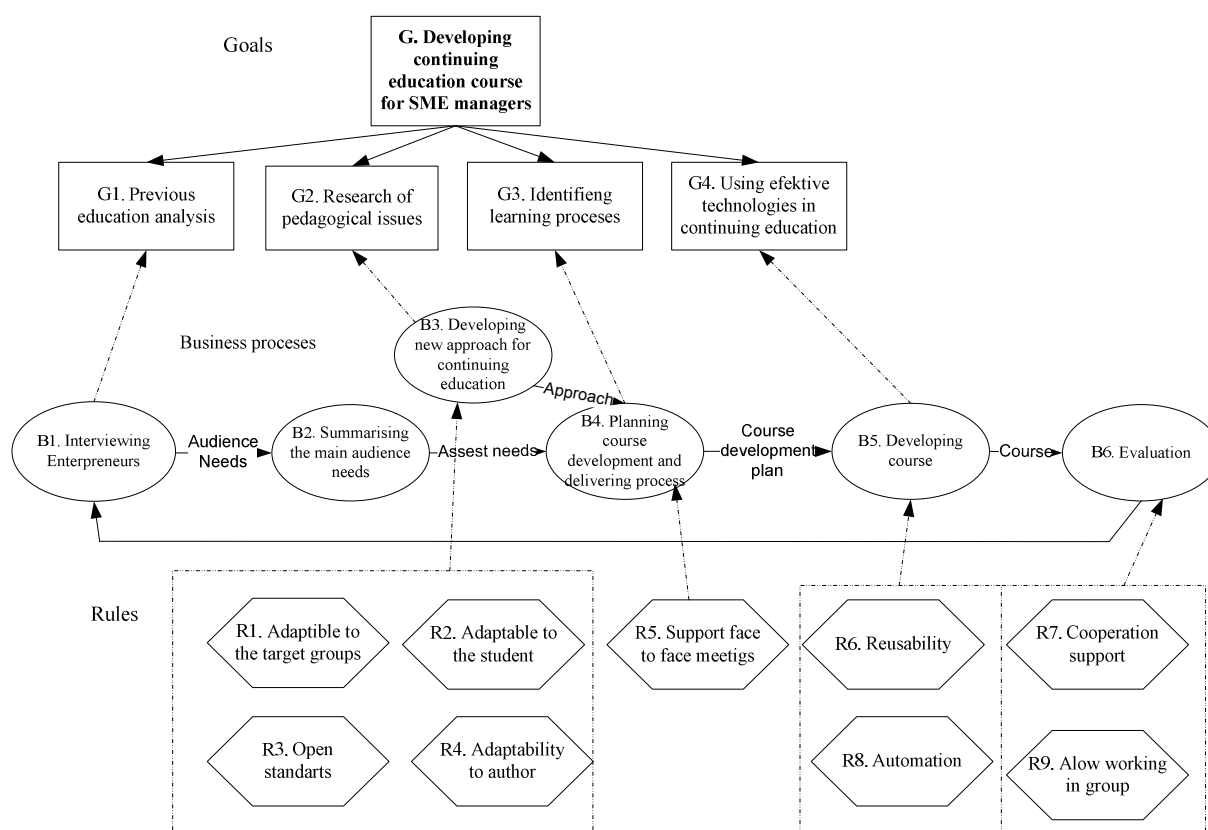


Fig.2. EKD model representing the design of continuing education curriculum.

3. Gaming in education

The range of games used in education is widely varying from play in pre-school period to role-playing, and computer-based simulations, and management games at later education stages. The current paper describes the advantages and disadvantages of gaming in the vocational continuing education. The first simulation games were used in the fifties of the last century in the USA [4]. Usually, the simulation games are used when the formal research and analysis methods do not provide a suitable solution of the problem. The most successful game applications have been achieved in military training and business and management learning.

Simulation game is a specific simulation model by what its user studies the system “from the inside”. The player’s previous knowledge and experience are increased by the experience

got during the game-play. It builds up the prerequisites for the formation of new knowledge whose truth is validated by the results of the experiments made during the game-play. The gaming initiates active attitude to the learning material and promotes its better perception – if the player does not want to fall out of the game, he/she should take ongoing proficient decisions. Such activities provide *learning by experience* comprising also *learning by doing*. The most popular reasons for game applications are the following [5]:

- to advance learning of fundamental concepts and principles;
- to demonstrate the applications of theory to practice;
- to improve all kinds of cognitive skills;
- to provide and support the trainees' laboratory and individual work;
- to develop the skills necessary for literature studies and research;
- to improve communication skills;
- to promote system thinking trainees and staff members.

The simulation games can be introduced into the learning course before applying the conventional didactic techniques with the aim of providing the trainees with advanced information on the subject and thereby preparing them for the study course. On other hand, simulation games can be blended with conventional education techniques in order to improve the trainees' professional skills. Moreover, the simulation games can conclude the learning course so as to perfect the trainees' professional skills and to promote better insight on the interconnection of the things [6].

The players, rules and information on the real-world system modelled by the game are the key components of the simulation game. The rules are defined according to the game scenario. They determine the roles of the players and participants' behaviour during the game playing. The game scenario is a description of the implemented simulation model. The roles of the participants are the elements of the model implemented by players according to the rules of the game.

During the game playing, the participants perform the proposed tasks and evaluate the acquired results. The organizers of the game prepare the tasks according to the ideas and opportunities established by preliminary actions. During the game playing, the players are provided by the information appropriate to the one used in the real-world system. The software, reference, internal documents, experts, etc. can serve as information sources.

The model implemented in a simulation game represents an existing or intended part of the real world. The game models it with accuracy that is reasonable for the validity of the study results. The kind of the model underlying an educational game and its accuracy are defined by didactic goals. In case of complex systems, the applied models highlight some real-world elements and processes at the same time hiding others. When it is decided to use gaming for a continuing education course, the course development methodology plays an essential role supporting both the process of the game design, and representing the game scenario. The next chapter describes modelling methods and the possibilities to apply them to the design of simulation education games.

There are several game-simulators available in knowledge and project management fields, for example, Virtual leader [11]. This game teaches leadership skills for leadership and managing negotiations. Another is KM Quest [12], the game for training in problem solving. In this game the solution guides the player through the encountered KM problems. Moreover, it allows the player to reach for the extra resources that she will need during the game-playing process. A further example is ITMG1 [13]. This game allows the player to recognize the daily problems in the IT department, but does not provide the necessary skills to solve them.

These simulators operate in a network environment and are based on problem solving. There is a particular scenario that needs to be strictly followed in these games to arrive at solutions.

Our solution proposes to develop a simulation game, which is context sensitive and offers users suitable skill acquisition service (see Section 5).

The game architecture will be designed of modules using service oriented system development architecture. Each of the modules will ensure the working of the project management skill acquisition environment showed in Fig. 4, Fig. 5.

4. The use of modelling methods in the design of game-based training curriculum

The following methods have been applied into the design of a continuing education curriculum [8]:

- 1) EKD – Enterprise Knowledge Development provides possibilities to represent knowledge of the organization;
- 2) EML – Education Modelling Language enables implementation of each stage of the software life-cycle;
- 3) LTSA – Learning Technology System Architecture describes the process of the computer-based training identifying sub-processes and data flows;
- 4) SCORM – Sharable Content Object Reference Model describes software behaviour and interface of components.

According to game theory, the design of a game scenario is the most essential task for the development of an education game. In addition to that, applying the gaming approach to design of a continuing education curriculum, it is important to describe the rules to be complied with the implementation of the game and to take into account the constraints and requirements to be considered during the design of the game. From the above mentioned methods, the EKD method is the most suitable to the defined requirements [8, 9]. The current method is applied to the design and representation of the game scenario and its constraints. In Fig.3, a rough model of the training environment for the improvement of project management skills is depicted. The chart represents three kinds of models. The goal model represents the achievable goals and available knowledge and skills. The process model describes the processes and actors taking part in the game implementation process. The rule model represents the rules to be to considered for organizing an education game.

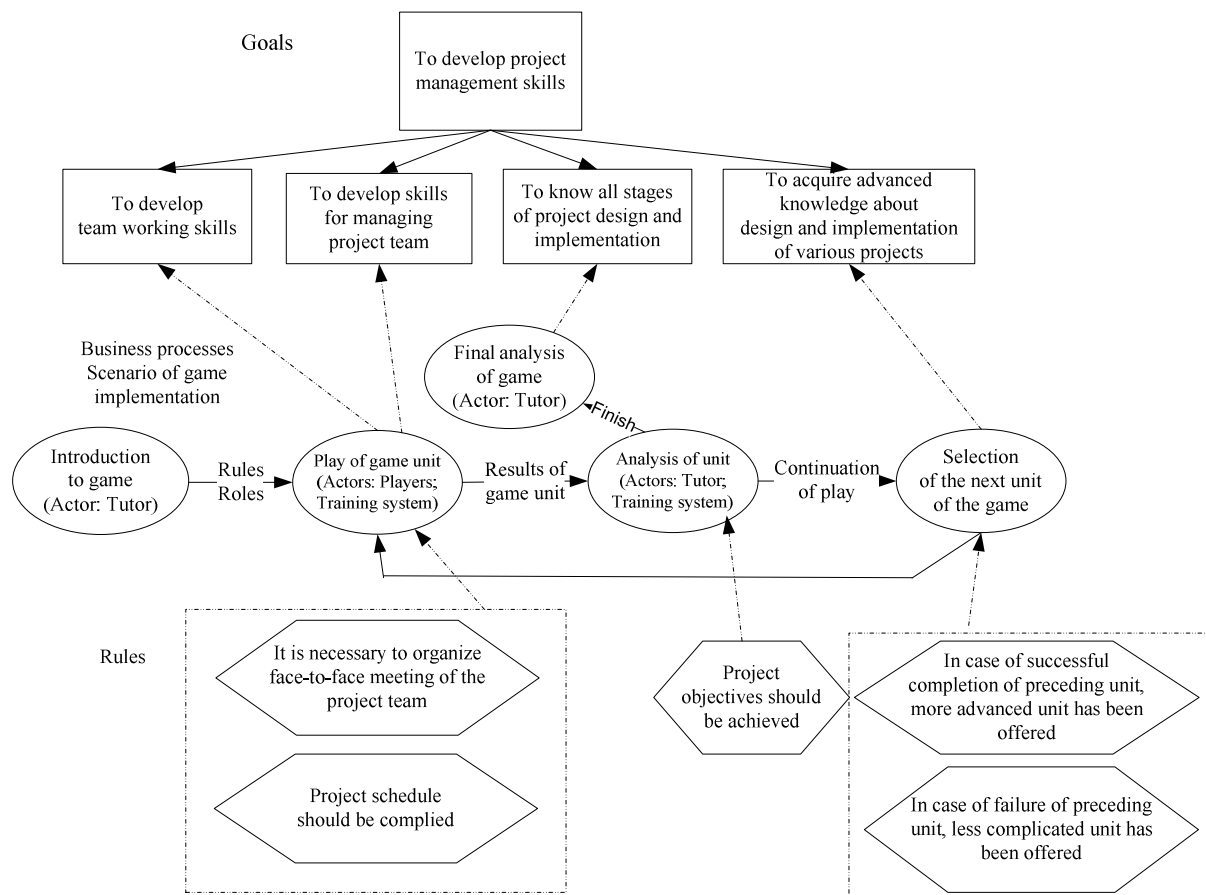


Fig.3. EKD model for the implementation of a continuing education course.

5. Conception of the project management training environment

The modelling method and gaming approach discussed above have been applied for the design of conception of the environment supporting improvement of project management skills. The mentioned skills are ill-defined skills, i.e. depending on the context they can be expressed in different ways as well as the same skill can be comprised by several skill categories. The key concepts in the current conception are the following ones: (1) skill, (2) situation where the skill can be expressed, (3) service of the skill, (4) service-oriented game scenario. The service of the skill can be expressed in two ways. On one hand, that is similar to the learning object because it is provided for the knowledge acquiring. On the other hand, that represents a particular service in the context of a service-oriented paradigm [10]. The service of skill provides the situation requiring a specific skill for the following-up of the activities. The framework of the game scenario has been constructed basing a the model of project development process defining key activities that should be carried out by each student. The service of skill adjusted to a specific activity increases the performance level of the activity. The modelling methods are applied for the identification of the skills to be improved and their development situations as well as for building models of project design processes. (see Fig.4).

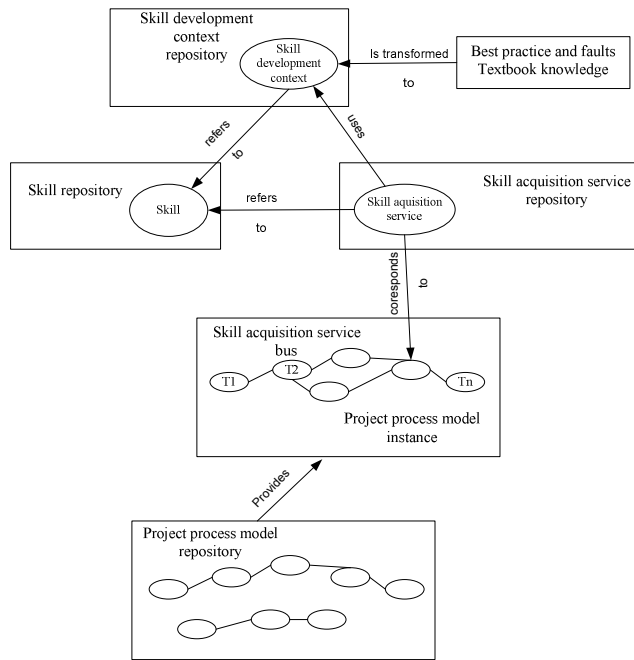


Fig.4. Conceptual representation of the environment providing acquisition of the project management skills.

The gaming approach is applied to designing a scenario for training of skills. The game scenario represents a process of a project design, during which a student should show the skill of running the project overcoming specific difficulties. By our definition, the difficulty has been overcome if the student has developed a particular project management skill. The range of the difficulties, i.e. services of skills is selected by skills training scenario designer (see Fig.5).

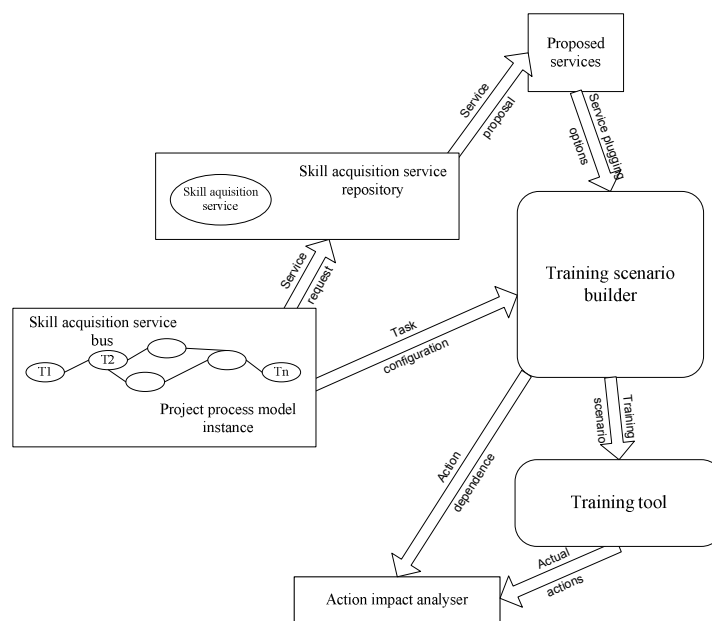


Fig.5. The representation of the environment providing training of project management skills.

In order to provide individual approach, it is necessary to analyse how the student's activities affect the increase of skills as well as to implement feedback on the skills acquisition service repository providing each student with a possibility to request the service.

6. Conclusions

The use of modelling methods and gaming for the development of a continuing education curriculum provides a wide range of possibilities to implement a more dynamic curriculum design process. The modelling methods serve for identification of the skills and determination of a curriculum implementation scenario. The gaming approach provides a possibility to define a learning object service-oriented architecture, i.e. to characterize the expected skills and to describe its acquisition scenario. Such approach promotes provision of individualized training because it offers possibility to traceably link the skills demonstrated by the student, and the repository of potential skills, and a training (gaming) scenario.

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Štāle G., Kirikova M., Tomsons Dz. Modelēšanas metodes un spēļu pieeja tālākizglītības attīstīšanā

Sakarā ar straujo tehnoloģiju attīstību, visās nozarēs pieaug pieprasījums pēc jaunām specifiskām zināšanām un prasmēm, kuras ir nepieciešams nepārtraukti pilnveidot. Šī iemesla dēļ, aizvien lielāku nozīmi izglītībā ieņem tālākizglītība un mūžizglītība. Atšķirībā no tradicionālās izglītības kursiem, tālākizglītības kursu izstrādē daudz lielākā mērā ir jāņem vērā tādi faktori kā: iepriekšējā izglītība, tirgus pieprasījums, kursa izstrādes un realizācijas automatizācija, kursa individualizācijas iespējas, mācību objektu atkārtotas izmantošanas iespējas, izglītības un profesionālo standartu saskaņotība ar tehnoloģiju iespējām. Šajā rakstā ir izpētītas modelēšanas metodes, kas ļauj atspoguļot augstākminētos faktorus un to savstarpējo saistību. Šīs modelēšanas metodes tiek izmantotas, lai izstrādātu vadlīnijas tirgus prasībām atbilstošu profesionālo prasmju iegūšanai, izmantojot spēļu pieeju. Spēļu pieeja apmācībā dod iespēju iegūt prasmes, kuras ne vienmēr ir precīzi definējamas. Modelēšanas metožu izmantošana tālākizglītības kursu izstrādē dod iespēju dinamiski pielāgot kursa saturu atbilstoši nozarē nepieciešamajām specifiskajām zināšanām un prasmēm.

Stale G., Kirikova M., Tomsons Dz. Implementing of Modeling Methods and Game Approach in Continuing Education Design

Today people in almost all professions are faced with increasing demands regards their knowledge and abilities, because the fast development of technologies and vocational demands require specialized and complex skills that need to be renewed frequently. Therefore, the role of continuing education and lifelong learning is becoming more and more important. This type of education differs from traditional academic education and requires integrated consideration of many factors to achieve timeliness and professional excellence of continuing professional courses. Some of these factors are as follows: previous education, market demands, automation of course development and delivery process, course customization possibilities, reusability of the learning objects, coherence with professional and educational standards. This paper illustrates a variety of issues to be taken in to consideration in continuing education course development and suggests the training environment based on game approach for acquiring professionals skills according to the market demands. Particular modeling methods are needed for designing such training environment. The modeling methods are used for the identification and representation of large variety of concepts relevant to the problem scope. The knowledge management methods are used for the identification of market demands and for training environment design. The game-oriented approach is useful for trainee to acquire and demonstrate professional skills according to the real life situation reflected by the game.

Штале Г., Кирикова М., Томсонс Д. Методы моделирования и игровой подход в развитии дальнейшего образования

В связи со стремительным развитием технологий, во всех отраслях возрастает спрос на новые специфические знания и навыки, которые необходимо непрерывно обновлять и пополнять. Поэтому, всё большее значение в образовании принимают процессы дальнейшего и самостоятельного обучения. В отличие от традиционных курсов обучения, в разработке курсов дальнейшего обучения, надо принимать во внимание такие факторы, как: предыдущее образование, рыночный спрос, автоматизация разработки и реализации курса, возможности индивидуализации курса, возможности повторного использования обучающих элементов, согласованность профессиональных стандартов и стандартов образования с технологическими возможностями. В данной статье изучены методы моделирования, которые позволяют отобразить вышеупомянутые факторы и их взаимосвязи. Эти методы моделирования используются для разработки основных направлений освоения профессиональных навыков, соответствующих требованиям рынка, с применением игрового подхода. Игровой подход в обучении дает возможность приобрести навыки, которые не всегда точно определяемы. Использование методов моделирования в разработке курсов дальнейшего образования даёт возможность динамически приспосабливать содержание курса сообразно необходимым отрасли специфическим знаниям и навыкам.