# Stages of developing narrative material for educational video games for the formation of managerial competencies in decision making

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### Abstract

The article presents a design algorithm for narrative and storytelling of an educational video game that develops the professional competencies of managers. The emphasis is on the importance of observing the principle of non-linear game plot for increasing the effectiveness of business games, their close connection with case studies and problematic learning. The stages of developing storytelling of an educational game for the formation of skills for making managerial decisions are determined. The results are summarized in a flow chart. The close relationship between narratalogy and ludology of the game is shown in the matrix of transformation of professional competencies and procedures for making managerial decisions into the rules of the game, their metaphorization and translation into script phrases. It is shown that the gamification of training exercises and situations is a synergy of creative and informational-analytical work with databases and game design project documents; designing effective collaboration and communication between all participants in educational and business processes.

Etappen der Entwicklung von Erzählmaterial für Lernvideospiele zur Bildung von Führungskompetenzen bei der Entscheidungsfindung

### Zusammenfassung

Der Artikel präsentiert einen Algorithmus zur Entwicklung einer Erzählung eines Lernvideospiels, mit dem die beruflichen Kompetenzen von Managern entwickelt werden. Der Schwerpunkt liegt auf der Wichtigkeit der Einhaltung des Prinzips des nichtlinearen Spielplots zur Steigerung der Effektivität von Geschäftsspielen, ihrer engen Verbindung mit Fallstudien und problematischem Lernen. Die Entwicklungsstadien des Erzählvideospiels für Manager werden festgelegt. Die Ergebnisse sind in einem Flussdiagramm zusammengefasst. Die enge Beziehung zwischen Narratalog und Ludologie des Spiels zeigt sich in der Matrix der Transformation von Fachkompetenzen und -verfahren, um Managemententscheidungen in Spielregeln umzusetzen, diese zu metaphorisieren und in Drehbuchphrasen zu übersetzen. Es wird gezeigt, dass die Gamifizierung von Trainingsübungen und -situationen eine Synergie aus kreativer und informationsanalytischer Arbeit mit Datenbanken und Projektdokumenten für das Spieldesign darstellt. Gestaltung einer effektiven Zusammenarbeit und Kommunikation zwischen allen Teilnehmern an Bildungs- und Geschäftsprozessen.

| Keywords: | Schlüsselwörter: |
|---|---|
| professional competencies; | berufliche Kompetenzen; |
| managerial decision making; | Management-Entscheidungsfindung; |
| development of computer games; | Entwicklung von Computerspielen; |
| storytelling of training game | Storytelling-Trainingsspiel |

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# 1   Introduction

### 1.1   Formulation of a research problem

The realities and challenges of the information society have prompted a rapid transformation and modernization of education, changing its priorities, in particular, increasing attention to the formation of so-called "soft skills", and therefore the focus on the formation of a socially active, self-directed, highly adaptive personality, which seeks to maximize opportunities to constantly learn and make informed and responsible choices in a variety of life and professional situations. This is especially true in the context of the widespread introduction of information and communication technologies, which have changed the paradigm of performance, shifting it to the space of personal management.

At the same time, the high demand for professional managers is felt by the business world and employers as important customers of education. The intensification of information exchange, the complexity of the information economy, the need to take into account, in a timely manner, the huge number of heterogeneous factors that are constantly changing, causes in the power structures and business circles the urgent need to develop effective technologies for optimizing management decision making. Currently, various expert management decision support systems and information systems based on artificial intelligence are being actively developed to identify, consolidate and adjust knowledge in different subject areas, as well as to simulate complex creative tasks. However, they do not make decisions for the manager, but are only an auxiliary tool. Important in the decision-making process is the human factor (emotions, intuition, insight, experience) that is not covered by the technological system.

Therefore, it is advisable to intensify the scientific discussion and practical development of the IT-integrated methodology for the training of the human manager and the professional training of the managers. In particular, the creation of virtual training environments in which the future leader has the opportunity to form and comprehensively develop business communication competencies and management decisions. A good form of such virtual learning environments is computer games.

### 1.2   Analysis of recent publications on the problem of research

With the rapid development of information technology and the continuous increase in the amount of information required for work and professional communication, computer training is gaining popularity. E-learning courses and systems are developed and successfully used in the educational process, methods and results of their application are researched and analyzed. Scientists are constantly developing and proposing new, more sophisticated methods that can significantly improve the quality of learning [1], [2], [3], [4], especially the means and principles of computer games [5], [6] , [7], [8], [9], [10].

D. Gray points out that any game contains such components as: game space (topos), time (chronos), artifacts, purpose, boundaries, rules, including rules of interaction [11]. The rules define the game algorithm not only as a system but also as a story consisting of a plot as a stream of events (prologue, exposition, tie, development, culmination, denouement, epilogue) [12], narrative (discourse, instruction to understanding of storytelling [13], [14]) and storytelling. In this case, storytelling is not understood as a component of history, but as a way of conveying information and finding meaning [13]. The narrative as an instruction (or teaching, moral inference, soft rule) has many interpretations in different situations of cognition. And the storytelling as an algorithm for providing guidance is always specific according to the communicative context.

If narrative research has a significant historiographical tradition (primarily represented by the works of A. J. Toynbee, J. Derrida, J. M. Lotman) and has developed into the science of narratology [15], then the term "storytelling" needs to be clarified. Scientists considered it as a technology for business, marketing, advertising and PR [16], as well as as a pedagogical method of communicating information to the audience in the form of interesting, touching educational stories with real or fictional characters [17], [18], [19], [20]. In this perspective, storytelling is developed in the context of teaching the disciplines of specialization [20], [21], [22], [23], the formation of the communicative competence of higher education applicants [24].

We see the origins of storytelling in the oratory practices of antiquity and the genre of medieval Latin literature, "Exempla," which were instructive stories, parables, and examples of life used in sermons and reasoning as a method of enhancing emotional and motivational influence on audiences [25]. It is noteworthy that storytelling is associated with oral communication (such as kobzar, rhapsodies, minstrels, etc.). However, with the onset of the information age, oral communication has undergone significant changes, and staging is

widely used in modern media (such as transmitted storytelling [21]), in particular in the gaming industryThe latter acquires a trait of interactivity, because it enables the user to construct a story, and therefore embodies the pedagogical principle of "Active learning" - learning in the process in which a person learns actions and experiences in order to improve productivity. One of the main competences that creates active learning is the ability to solve problems [26, 6], and therefore it is effective for managers training [27].

Thus, it can be stated that accumulated a considerable amount of information and knowledge about storytelling as a method of information submission [12], the expediency of its use in teaching subjects [20], the history, essence and criteria of efficiency [13]. However, to date, no specific methodology has been proposed for the design of storytelling for computer-based training games, in particular for the formation of important management competencies.

**The purpose of the article is** to substantiate the methodology the stages design of narrative and storytelling of the educational game for the formation of competencies in making managerial decisions. This will become the basis for the development of educational computer games of a professional direction.

## 2   Research results

Any game has a story that starts with the hero's journey. Even if the character is not embodied in an inspired form, which is usually associated with a human or animal. The concept of "spirituality" by dictionaries is interpreted as the ability of a subject to arbitrary movement. In computer games, they can be anything like balls, cars, dots, and more. Storytelling is an important compulsory component, often guaranteeing the effectiveness of the game as an educational form and even its commercial success. Like every educational material, every game is not simply a repository of particular facts and events, but it builds a coherent narrative, even if it does not appear as verbal text.

The narrative of the game is defined by the development of events as a process that begins and ends; the heroes, the artifacts that influence them, as well as the metaphor, mythological structures and interactivity of the plot, which causes constant feedback [28]. All this brings the game, the story, the project activity and, in fact, the business game closer. D. Gray notes that "business, like many other human activities, has emerged because of goals. Only the presence of a target forces one to move from point A to point B; from where we are, to where we want to get. There is a tension between the current state A - the initial condition - and the desired future state B - the target. What is in the interval, we will call the space of the problem. It is him who must be overcome in order to achieve the goal" [11]. The generalized structure of the business game is presented in Fig. 1.
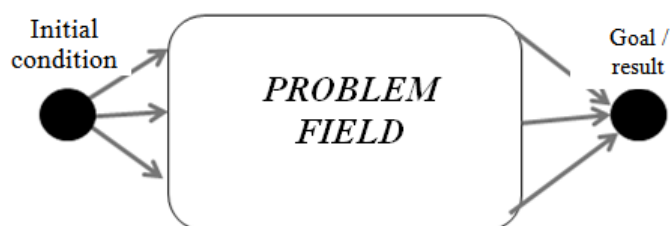


*Fig. 1. Structural model of business game*

The game narrative in this structure is embodied in a series of steps to overcome the problem space that create a cause and effect chain that leads to the desired result - the finish of the game and the achievement of a goal for business.

D. Gray points to two types of business games [11]: for a specific purpose (business process optimization, reengineering, productivity and sales enhancement, management decisions, etc.); and for the unspecified purpose of developing innovative ideas, developing innovative projects, etc. In this case, the narrative of the game may be associated with the folklore motif of "go there, we do not know where".

There is already experience in successfully comparing game scenarios and mechanics (rules) and features of fairy tale V.Ya. Propp [29] to automate the creation of effective game narratives [6]. In particular, scientists have proposed the "Canvas Narrative" [9], which is an effective tool for developing narratives and staging games.

The principle of nonlinear interactive narrative is especially important for creating educational computer games, because it is the communication of the game designer (game author, teacher) and player (reader, viewer, user, student) that forms the managerial decision-making competence. Yes, the game designer programs a range of options for choosing a character for which the player has to make a decision. In this case,

the nonlinear interactive narrative of the game makes it possible to feel the different effects of the decisions made, to plunge into the world of case-based tasks. All this forms the space for synergy of such methodological areas of study as Case Study and problematic. After all, the primary task of managers is to solve problems that are the core of any solution.

It is useful if the content of the educational business game is a case of practice (precedent, history, experience, story, problem and its solution), which clearly demonstrates some theory. CASE - cognitive acceleration in the process of natural sciences, developed by English scientists M. Sheyer, F. Edey and K. Eyte in the 90's. XX century. It is to use specific cases (situations, stories) to jointly analyze, discuss, or make decisions in a particular section of the subject. Working with CASE involves parsing or "solving" a specific situation in a particular scenario, which involves working independently, "brainstorming" within small groups, public speaking with the presentation and protection of the proposed solution, a screening of knowledge of the facts of the case [1] .

Close to case study is problematic learning, the essence of which is the formation of problematic situations and cognitive difficulties in the educational process, for which students need to acquire new knowledge or make intellectual efforts. The problematic situation that students are aware of and accepted for solving becomes a problem. A problem that specifies the parameters and conditions of the solution becomes a problematic problem or problematic task. Problem tasks are fundamentally different from training tasks. The purpose of the latter is not to find a new way of solving, but to consolidate a method known to students. Therefore problematic can be called learning to solve non-standard tasks, during which students learn new knowledge, acquire new skills, make certain managerial decisions [30].

The models of project management [31], thinking design [32] were based on the methodology of narrative development and staging of educational business game, which develops management decision making competencies (Fig. 2); informational blocks for gameplay of documents, including Bible story [33] and Canvas Narrative as a tool for counteracting the game's plot [7]; [9].
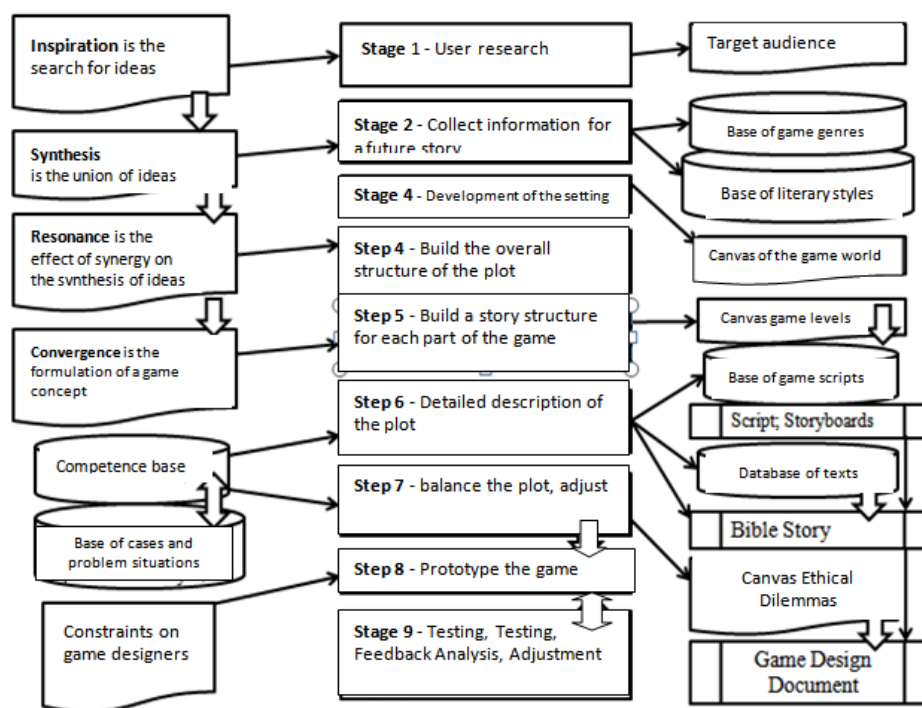


***Fig. 2.** Stages of development of narrative and storytelling of educational business game for formation of competencies of decision-making of management.*

*The first stage* is marketing, as it explores the needs and interests of the user of the future game and determines the target audience.

*The second stage* is closely linked to the input data (game genre, literary style, etc.) and consists of three actions: studying the input data; identify the typical characteristics of these data; making your own list of associations associated with the input. Typical input characteristics include:

- detailed definitions of game genres, which are usually classified by type of gameplay (for example, arcade game, game in 3D-shooter);

- detailed definitions of game genres with many examples;
- a comprehensive list of story techniques used in a wide variety of media content;
- an exhaustive list of literary genres, their distinguishing features; a description of the age restriction system.

As a result of successful implementation of these actions, a set of elements for plot construction is formed. At this stage there is also a list of the main game metaphors, which is determined by the literary and artistic style and genre of the game.

*The third stage* - development of game setting - environment, entourage, time, place, conditions and circumstances, in reality the events, properties of reality, modeled by a game designer or media product [34]; it is a set of rules and internal history of a particular environment [35]. This is the history of the game world, the factors, the backstory, the driving forces, the nature and character of the world aesthetics of the game. Setting consists of components of fiction (fantasy) and entertainment. Business game setting can be based on problem situations and case events that contain certain resources and limitations. The construction of such a setting is essentially a project development (Fig. 3).
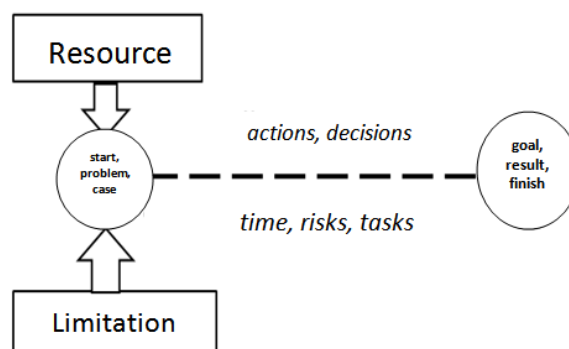


*Fig. 3. Project problem as the core of a business game*

*The fourth stage* is the formation of the story chain, to build the structure of the plot. Depending on a number of factors, the most important of which is the story volume and depth of the upcoming game. For a short story, a small game will fit a simple structure - one to two parts per plot, main action, climax and solution. A great storyline involves more parts. For example, two pieces for exposure, one for the lash, eighteen for the main action, etc., will total twenty or even more.

*The fifth stage* is the development and detailing of the plot structure for each of the parts (locations) of the game. Important here is the category of time that determines the type of plot: linear or chronic (with excursions, discrete, linear-parallel), plot with reverse chronology, concentric or causal, dynamic or dynamic.

*The sixth stage* is a detailed description of the plot. It is a combination and prescribing of information that was obtained in the first stages. At this stage, scripts, storyboards are developed, game texts (in-game dialogues and stories) are written. As a result, game design documents are created such as: "Bible Story" - a collection of storylines and game story characters, including concept art; "Script" - a collection of game scripts; Storyboards are storyboards of the game.

*The seventh stage* is the prototyping of the game. In order to link all the story units, to take into account the main and alternative stories, it is advisable to apply knowledge maps that help visualize the game plot, instantly cover the whole storyline, see flaws and discrepancies.

*The eighth stage* - balancing the plot, adjusting - finding all the logical differences, verifying that the plot exactly matches the input data, especially game genre, literary and artistic style, subject matter and target audience, purpose. An effective tool for balancing the effects of the game's plot is the Canvas Ethical Dilemma of the game [36], which enables the identification of ethical contradictions in the plot and corrects the pragmatic and educational influences of the game. During the balancing phase, the balance of forces and capabilities of the heroes as well as the effects of the game is checked, that is, compliance of the scenario with those competences that should be formed as a result of the business game.

*Stage nine* is playability testing, testing, feedback analysis, and adjusting business game narratives.

It is worth noting that the narrative of the game is closely linked to its ludulogy, since rules like game mechanics are at the heart of the metaphorization and value of action in the game space. A computer game has a clear or hidden narrative that is created through metaphorization when concepts from one subject area convey the properties of concepts in another area. Metaphorization is understood by scientists as the process of coding, the conversion of character characters from a certain sphere of knowledge and ideas into another, taking into account the conversion of human language into a programming machine language, as well as the

channel of electronic communication, the context that affects its decoding and perception [28]. Thus, in game design it is customary to distinguish game-rules that determine the purpose of the game and the conditions of winning (goal); and play-rules implementing the basic actions (manipulations) of the player [7]. Therefore, real decision-making procedures are translated into play-rules by means of metaphorization determined by the e-game genre: strategies, logic games, quests, simulations and more. The results are summarized in Table 1.

| Management decision making | Play- rules | Game-rules | Metaphor | Script phrase |
|---|---|---|---|---|
| Problem analysis | Select | Match | black box, cave, puzzle, broken artifact, violation of the ban, situation | The queens go to the garden, they are late for home. |
| Detection of restrictions | Shoot - the term invites the player to touch or influence the object at a distance | Destroy | obstacle, enemy, lack of something, treachery, conflict | The stepmother gives the stepson poisoned food. Fight with a snake. |
| Identifying alternatives | Manage | Avoid | Intelligence, investigation | The hero is single and goes looking for the bride |
| Decision making | Random | Create | tower, wedding, move, deal | At the disposal of the hero gets a magical object. |
| Implementation of the solution | Move | Avoid | travel | The hero goes to foreign countries. |
| Monitoring the implementation of the decision | Write | Match | test and reaction to it | Serve the king for three years. Dressing, cheating, exposing. |

*Table 1:* The matrix of transformation of procedures and actions for management decision making into game rules, their metaphorization and translation into script phrases

For the development of computer-based training in a professional-oriented game, it is important to account for and metaphorize the necessary and sufficient base of competencies, which is usually formulated in the curricula of disciplines and fixed in the educational and professional training program of specialists [37]. For example, the general decision-making competencies include the ability to plan and manage time, systematic analysis of the information environment of different levels, analytical and synthetic processing of arrays of information, etc. Accordingly, in a computer game, the metaphors and markers of the aforementioned competencies may be: timelines and resources (elements of game dynamics), a map of the game world and puzzles.

It is noteworthy that the actual writing of the game plot is a kind of practice in project activity and managerial decision making, because "The plot means to move through the dangerous terrain in history and to resist the ten branched possibilities of choosing the right path. A plot is a choice of writing events and their design over time" [12]. The game designer should create a flow of stories in the game based on what is happening (current, course of events) and how it is happening (details). Leading game design practitioners recommend the use of storytelling patterns, as it is estimated that there are only 39 different storylines [38]. This helps the game designer to concentrate on the details of the game's history, without wasting time developing the story process [39].

Within the framework of the Erasmus + KA2 international project "GameHub: university-business cooperation in the gaming industry in Ukraine", students of the Department of Information and Media Communication create project teams for the development of gaming computer concepts. In particular, the fantasy plot of the game "Forseti" was developed with fantastic-mythical elements of Scandinavian orientation. The rules of the game are based on operations for managerial decision making.

# 3   Conclusions and prospects for further research.

All of the above gives reason to state that computer game is a unique product of the information world. It is a storytelling of computer culture, largely based on databases. So playing training exercises and management decision-making situations is essentially a synergy of creative and informational-analytical work with databases and project documents of game design, constructing effective collaboration and communication between game designer (teacher) and player (student), as well as business processes.

The method of creating narratives and staging of educational business game is aimed at improving the quality of the content component while improving the adaptability and effectiveness of the process of developing game training environments that form the competencies for managerial decision making. They are in demand in a wide range of governing structures.

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