

# Perspectives on Computer Gaming in Higher Education

Edited by: Anna Wach-Kąkolewicz, Roberto Muffoletto

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in Higher Education**



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Bogucki Wydawnictwo Naukowe  
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Reviewer: Agnieszka Iwanicka, Adam Mickiewicz University in Poznań, Poland

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*Anna Wach-Kąkolewicz, Roberto Muffoletto*

## Introduction

Gaming has a long history in education. It is a history of pedagogical and theoretical conflicts. These conflicts have centred not on gaming itself but on the nature of education, knowledge identification and transmission, evaluation, methodology and power. I have included the notion of power because all educational matters may be reduced to conflicts based upon power and control. Control over the learner, the teacher, and the curriculum: its delivery and its evaluation. Conflicts, ideological in nature, may be traced back to Dewey and his student centred learning environment that was in opposition to the Thorndike behaviourist (connectivism) system centred approach. Vygotsky and Montessori, as well as others have entered in the discussion on rational instrumentality and cognitive development in relationship to a process that is structured upon system design and a system of control.

Serious models of gaming in education (and here we would include simulations), whether it is in early education or higher education demand upon the institutional system a shift from an instructional framework to a learning one. Instructional frameworks and designs focus on a means-end outcome (instrumental rationality) where as a learning paradigm considers process and experience as the key elements.

Distance education provides us with a good case. Traditionally distance education (with its roots in the 19th century in the form of correspondence models) attempted to mirror the designs and expectations of traditional classrooms where the teacher/instructor was the centre and holder of knowledge and power. Early, and in many contemporary, computer based instructional environments we find “self-paced learning packages” or computer generated, delivered and evaluated individualized instruction. In both cases the learner is “acted upon” by a system focused (paradigm) on outcome-based education.

Change the paradigm to a learning environment and the value of process takes precedence over fixed outcomes. There is a shift from behaviourism to constructivism, from system to learner, and from behavioural outcome to reflection and understanding. This paradigm focused on the learner and a learning environment challenges the status-quo, institutional expectations, and centres of instructional



control. The point is, that the instructional/learning paradigm shifts effect the total system bringing about systematic changes in institutional behaviour and expectations.

It is in context that this collection of essays on computer gaming in higher education not only offers an alternative to the traditional classroom format but also a challenge to the institution.

If designed as a “student-centered learning environment” the game needs to be student centred, a collaborative (not individualized) practice, based on problem identification and solution(s), and is focused on process over product. This challenges not only the institution but the faculty as well. How will faculty move away from the podium and being the voice of authority? How will students be re-socialized to their new role as collaborator, decision maker, problem-identifier, question-asker, and reflector?

Gaming in education offers the learner and the institution (We refer to institution because it is an institutional challenge) a rich and challenging opportunity “if” the theoretical and political issues are recognized and addressed. The danger is that education wears a new set of clothes but repeats the same behaviours.

This book is the result of work carried out by an international team of academics from Polish, Estonian, Finnish and Spanish universities in the project *Virtual Game Method in Higher Education* (project number 2014-1-PL01-KA203-003548), implemented within the Leonardo da Vinci Transfer of Innovation programme. To get broader overview of the issue, we also invited other authors to cooperate in creating this publication. In the first part of the book the authors explain to the reader general insights on the game method in higher education. The second part is focused on experience with the virtual game method through the GAME project, research results and the technical description of the games itself.

In the opening chapter Anna Wach-Kąkolewicz describes a constructivist approach in teaching in higher education. She presents learning-teaching process in the behaviourist and the constructivist paradigm, pointing at surface and deep approaches to learning, both connected with the way classes are designed and with the adopted teaching model embedded in a certain paradigm. She particularly appreciates student-centred approach and designing classes according to constructivism alignment, showing as the example Kolb learning cycle as the framework for teaching in higher education.

The essence of the next chapter written by Karolina Daszyńska-Żygadło and Michał Pająk is that serious games can create new learning opportunities for students. They present the problem of sustainable development education in the light of the complexity of the issue and potential usage of serious games in the learning process. They postulate that dilemmas connected with sustainable development arise from the complexity and interactions, both current and historical, between stakeholders and other people or institutions involved in the process and environment. In the authors’ opinion such coupled issues create challenge in education process that can be addressed through simulations and serious games.

The third chapter, by Artur Tomaszewski, presents the game theory applications in business simulation games. This article introduces and describes game

theory with special emphasis on its two game models: a two-player non-zero-sum game and the bargaining set model. The author clarifies the similarities and the differences between game theory and simulation games and shows examples of the use of games in business. In the final part of the chapter the author describes two selected business simulation games.

In the fourth chapter written by Iurii Novak, Inna Novak and Nataliia Verniuk business simulations are described as one of the teaching strategies at universities of Ukraine. The authors point out that in Ukrainian universities and business schools it is more often believed that business games are a great way of studying topics that are difficult to manage only by reading textbooks. They show the potential and usefulness of business simulations in increasing students knowledge and skills as well as other features like creativeness, motivation, enterprising.

Yuliia Fernos, Oleksandr Shkolnyi and Nataliia Verniuk in their chapter focus on a collaborative virtual teaching and learning in logistics education based on the example of the Ukrainian and German universities. They state that one of the most important criteria of their effective work is collaboration with other educational establishments, attraction of foreign students and academics despite the fact of a great competition between universities globally. Further they describe their project “German-Ukrainian Master Program in Logistics” (called GUMLog), with the purpose of building the knowledge in a logistics management collectively.

The last chapter in the first part of the book written by Blanca Miedes Ugarte, Celia Sanchez Lopez and Maria de la O Barroso Gonzales focusing on strengthening students' social and environmental awareness through business virtual games. The authors discuss possibilities and limitations of using virtual gaming business in higher education, in order to support and improve students' skills in the company's management. They rise the changes in higher education and the emergence of edutainment (from the broadcast model to edutainment), describe the characteristics of virtual business games, suggesting the social and environmental concerns to be carried out to scenarios of business games in order to make them more valuable for students.

In the second part of the book we deal with the experience of the virtual game method through the GAMES project. The chapter written by Kandela Õun, Merle Mägi and Airi Noppel titled “Learning business by simulation game. Survey among students who played developed games” presents summary of research results carried out among all project participants. The authors report and discuss chosen issues concerning students' assessment and opinions on the virtual business game created during the project. The chapter gives a broader overview and a platform for the next chapter written by Tiina Tiilikka and Arja Haapaharju.

The following authors focus on game-based learning in entrepreneurship studies in the social and health field in Finland. Besides trying to find out pros and cons of gamification and digital games in education they show the entrepreneurship in the social services programme as well as discuss how gamification research and practice of social and health care are bound together. They also present selected research results concerning a Finnish group of students.

Last two chapters are devoted to technical description of the Game-project. In the chapter “Scenarios for virtual management games”, Sergiusz Strykowski presents the administration domain of Business Arena platform and explains what game scenarios are and how to go through the game.

In the last chapter Aleksandra Gawel describes the management of virtual game during the educational process. She points at a few steps including: preparing for classes, arranging the work of students, starting and progressing the game, and evaluating games results. She presents students’ and teachers roles in designing and teaching classes with the use of virtual games, emphasizing student-centred approach to learning.

The use of computer and Internet based learning environments present a number of learning opportunities and models for pedagogical and institutional change. This collection of essays and reports included in “Perspectives on computer gaming in higher education” provides a platform for further research, development, and inquiries into the nature of gaming and learning.

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# Constructivist Approach in Teaching in Higher Education

## Introduction

Today we observe a specific paradigmatic turn in academic teaching, expressed in the formula “the shift from teaching to learning”, which emphasises shifting the focus from the approach based on the transmission of educational content towards students and the role of the teacher as a facilitator (Barr, Tagg, 2000 as cited by: Sajdak, 2013; Malewski, 2010; Dylak, 2009). Among scholars who advocate this approach to learning and teaching at university are, among others, Ramsden, 1992, Biggs, Tang, 2007; Entwistle, Ramsden, 1983; Prosser, Trigwell, 2014). These authors suggest that the directive, expository teaching process should be replaced by the process with students and their multilateral activity at its centre. Thus, they propose a shift from theory and educational concepts based on the behavioural paradigm to the constructivist, humanistic, or even critical-emancipation paradigms (Sajdak, 2013)<sup>1</sup>. In each of them, teaching and learning are understood and defined in a different way, different roles are attributed to students and teachers, and different strategies and teaching forms are used. Hence, depending on the adopted paradigm, teachers use different models of designing and teaching classes in their academic practice (Martin et al., 2000; Trigwell, Prosser, 2004; Trigwell et al., 2005; Prosser et al., 2008; Prosser, Trigwell, 2014). Among a number of cognitive and social learning theories widely spread in recent years, it is constructivism that seems to be the best known (Fry et al., 2009).

The aim of this paper is to discuss the constructivist paradigm in academic teaching. Thus, I will discuss learning from the behaviouristic and constructivist

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<sup>1</sup> A. Sajdak distinguishes four paradigms: behaviouristic, constructivist, humanistic and critical-emancipation one. In my article, I will refer to only two of them, discussing in detail the constructivist paradigm, which is a lot more likely to be applied in academic teaching than the humanistic and critical-emancipation one.

perspective, comparing selected categories of the learning-teaching process. My intention is to present surface and deep approaches to studying, which mainly depend on the teaching assumptions adopted at the beginning of the educational process. Against this background, I will describe David Kolb's learning cycle, indicating possibilities of the application of his concepts as the framework for designing classes in accordance with constructivist assumptions. I will discuss the tasks and roles of students and the teacher, as well as teaching strategies that may be applied in each of the phases.

## **Learning in the behaviouristic and constructivist perspective**

When searching for the answer to the question of what teaching really is, how we understand it and how we design the whole process, it is necessary to begin with the definition of learning. Pritchard (2009: 2) distinguishes a few examples of definitions according to which learning is:

- A change in behaviour as a result of experience or practice;
- The acquisition of knowledge;
- Knowledge gained through study;
- Gaining knowledge of, or skill in, something through study, teaching, instruction or experience;
- The process of gaining knowledge;
- A process by which behaviour is changed, shaped or controlled;
- The individual process of constructing understanding based on experience from a wide range of sources.

The above definitions stress differences in the understanding of this concept, showing learning in various perspectives and paradigms (from the behaviouristic to constructivist one). To put it simply, behaviourism focuses on observable change in behaviour as a result of experience and discounting any mental activity (Pritchard 2009: 6). It concentrates on providing stimuli for remembering, applying mechanisms of positive (reward) and negative (punishment) reinforcement for specific results (Sajdak, 2013). However, the last of the above definitions, which belongs to the constructivist approach, is in contrast to the other ones, indicating that learning is a more complex process. Constructivists believe that learning consists in the learner's giving meaning in the process of the construction of individual cognitive structures, which takes place thanks to his or her involvement and multilateral activity. In accordance with the assumptions of constructivism, learning occurs when (Johanssen et al., 1999 as cited by: Pritchard, 2009: 32–33):

- the construction of knowledge rather than the reproduction of knowledge is paramount;
- new information is built into and added onto an individual's current structure of knowledge, understanding and skills;
- learners construct their own knowledge in an active way (active learning strategies);
- learners use their previous knowledge in building new knowledge;

Table 1. The learning-teaching process in the behaviourist and the constructivist paradigm

Behaviourism	Constructivism
Communication	
<ul style="list-style-type: none"> <li>- Unidirectional communication</li> <li>- Teacher-student relation</li> <li>- The transmission of information</li> </ul>	<ul style="list-style-type: none"> <li>- Multidirectional communication</li> <li>- Student-student, student-group, student-teacher, group-teacher relations, etc.</li> <li>- Social interaction, discussions, negotiations</li> </ul>
Goals and effects of teaching	
<ul style="list-style-type: none"> <li>- The aim is to remember/name/identify messages and the ability to reproduce them at an exam</li> <li>- Predominant encyclopaedic knowledge/memorizing</li> <li>- The resulting knowledge is often short-term, declarative and not interrelated</li> </ul>	<ul style="list-style-type: none"> <li>- The aim is to construct permanent knowledge, which is meaningful for the learner</li> <li>- Students establish the scope of goals on their own</li> <li>- The aim is to shape cognitive curiosity and intellectual competences, such as: analytical skills, searching relations, synthesising, critical thinking, reflectiveness</li> <li>- The resulting knowledge is permanent, holistic, declarative and procedural</li> </ul>
The teacher's role and competences	
<ul style="list-style-type: none"> <li>- The teacher is the main source of knowledge</li> <li>- The teacher is an expert in the subject area</li> <li>- Presentation skills, the teacher is an orator</li> </ul>	<ul style="list-style-type: none"> <li>- The teacher is the designer of students' cognitive activities</li> <li>- The teacher is a moderator and a facilitator</li> <li>- Teaching skills</li> </ul>
The learner's role and motivation	
<ul style="list-style-type: none"> <li>- The student is a passive recipient of information</li> <li>- His or her task is to understand and memorize the educational content, and then to reproduce it</li> <li>- The motivation to study is usually external and is stimulated through the system of reward and punishment</li> </ul>	<ul style="list-style-type: none"> <li>- The student is an active builder of his or her own cognitive structures</li> <li>- Involvement and multilateral activity</li> <li>- The motivation to study is usually internal, aroused cognitive curiosity</li> </ul>
Teaching strategies and forms	
<ul style="list-style-type: none"> <li>- Frontal teaching is dominant, lecture is the main teaching method</li> <li>- Individual or collective work</li> </ul>	<ul style="list-style-type: none"> <li>- Active teaching strategies, such as: discussion, case study, brainstorming, Oxford debate, project</li> <li>- Group work</li> </ul>
Educational media and IT	
<ul style="list-style-type: none"> <li>- Presentation media (multimedia presentation, OHP, film), reinforcing a verbal message</li> </ul>	<ul style="list-style-type: none"> <li>- Task-based media, media in the hands of students, worksheets, case study sheets, materials making students involved</li> </ul>
The arrangement of educational space	
<ul style="list-style-type: none"> <li>- Classes in lecture rooms in the amphitheatrical layout</li> </ul>	<ul style="list-style-type: none"> <li>- Classrooms are laid out for group work, space may be arranged in any way depending on a purpose</li> <li>- Classes may also take place outside the university building</li> </ul>

Source: Author's own work.

- learning involves the use of variety resources;
- authentic tasks in a meaningful context are encouraged;
- reflection on prior knowledge is encouraged;
- collaborative work is encouraged;
- autonomy is encouraged.

Constructivism as a theory of learning and cognition explains how people learn, at the same time becoming the framework for designing a teaching process as it emphasises what students need to do to construct their knowledge, which, as a result, indicates what learning activities teachers should plan for them in order to achieve the assumed teaching goals and effects (Biggs, Tang, 2007: 21). Table 1 shows a comparative description of various elements of the learning-teaching process in the behaviouristic and the constructive model. The analysis lets us grasp certain trends in the approach to the teaching process and to highlight the most important differences. We chose the following categories: communication, the teacher's role and competences, the learner's role and motivation, teaching goals and effects, teaching strategies and forms, educational media and IT, and the layout of educational space.

## **Approaches to learning: surface and deep approach**

The existing body of literature and studies (Marton, 1975 as cited by: Fry et al., 2009) show that students in the learning process have specific approaches to learning, called surface and deep approaches, which do not result from their individual characteristics and motivations to study (although learners differ when it comes to the degree of their interest and involvement in studies), but are connected with the way classes are designed and with the adopted teaching model embedded in a certain paradigm (Biggs, Tang 2007; Fry et al., 2009). In other words, a student's approach to study will largely depend on the way classes are taught by the teacher. Thus, good teaching can influence students to take a deep approach, while poor teaching can pressure students to take a surface approach.

A surface approach in the learning process is an attitude focusing on the acceptance of new facts and ideas unquestioningly, with no relation or reference to previous knowledge, as the result of which new information often fails to become incorporated in the existing cognitive structures. What is the characteristic feature of learners is their intellectual passivity, which comes down to memorizing specific contents and then reproducing them at an exam. Students with such an attitude take a narrow view and focus on details. They often fail to distinguish principles from examples. Usually, they stick closely to course requirements and do not seek to acquire additional knowledge. They tend to be motivated externally, in the fear of not passing an exam. A deep approach, in turn, focuses on studying new facts and ideas in an active and critical way, relating to prior knowledge, thus allowing students to construct new cognitive structures and rebuild the existing ones. Students who take a deep approach have the intention of understanding, engaging with, operating in and valuing the subject. They actively seek to understand the course content, search subject material, ask questions and

look for answers. They take a broad view and relate ideas to one another. They are motivated by interest; they tend to expand their knowledge, going beyond the course requirement (Lublin, 2003). As a result, depending on the adopted approach, specific cognitive processes are initiated, starting from the easiest, such as memorising and naming, to the most advanced ones: explaining, hypothesising or reflective thinking (Table 2). They are shaped through the undertaken learning activities, becoming the desired final effects of learning. The analysis of table 2 shows that by using a surface approach, we shape intellectual competences that are indispensable for learning, working and lifelong development only to a slight extent. It is the deep approach to learning that is richer in terms of quantity and quality as it helps students – in addition to acquiring permanent and holistic knowledge of the subject area – to gain a wide array of cognitive skills.

Biggs and Tang (2009) list factors which encourage students to adopt a specific approach. They also include factors on the teacher’s side, related to designing and implementing the learning process that I will refer to. Students’ surface approach to learning is particularly reinforced by:

- teaching step by step following a list, not revealing the intrinsic structure of the subject or field;
- assessing for independent facts, especially when the teacher requires only short and multiple-choice answers;
- giving not enough time to complete the task; focusing on coverage at the cost of depth;
- causing excessive anxiety or low expectations of success (Biggs, Tang, 2007). Students’ deep approach, in turn, is shaped by:
- teaching in a way that helps to keep the structure of the topic;
- teaching to make students active in responding (by asking questions, presenting problems to be solve);
- teaching by relating to students’ prior knowledge, building on what they already know;

Table 2. Cognitive level of learning activities

Surface Approach	Deep approach
– Memorise	– Memorise
– Identify, name	– Identify, name
– Comprehend: sentence	– Comprehend: sentence
– Paraphrase	– Paraphrase
	– Describe
	– Comprehend: main ideas
	– Relate
	– Argue
	– Explain
	– Apply: near problems
	– Relate to principle
	– Hypothesis
	– Apply: far problems
	– Reflect

Source: based on Biggs, Tang (2007).



- challenging and getting rid of students' misconceptions;
- assessing for the understanding and the ability to connect the information than for independent facts;
- creating positive atmosphere during class, allowing students to make mistakes and learn from them;
- focusing on the depth of learning rather than on coverage;
- using teaching and assessing strategies that help to reach intended course outcomes (Biggs, Tang, 2007).

The above factors are of the key importance for shaping students' approach to learning. This paper shows that a surface approach is reinforced by the behavioural assumptions concerning learning, while a deep approach is embedded in the constructivist paradigm with a student and his or her activity in the centre of the process (student centred-approach). A deep approach to study is largely shaped by properly designed classes, which are usually taught by reflective teachers with a high level of pedagogical competence. They result not only in permanent and holistic knowledge of learners, but also in their high intellectual competence.

## Kolb learning cycle as the framework for teaching in higher education

When planning constructivist classes, David Kolb's learning cycle may appear useful (Kolb et al., 2001). It is the basis of the concept of experiential learning. It initiates a deep approach to learning, assuming that learning is a process during which knowledge is created or reconstructed through experience (Kolb, 1984). In other words, "experiential learning is a continuous process and implies that we all bring to learning situations our own knowledge, ideas, beliefs and practices at different levels of elaboration that should in turn be amended or shaped by the experience – if we learn from it" (Fry et al., 2009: 15). Although Kolb learning cycle presents stages of learning (Fig. 1), it may be the framework for the constructivist design of the teaching process and its particular phases may become successive stages in the scenario of classes.

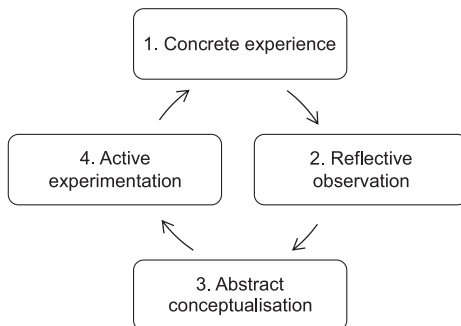


Fig. 1. Kolb learning cycle

Source: Author's own work based on: Kolb et al. (2001).

The first stage of Kolb cycle involves concrete, direct experience. In this phase, the teacher's role is to propose a problem task to learners, thanks to which they will be able to refer to their previous experience or new experiences will be generated (e.g. in the cognitive sphere). When solving a problem situation, students should refer to their prior knowledge, the skills they have gained so far and previous experiences. The task that students have to cope with

should be interesting and new, and should be designed for the zone of proximal development (e.g. Vygotsky, 1978). In other words, it should draw on learners' existing competences and go beyond the skills that have not developed yet. At this stage, the following teaching strategies and methods may be useful: brainstorming, a case study, a film, drama, a simulation, a game, experiencing real situations, etc. (see Knowles et al., 2009). The teacher's role at this stage of his or her work with students is to introduce them to the problem in the appropriate way, establish goals and principles of work on the task and help them in identifying roles (Table 3).

In the phase of reflective observation, students make an analysis of concrete experiences that they had in the past or of those that occurred during classes. The key element of this stage is reflection on action (Schön, 1983), which is necessary in the process of shaping knowledge and skills. Learners analyse the events that took place, interpret them with reference to prior knowledge, and search for their meaning. In this phase of teaching the following methods are especially recommended: discussion in small and big groups, mind mapping, SWOT analysis, a case study, blogs, and presentations prepared by students. The teacher's role is first of all to encourage learners to reflect deeply through asking questions that will stimulate them to share their observations, insights and opinions. It is particularly important that the atmosphere of openness, trust and safety should be ensured (Table 3).

The third stage of Kolb cycle is abstract conceptualisation. Learners' role is to move from a concrete experience to a more abstract level. In this phase, students make generalisations, draw conclusions, formulate general directives, principles, rules, criteria, and discover mechanisms. The teacher's role is to help learners to construct them and supplement them with those elements that were missing in students' work. The teacher thus organises and sums up contents and asks questions that will allow students to come to the right conclusions. Teaching strategies that will be useful in this stage of the work with students include talks, lectures with presentations, reading articles, or course book contents (Table 3).

The last phase of Kolb cycle is active experimentation, which involves implementing theory in practice, implementing specific skills. The teacher's role is to design tasks thanks to which learners will make use of the acquired knowledge in real; they will practice and improve their skills. From the educational point of view, the following activities and methods should be applied: projects, programming, performing practical tasks, training periods, internships, and writing assignments, such as a dissertation or an essay. At this stage, the teacher should support learners, moderate their work and encourage them to try out their newly acquired knowledge in practice, so that they could gain full competence necessary to start another round in the presented cycle (Table 3).

## **Conclusion**

The above proposal of designing classes in accordance with Kolb learning cycle is an interesting solution embedded in the constructivist paradigm that could be

Table 3. Teachers' role in Kolb cycle

Phase	Students' role	Teacher's role	Activities to use/ teaching strategies	Teacher's questions that might be asked
1. Concrete experience	<ul style="list-style-type: none"> <li>- Being involved fully and freely in new experiences</li> <li>- Uncovering new information that requires a response on their part</li> </ul>	<ul style="list-style-type: none"> <li>- Introducing a problem task which will help students refer to their previous experiences or which will generate new experiences</li> </ul>	<ul style="list-style-type: none"> <li>- Brain storm</li> <li>- Case study</li> <li>- Role plays</li> <li>- Field visits</li> <li>- Skills practice</li> <li>- Games</li> <li>- Group task</li> </ul>	<ul style="list-style-type: none"> <li>- Are there any questions about the task?</li> <li>- Is there anything else you would like to know?</li> <li>- Have you thought about ...?</li> <li>- Could you say more about it?</li> <li>- Have you ever experienced...?</li> </ul>
2. Reflective observation	<ul style="list-style-type: none"> <li>- Making/having the time and space to be able to analyse and reflect on their experiences from different perspectives</li> </ul>	<ul style="list-style-type: none"> <li>- Asking questions that will encourage learners to reflect deeply</li> <li>- Motivating learners to share their observations, insights and opinions</li> <li>- Taking care of the atmosphere of openness, trust and safety</li> </ul>	<ul style="list-style-type: none"> <li>- Small/large group discussion</li> <li>- Mind mapping</li> <li>- SWOT analysis</li> <li>- Participant presentation</li> <li>- Group reports</li> <li>- Blogs</li> </ul>	<ul style="list-style-type: none"> <li>- What happened?</li> <li>- How did you feel when...?</li> <li>- How did you notice about...?</li> <li>- Do you agree? Why?</li> <li>- What's your thought?</li> <li>- Do you realise that...?</li> </ul>
3. Abstract conceptualisation	<ul style="list-style-type: none"> <li>- Interpreting what was discussed earlier</li> <li>- Forming and re-forming and processing their ideas</li> <li>- Drawing conclusions, learning new rules</li> </ul>	<ul style="list-style-type: none"> <li>- Guiding the learner</li> <li>- Helping the learner focus on the implications of the experience and reflection phases</li> <li>- Making the learner acknowledge having learned something new</li> <li>- Providing a summary</li> <li>- Asking questions to enable the learner to draw his/her own conclusions</li> </ul>	<ul style="list-style-type: none"> <li>- Lecturers</li> <li>- Demonstration</li> <li>- Reading assignments</li> <li>- Sum up discussion</li> <li>- Poster</li> </ul>	<ul style="list-style-type: none"> <li>- What did you learn from this?</li> <li>- What does all of this mean to you?</li> <li>- Have you gained a new insight about?</li> <li>- Are there any lessons to be learned?</li> </ul>
4. Active experimentation	<ul style="list-style-type: none"> <li>- Making connections between the learning setting and the real world</li> <li>- Making use of new skills in practice, in new situations</li> </ul>	<ul style="list-style-type: none"> <li>- Providing advice;</li> <li>- Encouraging the learner to try to improve new skills.</li> </ul>	<ul style="list-style-type: none"> <li>- Project</li> <li>- Poster</li> <li>- Essay</li> <li>- Field visits</li> <li>- Practicing new skills</li> </ul>	<ul style="list-style-type: none"> <li>- How can you apply this?</li> <li>- What's your own idea for the project?</li> <li>- How could you do this better?</li> <li>- Can you see any difficulties?</li> <li>- Do you have any questions concerning the issue?</li> </ul>

Source: Author's own work based on Training Trainers for Development (1995).

applied in higher education. There are a lot of arguments in favour of adopting and implementing it. First of all, it is in line with the most recent pedagogical and psychological developments in the theory of teaching, which means that it puts the student and his or her activity (cognitive, task-based and emotional) in the centre of the educational process. Thanks to the possibility of the application of various teaching strategies and forms of work in each of the phases, it allows learners to refer to their prior knowledge, previous experiences, and introduce new situations, which – subject to observation, analysis and reflection – will lead to establishing cognitive patterns, rebuilding the already existing ones and incorporating them into the structures of knowledge. It also enables active experimentation and the application of theoretical solutions, as the result of which skills are shaped. It promotes the development of social competences, such as teamwork abilities or communication skills. Finally, which was emphasised before, it helps to shape intellectual competences, which are useful in many fields of human activity, including professional work. It stimulates cognitive curiosity and internal motivation, which is important in lifelong education and broadly defined development. In other words, the proposal of designing and teaching constructivist classes shapes and reinforces a deep approach to studying, which has also been confirmed in some studies (Newble, Clarke, 1986; Sadlo, Richardson, 2003 as cited by: Richardson, 2005). At the same time, Kolb's concept is quite a comprehensible model for those teachers who take their first steps in constructivist academic teaching, mostly owing to well distinguished phases that help the teacher to design educational goals, select proper activities for students and classroom methods. It offers a modern alternative to traditional classes, based on the transmission of information. It may also become an inspiration and a model to follow for a number of academic teachers who want to develop their teaching competences.

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# Educating About Complexity and Sustainability Through Serious Games

## Introduction

Sustainable development is becoming a pressing matter these days. It can be defined as “*development that meets the needs and aspirations of the present without compromising the ability of future generations to meet their own needs*” (World Business Council for Sustainable Development). It is usually viewed as a challenge for society as a whole. We have to remember that business entities are also an important part of the economic system, and therefore, they are a key element of transition towards a sustainable future.

Our paper aims to present the problem of sustainable development education in light of the complexity of the issue and potential usage of serious games in the learning process.

We postulate that dilemmas connected with sustainable development arise from the complexity and interactions, both current and historical, between stakeholders and other people or institutions involved in the process and environment. Such coupled issues create challenges in the education process that can be addressed through simulations and serious games.

Our paper is organized in the following way: the second part is focused on sustainability and corporate social responsibility, the grounding of theories and empirical research in the field. The third part refers to the literature review of the learning process and system complexity, while the fourth part presents examples of serious games as suitable tools for education purposes on complex issues. The fifth part summarizes and concludes.

## **Sustainable development – theoretical background and empirical evidence on importance for the business**

For companies, sustainability and corporate social responsibility can play an important role in foreseeing environmental conflicts and distributional conflicts, and can be defined as taking actions which reduce the extent of externalized costs or avoid distributional conflicts (Heal, 2005).

According to Porter and Kramer (2006), there are four arguments that companies use to make the concept eligible:

1. Sustainability (economic, social and environmental performance). According to this, companies should operate in ways that secure long-term economic performance by avoiding short term behaviour that is socially detrimental or environmentally wasteful.
2. Moral obligation is understood as the duty of companies to be good citizens; for example, by operating within the law, such as honestly filing financial statements.
3. License to operate is the most pragmatic approach of the four mentioned. Companies identify and choose only those social issues that matter for their stakeholders and make decisions about them.
4. The reputation argument is used by companies to justify CSR activities as those which will improve company's image, strengthen its brand and enliven morale.

Referring back to the major goal of a company's existence, shareholder wealth maximization theory stands in opposition to stakeholders' wealth maximization. Initially, Friedman (1970) stated that the only goal of a company is to maximize shareholder's wealth. This theorem was followed by many, including Aupperle et al. (1985), who presented the opinion that firms implementing CSR policies and activities can get distracted by adopting additional goals, which can then lead to a negative impact on their profitability. Shleifer (2004) also argued that acting towards stakeholders' satisfaction is considered counterproductive from a purely financial standpoint.

While proponents of the stakeholder wealth maximization theory (Freeman, 1984; Donaldson, Preston, 1995) present the standpoint that ethical behaviour and profit are not mutually exclusive. Although money spent on ethical issues is not paid to shareholders over the short term, it might enable the firm to be more profitable in the future. Ethical behaviour can lead to reputational advantages, such as attraction of sensitive consumers (Guenster et al., 2010) and investing in the moral area can be seen as an opportunity to protect the firm against future risks (Godfrey, Hatch, 2007).

Following the theoretical discussions, much empirical research has been conducted in order to test whether imposing additional (CSR) goals on firms distracts them and reduces profitability, or if it has the contrary effect and improves financial performance. To date, more than 100 studies have examined whether corporate social responsibility (CSR) metrics predict or impact financial performance, with a variety of results. There are several studies that attempt to compare

previous findings, among which are Margolis and Walsh (2003) and Margolis et al. (2007). These studies show that a clear conclusion about relationship between CSR and financial performance has not been reached. Elsayed and Paton's (2005) study lists potential sources of biases and problems in the previous studies that might cause inconclusive results. Additionally, problems lie in specifics of the business, i.e. type of industry the company comes from. The research of Daszyńska et al. (2016) show that companies from every sector react differently to CSR performance in terms of value effect; what is more, some sectors are totally immune to any CSR activities, like, for example, the telecom industry.

It can be concluded that acting responsibly towards sustainable development is beneficial not only to the environment and society, but also to companies that implement such strategies and perform in that field. This brings us to the postulate that employees and future employees (students) should get a thorough education on sustainability and its potentially beneficial impact on the contextual environment, as well as on the company itself.

Due to the fact that sustainability is related to many interactions and feedback between various stakeholders, resources and the environment, it can be identified as a system with extended complexity. Complexity and couplings within the system make it hard to understand, even by experts in the area. An inability to grasp the system as a whole leads to "*local optimizations*" and "*green washing*"<sup>1</sup>, situations where undertaken actions cannot solve problems on a larger scale.

## **System complexity and educating on sustainability**

Systemic changes require a deep understanding of system's dynamic complexity. This type of complexity emerges not from the number of elements involved, but from interactions between them. Such problems require in-depth analysis of the dynamics of the system – feedback between its components and delays in its reaction to stimuli (Senge, 1998). This poses a challenge to the traditional education model. The problem of detail complexity can easily be addressed by lectures. Bullet points or schemes are great when it comes to disassembling the problem into small parts that are easy to grasp by the learners. This makes them the perfect method of presenting knowledge in an abstract and condensed way. Unfortunately, the lectures are not as effective when it comes to demonstrating the dynamics of the problem.

Even presenting historical data and documented interventions into the system may not be adequate. Dynamic systems, such as companies or organizations nested within their environment, tend to be chaotic. The complexity of interactions and feedback result in an inbuilt sensitivity to initial conditions (Fullilove et al., 1997). Even if the opening situations are similar, the small differences at the beginning can lead to divergent states of the system. Further complexity

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<sup>1</sup> It's greenwashing when a company or organization spends more time and money claiming to be "green" through advertising and marketing than actually implementing business practices that minimize environmental impact (definition from: <http://greenwashingindex.com/about-greenwashing/>).



is added through ‘soft’ elements of the problem, meaning human interactions within a given context. Optimizing the ‘hard’ component of the system can be challenging and requires much effort. When human behaviour is added to the equation, it may seem to be close to impossible. Unfortunately, people do not act as rational optimizers (Lane, 1992). Clashes of worldview, attitudes and motives may cause problems that cannot be easily solved (Senge, 1998).

The problem of mapping such interactions can be addressed by using specialized representations of the problem; for example, causal loop diagrams (Senge, 2002). Regrettably, they are still abstract, and, in a way, ‘static’. This means that even most accurate diagrams tend to be hard to grasp due to the limited ability of the human mind to process data. Understanding how the system operates require ‘seeing it in motion’ and analysing how it reacts to changes in parameters.

This experience and observation are present as important elements of Experiential Learning Theory (ELT). According to its principles, learning should be treated as a process that enables students to refine their knowledge of the subject. To be complete, it requires four fundamental components. One of them is Concrete Experience which allows student to experience reality related to the subject. The next step is Reflective Observation, where the participant studies the results of his or her actions made in previous stage. Such contemplation is required for Abstract Conceptualization, which is the process of transforming conclusions into theories about the problem. These concepts have to be tested through Active Experimentation, which leads once again to Concrete Experience. These four components create the cycle that enables the student to experience the issue, create his or her own ideas and theories about the problem and test them in practice. All its elements have to be present for the learning process to be most effective (Kolb, Kolb, 2005).

According to ELT, including experience and experimentation into the process of education about sustainability can improve students’ knowledge about the

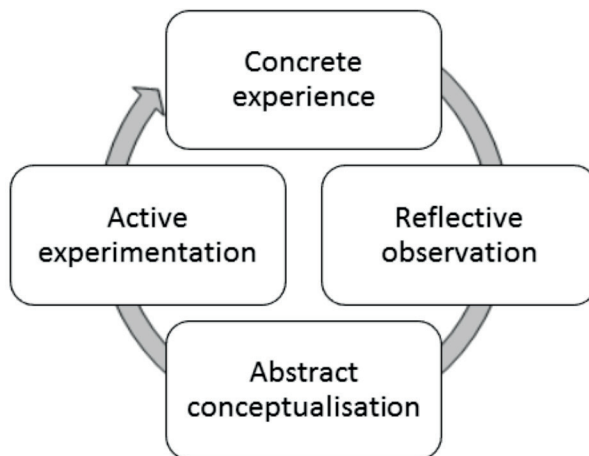


Fig. 1. Key components of Experiential Learning Theory (Kolb, Kolb, 2005)

subject. Unfortunately, such observations and testing ideas in real life would require enormous amounts of money and time. That makes them impossible or close to impossible to conduct. The solution to this problem may lie in computer-aided simulation. Maps of the problem, such as the aforementioned causal loop diagrams, can be translated into a set of rules mimicking the real-life behaviour of the system. It can be used as a model that can be subject to students' interventions (Senge, 2002).

Early examples of such learning aids, based on simple non-computer models, were already introduced in the 1950s when the Rand Corporation created the *Monopologs* game that concentrated on inventory management (Renshaw, Heuston, 1957). A study conducted by Faria that analysed usage of serious games in AACSB schools (The Association to Advance Collegiate Schools of Business) has proven that they are getting more popular over time, especially in Business Policy, Marketing, and Management courses (Faria, 1998). Serious games enable participants to make decisions in safe, simulated environment and experience their results (Barreteau et al., 2001). As opposed to the real world, the resources used are virtual, and time can be compressed, but the outcomes imitate real responses of the system. Therefore, they can be used as models of reality for the Concrete Experience and Active Experimentation elements of the ELT (Daré, Barreteau, 2003). In general, they enable people to test their ideas and learn from their mistakes without endangering real companies and organizations.

As mentioned before, such experience is a key factor when it comes to learning about dynamic complexity. Computer simulations have been present in this area from early the 1990s, when they were introduced as a part of systems thinking workshops (Senge, 2002). As they are established methods of showing people problems and opportunities connected with dynamic complexity, they should be the first choice when it comes to educating people about broadly-defined sustainability. As challenges associated with implementing sustainable business solutions are the result of multiple interactions and feedback present in such coupled systems (Fiksel, 2006), the participants should have the opportunity to face them.

Computer simulations can be responsible for dealing with 'hard' components of the modelled system. Nowadays, hardware is able to calculate numerous parameters and variables almost instantly and present them to participants in a user-friendly, graphical form. On the other hand, introducing the 'soft' elements is the result of actual interactions between students. Their aim is to act as they would think they should behave in real-life simulation, dealing with different access to information, various responsibilities and interconnections between the roles. This type of multi-player computer-aided simulation can create the most accurate representation of the coupled system that can be introduced in classroom or during the workshop. It engages students in social learning that emphasizes need to deal with differences in opinions and divergent views of the problem. An inability to create an effective discussion process that leads to transparent decisions may create a situation when the outcomes of the system are suboptimal and unsatisfying for the stakeholders (Pahl-Wostl et al., 2007).

All of these elements are present in workshops that use serious games. Even though the situation is simulated, people tend to act out their roles. This gives them the opportunity to experience the behaviour of both 'hard' and 'soft' components of the system in a workshop environment. They are able to test their ideas and get immediate feedback about their results instead of waiting for weeks, and even years, as in real life. This can be later used for reflection that can lead to better understanding and redefinition of the problems encountered. Therefore, it is a great way to introduce experience-driven learning in the area of sustainability to academia.

## **Serious games – educating for sustainability**

There are many different serious games that can be recommended for higher education and business training. Choosing the right one for the university curriculum requires considering both the alignment of the activity with the topic of the course and the time required to conduct it. Therefore, we would like to present some examples provided with descriptions that specify in which context the specific game can be most useful.

One of the examples of a serious game that simulates a real-life business situation with different responsibilities and various access to information is the Green & Great game. It aims at getting participants involved in managing a consulting business and allowing them to make successful business decisions not only in the scope of profitability, but also in sustainability matters.

In the Green & Great game, participants play the roles of managers of a large consultancy company. The major goal of the activity is to ensure the growth and economic position of the organization. There are a couple of stages of the game connected with the advancement of the contextual environment in the scope of a low-carbon economy, CSR, and sustainable development. Playing the game allows participants to acknowledge that the environmental and social reputation of the company can be a crucial factor in creating a business advantage over competitors. It also puts emphasis on the idea that running a successful business requires creating and implementing a long-term company-wide strategy, rather than focusing on occasional, one-shot actions that do not have a lasting effect. The game addresses this problem by using a complex reputation system based on The Sustainability Compass created by the AtKinson Group. Players have to plan and perform their actions carefully, balancing between the long-term vision of the company and current operational and economic performance. Additionally, the competitive environment is created by participants themselves, as their groups represent different companies on the market that have the same target to bid for the same set of projects and then to implement it. Participants run external business projects as well as internal project that engage their employees. Human resources management and proper training and remuneration policy are some of the challenges of the game. Missing out on high-impact projects can create a serious handicap in achieving goals set by the player. It has consequences for the following business opportunities and limits the ability to generate profits.

Participants get involved in the game very quickly; they have to put forth a lot of effort in order to grasp all the nuances of business operations simulated by the game. Finally, they are rewarded by gaining positive economic result as well as through reputation points in all the required fields under the condition that they understand how important it is to work in all reputational fields and adjust the business to a growingly competitive environment in the field of sustainability, a green and not brown economy. The game aims to change the mindset of the participants and draw their attention to the complexity of business operations and long-term strategy, which includes sustainability of the business performance. Green & Great was introduced to many workshops in academia, as well as business. It was played at the Wrocław University of Economics, Corvinus University from Budapest, Lufthansa trainees, EIT+, as well as during the workshop “Creative and Responsible: Sustainable Business as a Source of Competitive Advantage”. The workshop was a part of the European Week of Creativity conference for small and medium enterprises.

Ecopolicy® is a simulation that emphasizes the complexity and interconnections that have to be dealt with when governing the country as a whole. It emulates the various aspects of running the state, such as politics, production, environmental pollution, quality of life, education and population. The game is aimed at showing how actions undertaken in one area can influence the dynamics within the system as a whole (Vester n.d.). Social and environmental aspects implemented in the game are as important as the economics. Therefore, finding balance between these elements is the key to success.

In this game, players assume the role of the leaders of fictional country of Cybernetia. They have to work together to decide about policies and their implementation. Their performance is measured by KPIs. During the game, participants not only learn about how to deal with the complexity in the context of managing the state, but also about group decision making. The ‘soft’ aspect of the system is emulated by their interactions and it is their goal to make their teamwork effective. They learn how to present complicated information in simple ways and also how to work on common agreement (No Rules Just Words, 2013).

Ecopolicy® was already introduced in multiple workshops and academia. It was presented to various governing bodies, such as local authorities, as a learning tool. Furthermore, it is the key element of the *ecopolicyade*®, the international student tournament where groups of participants compete with each other to find out which of them is the best government of Cybernetia (Malik, 2011).

Another example of serious game developed for education in the area of sustainability is Energy Transition Game. It puts participants in the roles of various actors taking part in the process of shifting from fossil fuel energy production to renewables. The game presents multiple aspects of such a transition. It emphasizes the fact that implementing systemic change cannot be done by just introducing new technologies to the market. It emphasizes interconnections between actors and stakeholders that are typical of *technological systems*, where they have to function within a given institutional arrangement and technological regime (Geels, 2004). The Energy Transition Game can simulate situations where in-

novation cannot spread through the system because it does not have support from the authorities or society, or because it lacks the necessary scientific advancements. Only if all these elements are aligned can the transition be successful. When some of them are absent, it may result in spectacular failure (Yergin, 2014).

In the game, this problem is emulated through enabling participants to play various roles. They can be energy producers, technology developers, energy distribution company, different NGOs or various departments of the government. Each of them have a different range of responsibilities, possible decisions and goals. Some stakeholders compete with each other for the shares of the market. Therefore, the initial setting of the game is aimed to reflect the real diversity of roles and attitudes that is present in real life. The system, as a whole, is unstable. Introducing no changes can result in damages connected with climate change. On the other hand, introducing small, uncoordinated changes can result in failure. For example, the government can push forward the change for renewables, but without the advanced technologies that enable production and storage of energy, it may result in blackouts and infrastructure failures. On the other hand, energy producers may not be willing to bear the cost of the transition and technology developers may not be able to introduce the necessary innovations on time. Financing the change may be possible by increasing price of the energy, but doing so may cause public unrest that affects the government budget. Those are only few examples of the problems that can arise from the interconnections built into the system. Even more issues can emerge from interactions between the players. They are free to exchange information and create agreements, but different responsibilities and unclear interests may hinder the efficiency of the collaboration (Vansina, Taillieu, 1997).

The Energy Transition Game shows that a successful transition requires stakeholders to come up with procedures of sharing knowledge and data. Furthermore, it emphasizes the need to establish ground rules, participatory decision methods and transparent policies that legitimize the process of change and enables players to align their activities and effort. What is more, the computer model behind it is used to simulate the behaviour of power production and distribution system, which enables students to learn more about real-life infrastructure and technology problems connected with using renewable energy sources. The complexity of the simulation and number of aspects involved make the game attractive not only for students, but also professionals in the field.

A similar problem is addressed in the Lords of the Valley game. It was developed as a Floodplain Management Game in 'NeWater' to show the dynamics behind the transition between different river valley management regimes (Magnuszewski et al., 2010). It presents the difference between a traditional approach and the idea of 'living with the river'. The first one emphasizes building dikes to keep the water within a constrained area. It is connected with creating crop monocultures that require protection from the excess water. In the latter, all activities within the floodplain have to be changed to ones that are resilient to excess water. When there is a flood, it is allowed to flow in a controlled way

through the water distribution system and it is stored in specified areas. This approach increases the resilience of the valley economy and establishes more effective flood mitigation measures on the scale of the whole river (Stefańska et al., 2011).

The game presents a stylized version of the systemic problem and possible solutions based on the real-life case of Tisza River in Hungary (Stefańska et al., 2011). Similar ideas were also tested in the Netherlands ('Room for the river' programme) (Wiering, Arts, 2006) and Germany (Huang et al., 2007). The core of the problem is similar to the one depicted in the Energy Transition Game. Systemic change between regimes requires cooperation between various groups and stakeholders.

In this case, farmers tend to specialize in crops cultivation, which enables them to earn the most. On the other hand, this type of production is susceptible to excess water. This means that they are prone to put pressure on building the dikes that protect their fields from floods. Such investments, as well as the ones connected with an alternative management regime, are developed by a water board that is financed from taxes gathered by local authorities. Therefore, these roles are dependent on the economic level. When the weather conditions are stable, none of the roles has an incentive to change the management regime to be more adaptive and bear the transition cost. This creates a situation where participants tend to become entrenched in their initial positions. When the situation becomes uncertain and weather conditions become more extreme (severe floods and draughts that may be attributed to climate change), players are faced with the decision to invest even more in the current management regime or change it. Unfortunately, changes have to be coordinated. One stakeholder cannot proceed with the transition on his or her own – it always results in lower income or property damage (Stefańska et al., 2011). Two remaining roles – NGO and bank – are not initially connected economically with other players, but with their financial resources may play the key role in triggering or hindering the process of transition.

Therefore, the Lords of the Valley game can be used to educate students about implementing systemic changes. Even though it simulates economic and environmental situations in the floodplain, it can be used in other contexts, as the social aspect of transition process is most prevalent. As such, it was presented to various groups of participants that require first-hand knowledge about introducing changes on systemic scale (CRS 2013a, CRS 2013b, CRS 2015).

Finally, many companies have to deal with sustainable use of limited resources. The ability to assess, secure and utilize them among all projects or departments may be key factors to ensure the constant growth of the organization (Mishina et al., 2004). The issue of management of commonly-owned goods is a key problem in the About That Forest game. It puts players in the roles of members within a small community. They, as a group, have the opportunity to take part in the process of managing a common forest. Each person has incentive to cut the most of it to maximize his or her own profit. At the same time, the amount of resources is dynamic. The next round's amount of resources depends on how much was

left after the harvest in the previous round. The more they cut, the fewer new trees appear. Furthermore, the forest mitigates the floods by absorbing rainfall. Its destruction can not only endanger the future income of the community, but can also lead to losses from property damage.

Even though this model may seem to be quite simple, its dynamics can create a complexity that is hard to be addressed in formal way (Pająk, 2015). The community as a whole can benefit from restricting their harvest, as it guarantees sustainable growth and gives all players protection from the floods. On the other hand, each player has incentive to cut the most. This strategy maximizes profitability while benefiting from protection. Therefore, the community as a whole has to come up with management strategies that secure their long-term growth. The game gives participants mechanisms that enable them to vote on laws regarding the use of the resource as well as means to enforce them. Introducing them may improve the chances of achieving the sustainable growth (Ostrom et al., 1994). Still, they have to be selected and accepted by the whole community. Even if rules are legitimized by voting, none of the players can be forced to obey them. He or she can receive sanctions for not cooperating, but only wide collaboration can result in reaching the optimal result for the community.

Therefore, the game uses a simple model to present the problem of reaching common agreement about managing resources. In this case, the social dynamics of change are the most important. The context, due to the simplicity of the simulation, is only relevant as it presents players with the dilemma of choosing their own benefit over the long-term wealth of the community.

As mentioned before, there are other serious games that can easily be introduced into academia or can be adapted to be used in such context. Teachers can find other examples of games aimed at teaching students about sustainability online. There are several websites and blogs that gather information about them. For example, 'Learning For Sustainability' (<http://learningforsustainability.net/online-games/>), 'Games For Change' (<http://www.gamesforchange.org/>) or 'Games4Sustainability' (<http://www.games4sustainability.org/>), to name the few. Such websites can be treated as hubs when it comes to searching for new educational opportunities.

## **Summary and conclusions**

Introducing serious games similar to those presented in this article into academia can create new learning opportunities for students. They are new way of influencing the attitudes of participants and creating engagement, which is crucial for traversing through the whole cycle of learning as introduced in ELT. This idea is supported through the results of the surveys gathered for the 'Green games' project. It was aimed at introducing serious games in education about sustainable development and ecology at the high school level. In this project, educators, such as librarians and NGO workers, were given the opportunity to use various examples of this type of games in their workshops and were asked to assess their effectiveness. It turned out that 76% of the people who took the part in the

survey were positive that using serious games influenced students' attitudes towards environmental issues (Q1). Furthermore, the survey showed 82% of that educators agree that students become more interested ecology (Q2) and 92% are sure that using them created room to reflect on the results of the game (Q3). 97% of the people that filled out the questionnaire agreed that learning through entertainment is more effective (Q4). Educators were also positive that workshops that used serious games improved students' knowledge in area of climate change (87%, Q5), value of ecosystem services (85%, Q6) and biodiversity (84%, Q7) (Hutniczak, 2016).

The games presented in this article are only few examples of wide range of serious games that can be used in academia to teach students about sustainable development. Their common denominator is the way they approach the issue, addressing the complexity connected with system approach. Furthermore, each of them puts emphasis on the social aspect of transition towards sustainable solutions. It can be the reputation in the society and employees' satisfaction within the company, as in the Green & Great game or the much more complex problem of finding common ground and discussing possible solutions with multiple stakeholders. Regardless of the scope each of them gives students a unique opportunity to become part of the change process, to affect it and see how it unveils.

Such participation (even if it is only within the simulation) and the possibility to reflect on it is a cornerstone of the Experiential Learning Theory. Using this concept enables teachers to find appropriate place for serious games. As they can be used as a part of only two of the four components of the ELT, they are meant not to make lectures obsolete but to support them. Serious games can be used before them or after the traditional presentation of the theoretical knowledge. In the first case, the theory is derived from the experience. In the latter, students are able to test their knowledge about the subject in a simulated environment

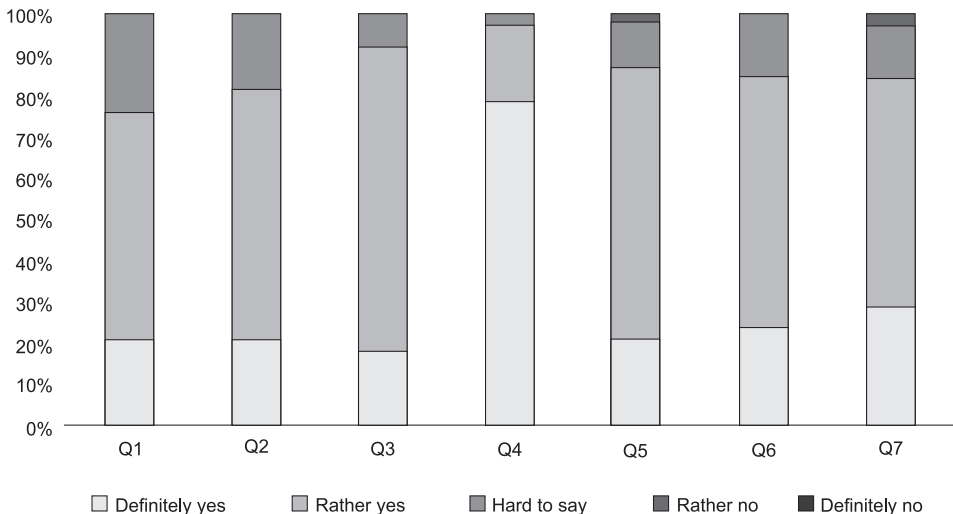


Fig. 2. 'Green Games' project survey results (Hutniczak, 2016)



and to try out ideas they know from the lectures. Still, according to the principles of ELT, the most beneficial way to introduce serious games would be to use them within the Concrete Experience and Active Experimentation parts of the learning cycle. If the course schedule allows it, they can be used multiple times. In this case, participants can learn from their experience, test their ideas for the solutions and repeat this problem in several iterations. This approach would be mostly beneficial for the students, yet may be more demanding from the course schedule point of view.

Furthermore, most of the serious games can be modified by changing parameters, initial conditions or creating asymmetric access to information. This can be used to change the relative power of stakeholders and introduce new dilemmas and conflicts for the transition process. This can create various scenarios for students to deal with. Introducing new variants of the games can further improve user experience when the simulation is replayed multiple times, and it enables participants to create new, creative approaches to presented issues.

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# Game Theory Applications in Business Simulation Games

## Introduction

Game theory focuses on players' strategic behaviour, the consequences of which directly influence each other. According to Mielińska-Lasota (2012), game theory foundations were one of the sources for decision theory. Game theory has also been presented to businessmen as a part of the decision-making process.

The main goal of this paper is to present game theory applications in business simulation games. This article introduces and describes game theory, with special emphasis on its two game models: a two-player non-zero-sum game and the bargaining set model. The thesis is that these models can be applied to business simulation games. The paper also reviews some literature concerning game theory foundations in business education. Furthermore, the similarities and the differences between game theory and simulation games are pointed out.

Special emphasis is put on the role of the game administrator, who needs to be educated not only in game theory, but also in strategic management and merger aspects, and needs to be able to present the assumptions and applications of game-theoretical models to students.

## Game theory: definition and models

Theory of games is a part of mathematics, which formally presents conflict and cooperation situations amongst various entities (Krzak, 2012). The very first foundations of game theory can be found in Cournot's book issued in 1838, entitled *Researches on the Mathematical Principles of the Theory of Wealth*. The book used mathematics to describe wealth and applied some first game-theoretical assumptions to economics (Stankiewicz, 2013). The launch of game theory is dated to 1944, when Oscar Morgenstern and John von Neumann issued their book called *Theory of Games and Economic Behavior*.

Game theory focuses on explaining the strategic behaviour of the players, the moves of whom are directly dependent upon themselves (Luke, McCann, 2012). Game theory aims to anticipate the most probable strategies to be used by the players in their game and points out, which ones are optimal. According to Mielnińska-Lasota (2012), game theory foundations were one of the sources for decision theory. Game theory has been presented amongst businessmen as a part of the decision making process. Hence, game theory foundations can be considered as a set of ideas that help one to understand the game of conflict and cooperation amongst players.

From the technical point of view, game theory foundations are presented in various game models. Each game model consists of players, all their available movements (strategies), their payoffs and information on other players' strategies. An optimal strategy is defined as the best-response of one player to the opponent. Games are formally described in their normal forms with use of a matrix (a table of profits). The matrix is a formal presentation of players' decisions, which can be made simultaneously or subsequently. In each game, players possess either full or some part of information to the preferences of the others. In games with full information access, players know rivals' decisions and their payoffs. In games with restricted information access, one or more players do not know all of the available strategies nor the payoffs of the others.

The payoffs determine the value of a game. Payoffs can be measured not only with monetary units, but also with satisfaction, prestige, and access to food or other utilities. However, it is common that payoffs are described with numbers. Game theory assumes that players act rationally, which means that their goal is to maximize their payoffs. All the players in a game respect the same game rules, which inform them how their decisions would be best made – either simultaneously or subsequently to the other player. It is important that these rules are acknowledged by all the players so that they play the same game. Game theory assumes that once the game rules are determined, a player cannot change the way of acting which could be contrary to set rules; for instance, by not making a certain move if he is supposed to do so. This restriction is obviously to some extent a limitation of game theory, but can be easily mitigated if the person responsible for setting the rules is able to predict all possible player's acting and include it in the rules of the game.

Game theory can be classified differently, but the most well-known seems to be the Osborne and Rubinstein (1994) classification. According to them, theories of games can be categorized into three types of models: cooperative and non-cooperative games, strategic and expansive games, and games with and without perfect information. For the purpose of further analysis, a focus is put on cooperative and non-cooperative games.

The definition of cooperative and non-cooperative games was introduced by Neumann and Morgenstern (1944). In both types of games, the players act to fulfill their own interests. In the cooperative games, the players form coalitions and collaborate by making decisions on taking into consideration the joint maximization of payoffs (Stankiewicz, 2013). It is assumed that each player in a coalition

gets a payoff, which is not worse than he would be if acting alone. Players are inclined to be in a coalition because they are sure of getting a fair (from the game-theoretical point of view) share of joint profits. The basis for the game solution is a fair split of coalition value, which is called a 'payoffs sum'.

In a non-cooperative game, each player aims at realizing his or her own interests, without entering into a coalition. In these games, players consider their opponents as their enemies, who need to be outscored by selecting an optimal strategy.

Two-player and n-player games are distinguishable, as they are played between two or more players. Games with three and more players are called n-player games. The more players are involved in a game, the more coalitions with different payoff sets are possible. From the player's perspective, the sole process of forging a coalition is only a way to obtain payoff. Thus, the issue of splitting the payoff in a coalition influences the choice of the 'right' coalition.

## **Game theory applications in business and education**

### **Meaning of game theory to business**

Game theory has been applied in various industries and business activities. Krzak (2012) used game theory to describe the tendering for raw materials deposits. Kowalik (2007) applied n-player games in the mining industry. Game theory helped describe the international container shipping market (Burnson, 2015). Game theory foundations were used by Roth (1984) to analyze interactions in the labor market for medical interns and residents.

Aschtatter (1996) presented how game theory was applied to auctions and how it helped to study the competitors, understand complexities in interactions between buyer-seller, and competition between the sellers. The problem in each auction was that there were participants who were not necessarily interested in taking part (false signalling) but just wanted to disturb the auction by causing unnecessary price wars.

The author named the example of the Federal Communications Commission (FCC) auction of wireless personal communication services. The auction was launched with an innovation of a mechanism that penalized companies which gave disruptive bids. Each bidder who withdrew bids would become the subject to penalties. This mindset referred clearly to game-theoretical foundation of false-signalling prevention, with its assumptions of mitigating the risk of competing against a company which is not really interested in the competition itself. With the application of the penalties mechanism by the FCC, the bidders were able to concentrate on the 'real' competitors and the FCC was sure of creating real market-driven rates.

Game theory has been used in business to present relationships amongst shareholders and managers. Jones and Burchman (2002) analysed stock option bonuses as a way of remuneration. Rosenberg (2001) discussed the alternative types of incentive payment systems as a better way to motivate employees to

perform with more benefits to stakeholders. Metz (2001) used some game theory foundations to negotiate the value of a company in mergers and acquisition. Cachon and Lariviere (2005) used the two-player game model to describe revenue-sharing contracts between supplier and retailer relationships in the videocassette rental industry. They compared revenue sharing with other supply chain management industries.

Nevertheless, game theory has faced some criticism because of its theoretical approach. Hakes (1998) argues that game theory is not a forecasting tool which can solve every problem, but rather, a way to minimize or eliminate worse decisions. Devlin (1996) argues that game theory foundations can be rarely applied in business situations. It can provide a possible scenario, or an alternative view on a business or life situation, but not a final solution. According to Garrouste and Loi (2009), game theory models are abstract representatives of various situations in real life. Osborne and Rubinstein (1994) state that the objective of game theory is to understand the behaviour of interactive deciders. However, the mathematical abstractions and formulas do not fully describe the phenomena from the real world.

### **Theory of games in education**

In the literature, there are studies on impact of theory of games in all education levels. Garrouste and Loi (2009) made a comprehensive study of game theory articles concerning education. They researched the ISI Web of Knowledge and discovered that out of more than 5000 articles published on game theory, exactly 404 are in regards to game theory and education, but only 9 concerned game theory foundations for teaching purposes, namely as a tool to help present various topics concerning economics. They signalled a problem of game theory adaptation to education due to formalness and a highly theoretical approach. It was concluded that in those 9 articles, the authors used, for instance, the Cournot model, the Nash equilibrium, or the Prisoners' dilemma as the tools to help explain the imperfect competition concept to students of economics.

Smith (1996) used game-theoretical thinking foundations as a way of educating his managers. He told them to play classic version of a war game, and divided his employees into two groups of players, with one group representing the company and the other representing their competitors. The employees tried to guess the strategies that were likely to be chosen by their opponents. Smith also provided an example of a future mapping game, in which employees present various possible future business scenarios and try to implement their optimal strategy to the changing environment. In Smith's task, the players were given all necessary business information from senior management to play the game. The future mapping game concept can be compared to the games against nature concept, in which the key aspect is to set proper probability to all the possible scenarios and find the optimal strategy for one's own company. By making his managers play the war game and use the future mapping concept, Smith wanted his employees to feel as if they were in upper management's shoes and could decide on topics which normally were beyond

their competency. This all played a great educative role for the employees, as they were able to develop their managerial skills.

In fact, there have been some doubts raised concerning role and usefulness of game theory in education. London (2012) brings up a story of a project in which game theorists and students were asked to foresee the result of six different bargaining situations. As a result, the outcomes of game theorists were not more useful than those of the students, who solved tasks based on common sense and self-knowledge. Moreover, in some simulations, game theory turned out to be less applicable than simple logical judgments. The reason for this is that game theory does not provide a single, best solution to any real life situation, due to the fact that it has limited assumptions. London (2012) concludes that what differs game theory from classical economics teaching is that it does not rely on monopoly nor perfect competition assumptions. In business, most situations concern firms competing with closest opponent, or oligopolies with a couple of big companies possessing huge bargaining power. Game theory describes the connections and behaviour of the closest competitors more accurately than classic economics teaching on the academic level. However, it is important to distinguish academic game theory and game theoretic thinking. The former is based on pure mathematics and is less applicable and teachable in a business area than the latter, which does not use complex algorithms but rather understandable models to describe real business situations.

The examples of game theory in education are, for instance, Dixit (2005), who discussed various ways of teaching game theory; for example, by playing interactive games in the students' classroom, screening and discussing movie clips concerning the subject or reading excerpts from selected books. Gibson (2003) suggested that game theory can be useful when teaching business ethics. He named four types of game theory models, such as Prisoner's Dilemma, Deadlock, Chicken and Stag Hunt, which can be used to describe various moral and ethical aspects which managers face in daily business. During his classes, students could translate real business situations into game theory models and formulate a piece of advice for managers. According to Gibson (2003), there exists a natural need to use different techniques, such as game theory, to attract students to classes. A student performs actively by choosing the right model to describe ethical problems and by solving the game, he is able to venture his own opinion and give a piece of advice.

## **Business games: definition and examples**

Business games are one of three learning environments, alongside with resource planning systems (known as ERP) and practice enterprise models. They enable their participants to understand decision process in enterprises and how markets act (Edman, Stahl, 2002).

The term "business game" is similar to "business simulation game", which involves sequential planning within the predefined plot of a game. The assumptions of business simulation games are coded in mathematical models, algorithms



and sequential decision-making exercises in a virtual environment. Their aim is to simplify the complexity of business situations or decision-making processes (Nisula, Pekkola, 2012). The rules of business simulation games are to respond to faced business situations by making managerial decisions which take into account many dependable variables. Every game participant has to take an active role and react to virtual business challenges. The players take responsibility for their virtual companies' performance in a fluid environment. In every business game, the main objective is to come out victorious. The business game participants, which are usually students or groups of students, either manage the whole enterprise or its entity by making important decisions (De Jong et al., 2000).

However, business simulation games do not perfectly match a true definition of a game. They are simulations rather than games, because according to De Jong et al. (2000),

- In simulation games, the players, based on their experience, knowledge and given information, introduce input (value of variables) to the game, and afterwards they observe the results of their actions.
- Simulation games do not necessarily aim to win against an opponent, but struggle to achieve a certain level of performance with less concentration on competition moves.

There are many criteria for distinguishing business games (please see, for example, Jankiewicz, 2014). According to Nusila and Pekkola (2012), there are 3 types of business simulation games: top management games, functional games and concept simulations. Top management games help formulate decisions for companies and also teach strategic management. As an example of such business simulation games, one can name the Scooters for the North game<sup>1</sup>, a business game created by Edman and Stahl (2002), or Ben-Arieh and Grabill (2008)'s simulation of virtual manufacturing enterprise. The second type of business simulation games are functional games, which put the emphasis on specific business functional areas like sales, distribution or finance. For example, one can name the Distributor Game, which is presented by Boyson et al. (2006), or the SCOR Model by Webb et al. (2014). Concept simulation games focus on a couple of business operations within an enterprise. An example is the conceptual framework for teaching leadership as proposed by Kark (2011).

The scenarios of business games usually deal with oligopoly markets. In these markets, companies (run by participants or groups of participants) produce and sell similar merchandise usually defined by a couple of characteristics. The main goals of business simulation games are learning the ability to make decisions, team working, working under time pressure, and being able to set key performance indicators and meet them (Jankiewicz, 2014).

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<sup>1</sup> Comprehensive game description can be found at Gawel and Pietrzykowski (2014).

## **Game theory and business games – comparison**

The main goal of this article is to examine game theory applications to business simulation games. It was stated that game theory can be applied through its models to solve managerial problems. Firstly, it is essential to focus on similarities and differences between business simulation games and game theory models. Clearly, both contain the word *game*. De Jong et al. (2000) formulate basic characteristics of games:

- Games need to have their goals, or some state of which need to be reached,
- Games have their boundaries and rules,
- Competition is involved,
- There is a predefined scenario.

The goals of game theory models and business simulation games are different. The goal of the former is to come up with a solution which maximizes players' payoffs on taking into consideration the moves of the competition. An equilibrium is reached through having analysed all possible strategies and payoff sets. In game theory, a model is a constraint in itself, since it cannot be changed during the game once it is chosen. The players (or game admin) choose the game model after having examined the players' behaviour and their strategic position and having decided if this is a repeated or non-repeated game, if players merge or not). Once the game model is chosen, game participants need to follow its assumptions and procedures while calculating the equilibrium.

In the business simulation games, the teams' goal is to be efficient enough in using resources in the management or production process and to come up with the best marketing strategy in a defined market. Teams are assessed based on companies' performance (which concern sales, income or other financial indicators) and students get their final marks.

There are defined objectives by the game administrators that relate to teams' performance. Players are limited with an initial budget which they need to distribute properly. The assumptions of the business simulation games can be formulated in the way that a team manages a company, which is divided into several managerial areas; for instance sales, operations, research and development, human resources, expected level of marketing, investments or profit ratios. The administrator (or game developer) creates the scenario and sets game model parameters which concern players' decision areas (Januszewski, 2014).

Each managerial area is described by a couple of parameters; for instance, sales parameters consist of price index, or sales channels effectiveness. The administrator sets a minimum for each area and the preferred value of the parameter which game participants need to reach. All in all, players' task is to meet the desired level of parameters set by the game administrator. There is a set level of expectation of teams' performance which needs to be reached to get a satisfactory mark.

Simulation games are more dynamic compared to game theory models in the sense that the assumptions (parameters) of the former can be changed by the game administrator each round by creating new markets or setting bigger weight-

ings to one parameter against the others. The game-theoretical model cannot be changed, when once chosen.

Competition is the essence in each game theory model. Players make their decisions based on predicting the competition's moves. The conjunction between choosing one's own strategy and anticipating rivals' decisions is strong and direct. In business simulation games, there are usually a couple of teams, which compete rather indirectly. The indirect competition also means that the teams can usually choose several markets to operate on, and thus there is no direct influence on each other. Even if teams decide to operate on the same market, they can compete in a different niche. Teams perform by achieving a level of performance, which is set by game administrators, so technically, they pay far less attention to their rivals.

Business games, as opposed to game theory models, have longer and more complex scenarios, which include more data, factors and indicators. Game theory models have rather short plots, where strategies and payoffs are defined; hence, the game can be solved in one step or several.

In the cooperative n-player games, it is possible to forge a coalition with other players. There are a couple of game theoretical models (Aumann and Maschler's bargaining set, Shapley value, Gately point, the nucleolus) which describe various conditions under which the mergers can be forged. The models differ in the ways of how payoff split for these coalitions are calculated amongst the players. In the business simulation games, coalition issues are rather abandoned. Teams compete, but do not collaborate, because there hardly any mergers, or joint-venture possible. Naturally, it is possible that teams informally cooperate to some extent (under the agreement of the game administrator). Nevertheless, in none of the simulation games which were presented in this article was the subject of coalition included in the game environment.

All in all, the biggest difference between game theory models and business simulation games lies in meaning of competition and coalition. Business simulation games put emphasis on playing the game itself and reaching a predefined level of performance. The decisions are made based on knowledge, estimations of a market, using limited resources and common sense. Game theory puts more emphasis on competition and coalition strategies.

## **Description of the selected business simulation games and their game theory applications**

Practical use of game theory requires using game-theoretical models. There are many different business games on the education market, so it makes it rather impossible to implement any general advice on using game theory foundations. Hence, rather than creating unnecessary generalizations, two business simulation games are chosen and one tries to find and apply game theory models to them.

## **Presentation of selected business games**

### **Scooters for the North**

The business simulation game called ‘Scooters for the North’ is a top management game, which involves game participants creating (on a web interface) a company which sells scooters. Each company can choose 3 markets to operate on (Germany, Poland and the Czech Republic). Game participants need to have a proper marketing strategy (design, price) to attract customers. The goal of the game is to gain market share and maximize profit.

Teams need to choose a market, establish key features of a product, choose proper marketing strategy, and set a price which should not exceed the maximum defined by the game administrator. The sales performance relies on what the size of the market segment is (this is also defined by the game administrator) and if the sales parameter values are on the desired level compared to the benchmark. The game consists of several decision rounds, and after each round, companies’ performance is evaluated.

The players need to achieve the defined level of parameters, which involves meeting the minimum (for example, minimum advertising investments) or not exceeding the maximum (for example, price for a product) values. In the evaluation process, there is rather a conjunction between a player and market and less player to player. The players compete in the sense of putting values into each areas of activity and are separately evaluated by the game administrator. The player – player competition is realized in that sense that the team which achieves better level of performance is able to sell more goods than the other.

### **Virtual manufacturing enterprise**

Ben-Arieh and Grabill (2008) modelled a business game of an aeroplane manufacturing enterprise. The aeroplane consists of many components, the production of which is either done in one of three of the player’s own assembly plants or outsourced to the suppliers. The aim of the game is to sell a product (aeroplane) by meeting demand requirements. The enterprise structure has three levels: executive level, a plant level and a production line level. Game participants can therefore be linked to each firm level. Naturally, they need to communicate in the day-to-day running of the business in order to achieve the company’s goals. The three company levels are linked by mathematical algorithms of 11 output indicators (such as customer satisfaction, demand, product quality), assigned with different variables and weightings (for instance, demand consists of customer satisfaction and advertising. Customer satisfaction consists of product quality, price and delivery time).

The teams compete for market share and the highest cash flow possible. The simulation model is divided into several rounds, after which the results are gathered, assessed and compared. The competition amongst enterprises in this model consists rather in struggling to achieving predefined expected values of performance than in analysing and reacting on strategies of the other enterprises.

## Game theory applications to the presented business simulation games

### Competition

As far as competition models are concerned, one can implement a two-player non-zero-sum game model for both the Scooters for The North and the Virtual manufacturing enterprise model. The game model is presented in its normal form in the following graphics.

In this model there are two players (A and B), who choose one of all the available strategies – from 1 to n for player A and from 1 to m for player B. Based on their choice, players are assigned payoffs. The payoffs are defined in certain values which can stand for market share, incomes, revenue etc.

A non-zero-sum game means that a payoff gain of one player does not mean the same amount of a loss to the other. In the business game, it means that these 2 players do not get a full split of a market. An increase of a market share will not reflect in decreasing same amount of market share to the other company. The goal of each player in the model is to choose the optimal strategy as a best response, which requires foreseeing the strategy of the opponent.

The model is naturally designed for two teams. In the two mentioned business games, there can be more than two teams, but the game model can still be adequate, as practically in business the companies follow only the closest competition from the strategic group (Banaszyk, Urbanowska-Sojkin, 2004). A strategic group consists of companies which use the same or similar marketing, distribution, pricing or promotion strategy (Porter 2006). There can exist a strategic group of two players so that it recalls the game model. However, if there is more than one opponent in the strategic group, then each team needs to treat all of them as one competitor; for instance by summing all their numbers (revenue, market share) and defining their all strategies.

The decision in which round to use the game model can be taken by the game administrator. It is also his task to explain to the teams the meaning of this model, its structure, and how to find the optimal strategy. Players can use the model rather in the further rounds of the business game when the data on strategy sets is gathered. Therefore, it is advised that teams apply it after at least a couple of rounds. The concept of using the two-player non-zero-sum game model can be summarized into some concrete steps.

Table 1. The normal form of a two-player non-zero-sum game model

		Player A		
		Strategy 1	Strategy 2	Strategy n
Player B	Strategy 1	Payoff (1;1)	Payoff (1;2)	Payoff (1;n)
	Strategy 2	Payoff (2;1)	Payoff (2;2)	Payoff (2;n)
	Strategy m	Payoff (m;1)	Payoff (m;2)	Payoff (m;n)

Source: own preparation.

- Play rounds first and gather data.

It is the task of the game administrator to challenge the teams to use the game model after a couple of rounds. He needs to fully understand the game model concept with its pros and cons and be able to describe it to the teams and explain to them how to use it.

- Find the strategic groups.

Teams are asked to find out which strategic group they are participating in and what competition they have. The game administrator can ask to point out at least one, but not more than two, competitors in a strategic group.

- Gather data to the normal form of a game.

Team members need to be able to name all the strategies used by themselves and by their opponents from the strategic groups. They need to assign the payoffs to them (whether it is market share, total revenues etc.) and put it in the normal form of the game. The role of the game administrator can consist in advising on what payoffs are taken into consideration in the game model.

- Find the equilibrium.

Having filled up each cell with payoff sets in the game model, a team seeks for own optimal strategy by finding the Nash equilibrium. The Nash equilibrium acknowledges a solution in which each player knows the optimal strategy of the others. Their strategies are constant (once chosen), which means no player can benefit by changing his or her own strategy. A solution is found by following the instructions for the maxi-min theorem, which means maximizing one's own minimum payoff considering the rival's optimal strategy.

- Make a final decision considering obtained optimal strategy.

A Nash equilibrium can be a set of pure or mixed strategies. A pure strategy is a best case scenario for a team as it provides a comprehensive piece of advice which strategy to select. However, there are situations where there is more than one pure strategy, so the choice turns out to be more difficult. In a mixed strategies set, probabilities are assigned to each pure strategy. Player randomly choose the strategies which are in a Nash equilibrium. It must be pointed out that the model does not necessarily have to give one, understandable solution. It is advised that the teams select the optimal decision not blindly, but after careful reviewing the solution and being advised by the game administrator.

### Coalition

As for coalitions, one implements the bargaining set for cooperative games, which was created by Robert J. Aumann and Michael Maschler in 1961 (Aumann, Maschler, 1961). The model is one of the n-player games alongside with the Shapely value, the n-person Prisoner's Dilemma, the *nucleous* concept and the Gately point. The difference between the bargaining set model and the others is that the rules of the model do not require forging one big coalition amongst all players, but rather forging smaller mergers.

A player decides to join the coalition that brings him the most benefit (individual rationality). Any future coalition is to be Pareto-optimal, as a merger has to be more profitable than acting on one's own. In order to simplify the coalition

scenarios, the game administrator assumes that a coalition can be forged by two players. The bargaining set translates the meaning of merger negotiations, bargaining power and merger values into mathematical formulas. The players must assess the future merger value and their bargaining power over other teams. As the sole method of persuasion, the teams use the threat of joining the other coalition (supposing they do not get a required split of profits). A bargaining set covers all probable coalition values with assigned numbers. In business reality, one observes that companies indeed look for the best partner to merge with and want to get as much profits as possible, knowing their own value they bring to the collation and their bargaining power.

A bargaining set  $A$  with  $n$  teams and their assigned payoffs  $T_{1\dots n}$  is presented underneath:

$$A = \left\{ \begin{array}{cccccc} 0 & 0 & 0 & 0 & T_1, T_2, T_3, \dots, T_n & \\ T_1 & T_2 & T_3 & T_n & v_1(T_1; T_2); v_2(T_3; T_n) & \\ T_1 & T_2 & T_3 & T_n & v_3(T_1; T_3); v_4(T_2; T_n) & \\ T_{n-1} & T_{n-2} & T_n & T_{n-3} & v_{\dots n}(T_{n-1}; T_{n-2}); v_{n-1}(T_n; T_{n-3}) & \end{array} \right\} \quad (1)$$

The  $T$  abbreviations stand for a team's payoff. The  $v_1(T_1; T_2)$ ,  $v_2(T_3; T_n)$ ,  $v_3(T_1; T_3)$ ,  $v_4(T_2; T_n)$ ,  $v_{\dots n}(T_{n-1}; T_{n-2})$  and  $v_{n-1}(T_n; T_{n-3})$  variables stand for value of each merger, which is in business terms predicted market value of a coalition. For instance, the  $v_1(T_1; T_2)$  is predicted market value of a coalition of team 1 and team 2. The  $T_1$  and  $T_2$  stand for payoff split of a merger. The  $T$  variables can be counted if a following equation is solved:

$$\begin{cases} v_1(T_1; T_2) - T_2 = v_2(T_3; T_n) - T_3 \\ v_3(T_1; T_3) = T_1 + T_3 \end{cases} \quad (2)$$

The bargaining set model is a way to help estimate players' bargaining power in merger negotiations. In the business game, a game administrator can, at a certain point (usually after a couple of rounds), force the teams to merge under the bargaining set conditions. However, he needs to understand the game model, be able to explain its rules and assumptions, and also have knowledge of the tools that the business world uses for calculating the merger value. A special emphasis must be put on the coalition values. The game administrator needs to have educational (and preferably business) backgrounds for estimating merger values.

## Conclusions

The main goal of the paper was to discover the possible game theoretical applications to the chosen business simulation games. Game theory applies to business simulation games in terms of using preselected models to describe business situations which game participants face while playing the simulation games. The situations should especially concern competition with the closest opponent and coalition aspects. In the article, the two-player non-zero-sum game and the bargaining set models were presented as a possible extension to two business

games: Scooters for the North and Virtual manufacturing enterprise. Upon using the game theory models, the game participants are able to judge the correctness of their strategies from the new, game-theoretical perspective. Thus, the paper's thesis that there are game theoretical models which can be applied to business games is defended. The game theory models can also serve as a base for class programs. The game administrator plays an important role in the whole process, as he/she sets conditions, explains models' assumptions, and delivers the educational background for the two-player non-zero-sum game or the bargaining set models.

This article also reviewed game theory applications in business and education. The review of literature clearly points out that game theory needs to be treated as another managerial tool in making decisions, rather than as a sole strategy. However, game theory can describe business relations amongst companies sometimes even better than classical economics. In its models, a lack of perfect information, the presence and use of bargaining power, oligopolistic behaviours and willingness to collaborate are assumed and carefully investigated. This is contrary to classical economics reasoning in business management education, whereas the market game concentrates rather on company-customer relationships.

However, the game models' solutions are not binding and may only point out directions. Each team can decide on its own whether to fully or just to some extent apply game theoretical thinking.

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## **Business Simulation as One of the Virtual Education Methods at Universities in Ukraine**

### **Introduction**

When it comes to adapting to international standards with the latest technologies, Ukrainian education is in the process of transformation. Traditional education methods are undergoing significant changes at all stages of the educational process: preparation of courses, classes, performance of independent work, and the preparation of projects and final or qualification papers. New technologies not only provide teachers and degree-seeking students with new means and resources, but also change the actual means of communication between teachers and students. Implementation of virtual methods in education and integration with the global information network is required for having competitive specialists in companies and global corporations. This subject is an area of scientific and practical interest for many scientists, leading managers of international companies and game developers who explore global tendencies and constantly work in the development of this area of knowledge.

The concept of virtuality is applied in Psychology, Physics, Biotechnology, Art Criticism, Ergonomics, the Entertainment Industry, and others. In Psychology, the terms “virtual image” and “virtual object” are used. For example, the virtual object is considered a union of a man and a machine. The functions of this virtual object can be reduced neither to human features nor to machine functions. A virtual object itself is possible only in the interaction of real objects – a man and a machine (Belinskaja, Gychkina, 2000). This concept can be developed in relation to lexical units.

The virtual learning environment is a creative environment where education is possible in the presence of high internal motivation of the students, their emotional uplift and positive, optimistic mood. A necessary condition for education in a virtual learning environment is the implementation of a personality-oriented educational paradigm with no need for the absolute priority given to teaching

methods. The degree of trust of lecturers in students' initiative in this system is higher than in the traditional education system. Thus, the activity of students is high, as technologies of productive creative activities based on interactive computer technologies provide opportunities for student self-fulfillment. It ensures an effective education process.

Interactive education is a special organisational form of a cognitive activity. It represents very specific and predictable goals. The main purpose of the application is to create educational conditions of study at a university, in which a student will become confident in his intellectual capacity, thus making the process of studying productive. According to some definitions, interactive education is a conversational study method in which there is interaction between a student and a teacher and between students.

Interactive education objectives are:

- emergence of student interest in studying;
- effective mastering of learning material;
- independence of making responsible decisions;
- working in a team;
- formation of student opinions based on certain acquired knowledge;
- access to the conscious competence level of a student.

The urgency of implementing virtual education methods to Ukrainian universities.

National scientific, educational and business seminars and trainings are increasingly filled with complicated software through which students can aspire to their chosen profession and master skills acquired during their education. Also, today in Ukraine there are conditions under which students are limited in the workplace. According to optimistic assessments of student social organizations, about 70% of students have education formally or fictitiously. As a result, students do not have the necessary competencies and skills in the relevant qualifications.

Therefore, in Ukrainian universities and business schools, it is increasingly believed that business games is a great way to study topics that are difficult to master fully by only reading textbooks. The data from the National Institute of Continuing Education (UK) confirms this: "We only remember 20% of what we read and up to 90% of what we read, saw, heard and did, that is when we got the experience through action". In foreign literature, such studying is called "learning by doing".

Computer simulation as an interactive form of education has major possibilities:

- Creating an image of the real attributes of the activity;
- Serving as a virtual analogue of the actual interaction;
- Creating conditions for replacing the real implementation of social or professional roles;
- A form of monitoring the effectiveness of education.

Today, the development of information technologies does not stop their momentum. The latest technology and information means that teachers must in-

crease the level of mastery and operation of educational material and expand the number of teaching methods. Therefore, in order to quickly initiate the proactive attitude of students towards cognitive activity, increase quality indicator of emotional perception of learning material, and develop creative thinking in regards to finding a solution to problems of medium and high complexity, it is necessary to actively use a variety of technical equipment during lessons in general education institutions.

It should be noted that the undisputed factor that argues for the need to use information computer technologies in academic disciplines is the great amount and congestion of information. The amount of material that is taught to students must be efficiently mastered. Therefore, students need time to study the received educational material and use it appropriately when solving certain problems. To better understand the theoretical part of the lesson and subsequently operate it easily, a student must comprehend logically the information and understand a given process both “inside and out”.

The main problem of implementation of this method into education in Ukraine is its cost, especially because of the reduction of public funding for national universities. Additionally, teachers often do not have sufficient training to use the new information computer technologies that are rapidly developing and changing. Ignoring this problem can lead to national higher educational institutions losing the quality of education, and therefore potential students may focus on universities in other countries.

The article aims to study business simulation as one of the virtual education methods at universities of Ukraine.

## **Results of the survey**

According to the results of the questionnaire of masters in leading educational institutions of Ukraine, most of them have only theoretical knowledge and cannot solve practical problems. Students are not satisfied with the situation when the material is in the form of “dry” theory followed by using such theory to solve simulated practical tasks. As a result of such education, it often remains unclear for students how and where they can apply this knowledge in practice. In our view, under these conditions, obtaining the necessary skills to work with information is possible if a student is actively involved in various training sessions and business games that are maximally approximated to the realities of the modern enterprise.

Thus, the introduction of information computer technologies with the use of multimedia technologies and remote access to information and educational resources promote a thorough continuity of virtual education. At the same time, the choice of teaching methods facilitates the identification of the individual creative abilities of students. Implementation of intensive forms and methods of teaching, especially in the organization of independent educational activity in a virtual education environment, is an essential factor in increasing motivation for teaching and learning activities, as well as the improvement of the level of emotional perception of new material.

One of the trends in modern education is the growing number of universities and corporations that use business games for serious purposes. Such goals can be educational, training, managerial, etc. The popularity of this method of production process simulation can be explained by the possibility of creating a model of studying that reflects the needs of the current generation of students to the fullest extent. In the virtual educational environment, a set of conditions conducive to the process of active interaction between teachers and students is realized. It can be through orientation to perform various types of individual work, including information and training, experimental and research, and research and practical activities based on information educational technologies.

It should be noted that leading Ukrainian universities over the last decade have actively implemented various forms of e-learning, from webinars and video courses to virtual worlds and business games, including business simulations. Expansion of the use of business simulations, especially abroad, is associated with “project-based learning”, commonly understood as learning through action or practice, in Western pedagogy.

Business simulations are divided into computer, table-top and business games. In table-top business simulations, key processes, decisions and procedures are displayed on specially developed playing fields and other forms and cards. The computer business simulation is an interactive game in which a computer program of simulation business realities performs the analysis of decisions. Business games are often based on the principle of a city or a road, in which it is necessary to achieve objectives and demonstrate appropriate skills.

## **What effect do virtual educational games have for students?**

Most scientists agree that the most important advantage of business simulations is its influence on the minds of students (Banshchikov et al., 2011; Faria et al., 2008; Lozovyk, 2013; Pazdriy et al., 2014). Few ways of training can be compared to business simulations in terms of getting feedback on students’ strengths and weaknesses. Given the proper use of simulations, unnecessary details, which often distracting and distracting focus from the main, are rejected. Leading experts believe that the word “simulation” is rather confusing because the game can be a simulation, but along with the lessons received from it, it is the experience that changes behaviour in the long run.

We believe that business simulations as an interactive technology of studying and the development of staff has a high potential of use for national universities. This category also includes active learning methods, such as simulation of activity on the simulator, role-playing, organisational and practical games and moderation. In general, interactive education methods are divided into two groups:

- Unmitigated methods: problematic lecture, lecture with previously scheduled errors, heuristic conversation, academic discussion, independent work with references, etc.
- Imitated methods: analysis of specific situations, case method, training with playing of an official role, business game, etc.

## **The principles of origin and implementation of interactive methods**

Business simulation is one of the most popular simulation game active learning methods that allow participants to gain practical experience in business management and individual business processes. In 2008, in the book “Simulations & Gaming”, a retrospective analysis of the development of this educational technology was published. In particular, it was noted that in 1929, M. Burstein proposed to adapt a concept of military simulations to economic reality. The first simulation was developed by the author in 1932, and it reproduced printing house activity and formed skills in solving the complex production situations of managers. Over the next decades, more than 40 of these business simulations for various branches were developed by M. Burstein and his colleagues.

Conceptual principles of active teaching methods were formulated by the American philosopher and educator John Dewey, who proposed to counter the traditional system of education, which was based on acquiring and mastering theoretical knowledge, by learning “through action”. It means that new knowledge is obtained from practical activities and personal experience. According to his reasoning, the practical work is above theory and science as “a gram of experience is better than a ton of theory and any theory has live value in the experience and affordable value in check” (Dewey, 1963). In cooperation, W. Kilpatrick and J. Dewey substantiated basic forms of project activities under the conditions of the reformist movement, which contributed to the emergence of an innovative method in education. The merit of W. Kilpatrick is that he announced the theory of J. Dewey to the public and successfully used it in practice (Jung n.d.).

In North America, the first business simulation was developed in 1955 by the American RAND Corporation, and was modelled on the logistics system in the Air Force. In 1956, in the USA, the business simulation “Top Management Decision Simulation” was presented, which later gained worldwide popularity. In 1957, a similar business simulation was first implemented in the educational process of a number of American universities, which was the beginning of the process of applying business simulations in teaching practice.

Today, modern information technologies take business games to a new level of education; there are practical information products that are designed on the basis of computer and role-playing games. Unlike traditional games, the effect of enjoyment of the game is combined with teaching and the educational aspect. Today, the following categories of games are the most widely used (Economy... n.d.):

1. Activism games. These games make it possible to understand and “play” global issues: fighting against hunger, tolerance towards immigrants, local conflicts. For example, such games as Democracy (Faria et al., 2008), Heifer Village: Nepal (Greenlaw et al., 1962), Change Your Generation (Lozovyk, 2013) and so on.
2. MedGames. These are games that are used to teach doctors and medical staff knowledge in practice. Instead of real patients, students are taught on com-



puter models that are maximally realistic. They are particularly actively used at Stanford University (MarkStrat..., n.d.) and in the US Army (more than 18 training centres).

3. Health Games. They can be created specifically for this purpose, such as Brain age (Pazdriy et al., 2014), or even aimed at entertainment while being used to improve health.
4. Augmented Reality Games. Games in which virtual objects are superimposed on real ones (such as video obtained from the webcams of players).
5. Global Kids. Games created with the purpose of teaching and promoting human values to a new generation in relevant (playing) form.
6. Ecology games. The aim of these games is to clarify and promote environmental behavior. Examples are City Rain, ECOThink, Clean Up by GomZ (Korea) and “Floodsim”.
7. Corporate Games. Games that allow employees of large corporations to get necessary abilities and skills. They are actively used by companies in almost all sectors.
8. Education Games. The purpose of this category of games is to teach something useful in a playing form. The target audience is schoolchildren and students. This group also includes games from other categories that are widely used in education, such as IBM INNOV8 2 and IBM City One.
9. Virtual Worlds. Virtual worlds provide an environment that is used for various purposes, including the creation of simulation games, conducting virtual lectures and cooperation. The largest virtual worlds are Second Life, Active Worlds, Kaneva, Smallworlds, Onverse and BlueMars (Virtual Worlds..., n.d.). According to official data, 53 universities, including Stanford, MIT, Harvard, Cambridge, Illinois, Cornell University, Princeton, California Institute of Technology, Drexel University and other leading universities have their own islands (3d location) in SecondLife (Virtual world..., 2012).

Universities use virtual worlds for:

- Conducting online conferences;
  - Collaborating remotely between universities;
  - Conducting online lectures, seminars and trainings;
  - Creating virtual museums such as Dotvidi (often this kind of projects is called mirror worlds);
  - Creating multi-player educational games.
10. Alternate Reality Games. These games are not “fully computer games”, because they are interactive narratives with playing elements that use the real world as a platform.

The list of the ten mentioned categories of games classifies only the most popular ones and is not quite complete. However, we believe that it is advisable to choose three formats for use in university education:

- The first category is games that use human thinking (business, organisational and active, situational and game trainings);

- The second category is games with modelling of processes (natural, industrial, economic, social and cultural). It includes situational models, simulation games, economic and military games;
- The third category is games with modelling of social contexts (role-playing, psychodramas and historical reconstructions).

Overall, we believe that business simulations keep a participant in that particular professional environment and making it possible to make decisions that will have tangible results but will be completely safe in real life.

## **Implementation of interactive methods in the Ukrainian universities**

Today, Ukrainian universities and teachers who are interested in using virtual methods in education have already had the opportunity to use new generation programs that allow students to obtain higher skill jobs. These leading universities are the International Management Institute and Lviv Institute of Management (joint interuniversity programs using IT), International Christian University and Kyiv Business School (joint with Carnegie University Mellon computer simulation business), Lviv Polytechnic (use of modular control system that encourages students to work regularly during the semester), the National Centre for the Training of Bank Specialists (Kyiv city), the Kyiv National Economic University (named after V. Hetman) and others. Among the afore-mentioned educational institutions, Gesim, MarkStrat, “Vyrtonomyka”, “Business Course: Corporation”, GMS, Nyksdorf Delta, Sigam, Topaz, EcoSim and others are widespread (Dementievska, 2012).

In our view, Lviv Business School of UCU had an interesting experience in the use of behavioural strategy in the market and competition in the form of the business simulation MarkStrat in a practical training program to study marketing tools. MarkStrat is a business game that, according to the Financial Times, is the world leader in business simulations. It was developed by professors Jean-Claude Larreche and Hubert Gatignon of leading European business school INSEAD, in partnership with consulting company STRATX. Currently, 25 of the 30 top business schools in the world have used MarkStrat in their programs for over 30 years. This business simulation allows students to demonstrate skills in strategic thinking and planning, apply previously acquired knowledge and test real strategies, all while having the experience in a risk free space. The software Environment Blue Ocean Strategy provides the opportunity to apply theoretical knowledge to develop innovative products at the forming market.

Kyiv National Economic University, named after V. Hetman, was one of the first universities to experience implementation of virtual technologies into the educational process. Scientists O. Gryshchenko and V. Pazdriy under the leadership of P. Banshchikov in the Department of Business Strategy have developed the Ukrainian business simulation ViAL+. This large-scale interactive simulation system is aimed at the creation of opportunities for the acquisition of practical skills of economic management throughout the process chain of production,

sales and product competition in the market environment and in business management in general.

Business simulation ViAL+ was tested through the involvement of more than 200 participants in the form of focus groups, training sessions and practical courses during the school year 2011–2012. Participants in the event were students and teachers of the leading universities of the country, scientists of the National Academy of Sciences of Ukraine, and representatives of the real sector of economy. Also, this virtual product was used as a helping aid for high school students in determining future occupational guidance. Thus, in 2014–2015, at the initiative and patronage of KNEU, “Coca-Cola Beverages Ukraine”, KPMG Company, “Company of Intellectual Technologies”, and more than 20 partners, the All Ukrainian Business Tournament “Company Strategy” was held for students of forms 8–11, using the Ukrainian business simulation ViAL+ (Rudaia, 2000).

Thus, virtual reality with the application of interactive computer technologies in education contributes to the creation of an interactive educational virtual environment by using methods of creating and implementing virtual images. The aim is to cooperate actively with them or inside them, in accordance with a high level of reliability. Both spontaneous and purposeful development of the virtual education environment can clearly be seen at the present stage. The virtual education environment is an open system that represents the interconnection of means of new interactive computer technologies and communication capabilities for effective learning in the presence of interaction of all members of the educational process.

## Conclusions

According to the results of the study, we can conclude that the transformation of innovative forms in the organization of educational process and extracurricular activities of higher educational institutions in Ukraine will improve the education of young people and increase levels of competence, integration and socialization. It will also contribute to building a transnational community of creative, enterprising, motivated people who are ready to implement large-scale international projects, devoid of stereotypes, boundaries and old standards of behaviour. Consequently, preconditions for the formation of competitive specialists will be established that will ensure restoration of the economic capabilities of Ukraine and improve the living standards of the population.

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## **Collaborative Teaching and Learning in Logistics Education**

### **Introduction**

Globalization has contributed to an increasing demand for a larger quantity and better quality of higher education graduates. The current system of higher education that fully meets the requirements of the time is one of the key factors for increasing the quality of human capital, generating new ideas, and promoting the dynamic development of economy and society as a whole. To perform these important tasks effectively, Ukrainian education should be renovated, taking into consideration global trends in higher education development. Modern education is students-oriented, which involves changes in the pedagogical methods used. In order to increase efficiency, competitive educational establishments should provide their students with the tools and information they need in the dynamic and evolving labour market. It is without doubt that a career in logistics and supply chain management is of great importance today, and employers expect logistics graduates to be well-educated, flexible, ready for collaboration and aware of the global trends in this field. To achieve this, universities are likely to begin seeking joint efforts towards educational techniques improvements.

The article highlights some of the opportunities and challenges that collaboration between Ukrainian universities (Ukraine as a transitive economy) and universities from developed countries (particularly Germany) can bring to the improvement of the higher education system in Ukraine (teaching logistics management in particular). Another issue is “human resources”. Today, when traditional production resources have marked their limits, human resources are becoming more important. If Ukraine wants to develop and integrate into the European Community, it should be open to radical innovations in education that will lead to the country’s increasing productivity of available resources and the improvement of living standards.

The rapid expansion of the Internet, and, as a result, unlimited access to worldwide information, is changing the way new generations learn and communicate, which is a real challenge for the current system of education. Information and communication technologies are changing the job profiles and skills demanded by labour markets. But at the same time, they offer possibilities for accelerated learning. So, the third issue is that we must decide how to design E-learning (virtual environment) in the formal process of higher education to allow our students to learn better. We can consider digital games for teaching logistics management, in combination with other teaching approaches, as great sources for improving efficiency.

### **Universities competitiveness formation by means of accumulation of strategic resources**

The dynamic market environment requires new approaches to teaching subjects related to logistics. The traditional methods of strategic positioning in educational leadership anticipate identifying internal reserves (their strengths and weaknesses) and evaluating possibilities and threats (the SWOT analysis). Using strategic models based on the study of environmental parameters, one can make the wrong conclusion concerning the homogeneity of Ukrainian universities. However, one of the sources of competitiveness advantage is to identify the quantitative and qualitative characteristics of the educational establishments related to the human capital characteristics and teaching technologies.

To define the strengths and weaknesses of the university, the analysis of human and physical assets, parameters, and determination of the university's position in the educational services market are needed. Valuable resources promote additional advantages and guarantee a stable, competitive position. Unique resources help to manage all the threats from the external economic environment and also provide the formation of a value system for the consumers of educational services.

To ensure the conditions for dynamic competitive advantage, not only are specific education technologies are important, but also the speed with which they are created and updated at the adequate level of innovation management system. Constant qualitative and quantitative renovation of the strategic resources may guarantee optimal decisions made in the educational services market, which are the basis for the dynamic competitive advantage.

Some researchers (Kozlenkova et al., 2014) showed that the resource-based theory can be applied in three domains: marketing strategies, international marketing, and marketing innovations. Not all resource categories of the universities are able to support sustainable competitive advantages. Effective strategic positioning is able to adjust the parameters of educational services to the requirements of market conditions. At the same time, the available universities' resources cannot adequately reflect the diversification requirements. Valuable resources contribute to the achievement of strategic objectives, which aim to increase efficiency in the field of educational marketing. In such a case, it is impor-

tant to realize all the opportunities and overcome possible threats from potential competitors.

The synchronous duplication of value formation strategies by the numerous educational services market participants cannot provide a sustainable competitive advantage. At the same time, a synergetic effect can be achieved through collaborative efforts of the academic strategic alliances. Eckel and Hartley (2008) have stressed that in partnership relationships, the mutual benefits and individual partner preferences should be considered.

One way to achieve the competitive advantage is strategic resources formation, which universities use to choose the strategy and bring it into life. Scarce and valuable resources provide the sustainable competitive advantage. One of the resource functions is the arrangement of conditions for achieving competitive advantages in order to implement a strategic plan. Synergy from the combination of educational technologies under the conditions of joint technological capabilities of different universities allows the creation of competitive positions.

Changes of demand in the labour market, new educational technologies and the current trends in the global educational market require supporting leadership incentives and adjustment of the human capital parameters of universities. Regulation mechanisms should guarantee dynamic renovation and educational technology adaptation to current market conditions. The crucial role here belongs to the qualitative composition of teaching staff and the use of innovative technologies in the educational process.

The low level of supply elasticity of certain types of educational services is determined by the fact that time is needed for the creation of a sufficient amount; some of them are not subject to purchase or sale at all, which is why universities with such resources available can provide effective work even under conditions of economic instability. Inelastic supply of certain types of educational technologies is a source of sustainable competitive advantages. Resources that are difficult to imitate require appropriate financial expenses and much time for technology assimilation and adequate experiences, which creates barriers to competitors entering the market.

The unique resources and capabilities possessed by leading research and educational institutions are among the main driving factors of cooperation in an academic environment (Georghiou, Harper, 2015). Globalization is accompanied by dynamic changes of educational technologies, students' access to the Internet, and possibilities for studying abroad. It should be pointed out that the existing technological capabilities of many universities in Ukraine are not able to provide the global competitive advantage, as proven by the ranking of leading domestic universities. Competitive advantages appear when educational establishments use teaching technologies that differ from those of their competitors, and it will give a possibility to prepare really competitive specialists.

A prerequisite for keeping up with other universities is competitors' lack of substitutes for available resources. For example, strong links based on mutual trust between universities are difficult to copy. In this regard, common education activities with foreign partners allows for innovative training resources and



techniques, and also gives access to strategic information. Despite the fact that intangible resources (such as human capital) are difficult to value, they play an increasingly important role in the efficiency upgrading of educational activities.

The motive for the intensive growth of university activities abroad is an aspiration for unlimited access to strategic education technologies, highly qualified staff, and competitiveness due to the accumulation of experience working with foreign colleagues. For collaboration, foreign universities mainly choose the ones with vast experience in international educational link formation.

The impact of global competitive forces and relevant technological changes determine the need for qualitative changes in education technologies and assessment techniques for students, academic staff and universities. Now it is important to respond quickly to changes in market drivers and conditions. Quantitative and qualitative characteristics of educational technologies are connected with strategic plans, focused on the adaptability of the teaching staff and the quality of specialists they prepare. Different techniques used in the educational process should be combined with the engagement of competent teaching and administrative staff.

The proliferation of different innovative changes requires the active involvement of teaching staff in mastering innovative technologies. The efficiency of technology solutions is tested on the basis of perception of innovative education technologies by students, as well as the critical comments of the enterprises and organizations concerning the quality of the specialists prepared. Innovations are often combined with uncertainties and risks. For this reason, while using innovative education technologies, it is important to take into account the social and ethical aspects of innovative solutions in education.

## **Synergies as a result of collaborative teaching in logistics**

Great attention should be paid to the collective building of knowledge in logistics management. Case studies allow students to solve different management situations, which helps them to gain practical experience in logistics. However, such methodological approaches to teaching and learning focus mostly on the situations in the past without connection with current and future market conditions. Even though there is great competition between universities on the global stage, some of the most important criteria of their effective work are collaboration with other educational establishments and the attraction of foreign students and academics.

The joint project “German-Ukrainian Master Program in Logistics” (with abbreviation GUMLog), funded by the German Academic Exchange Service (DAAD), will be fulfilled by the Chair in Maritime Business and Logistics (Universität Bremen, Germany) and the following Ukrainian Universities during 2016–19: Kyiv National Economic University, named after Vadym Hetman; Odesa National Maritime University; and Uman National University of Horticulture. All of these universities, having their own peculiarities, are joined by the common goal: to build knowledge in logistics management collectively. The project is

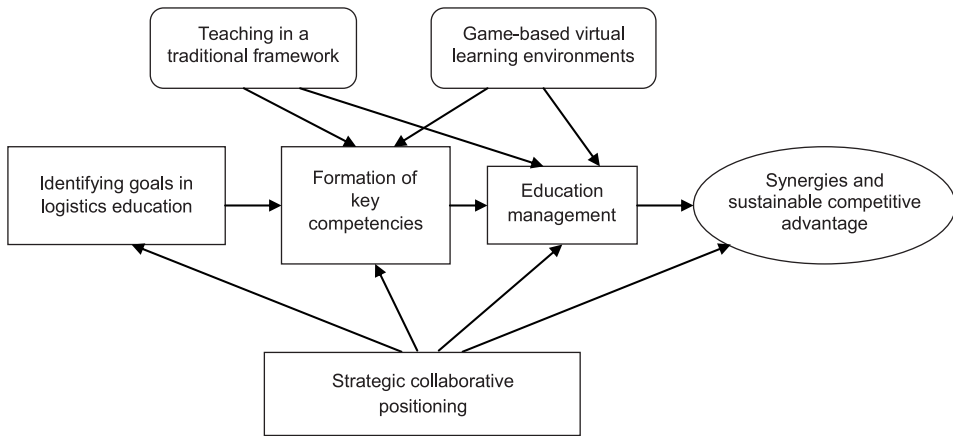


Fig. 1. Strategic academic collaborative positioning under the German-Ukrainian Master Program in Logistics

oriented to the development of reciprocal curricula and establishment of a master program in logistics in order to reflect the objectives of the Strategy on Sustainable Development “Ukraine – 2020”.

The need for constant innovative changes in the educational process forces universities to search for new knowledge not only with the help of their own academic and teaching staff, but also by means of outsourcing.

The formation of new knowledge and education technology is possible due to the quality changes of the educational components and synergetic effect of the combination of knowledge, obtained by different universities (Fig. 1).

In the process of common problem-solving, both students and teachers learn. The GUMLog programme involves an exchange of students and teachers, public lectures, entrepreneurial involvements, workshops etc. The participants have the possibility to form open academic environment and new contacts in the educational sphere, which will enlarge the scope of knowledge in logistics management.

Currently, the exchange of students and teachers takes place, but only some of them have such a possibility. Involving all the students and teachers in the comprehensive exchange virtual learning environment is of great importance.

## Need for innovations in the process of teaching logistics management

A traditional teaching framework can be still used for logistics education. However, due to the increasing scope of information, sharing the study in a virtual environment is of great importance.

The necessity of advanced logistics knowledge and cross-cultural collaborations is determined by the influence of dynamic market conditions. Nonetheless, traditional methods of teaching (face-to-face) cannot assure the efficiency of new knowledge formation. Competitive factors in the sphere of global logistics strat-

egy drive the need to change methodological approaches to teaching and learning activities.

In our opinion, virtual learning has many benefits in comparison to traditional learning. Virtual environment conditions encourage interaction between the participants of teaching and learning activities. Their mutual actions are coordinated by a common goal and constant tasks. Additionally, virtual game methods can synergize collaborative efforts in order to improve educational technologies. Game-based virtual learning environments combine innovative teaching approaches with students' initiative and creative efforts.

There is no single definition of a game, and various subjects have different conceptions of a game. But, as our task is not to define the term "game", but rather to state the importance of gaming in the process of teaching logistics management, we should concentrate on some basic characteristics of a game (though not all of them are necessarily exhibited in a specific game) that may lead the students to better competence in the above-mentioned field. Whitton (2010) identifies such characteristics: competition, challenge, exploration, fantasy, goals, interaction, outcomes, people, rules, safety.

*Competition.* Readiness to accomplish competitive positions is a key factor for a successful logistician. The goal of most of the games is to win by achieving better results. Such games get students used to working in a competitive environment.

*Challenge.* Each new task is a kind of a challenge for students; to win, one must tackle it. Gaming prepares students to meet challenges in real life.

*Exploration.* A simulated environment (real or virtual) presented in the game is explored by the player, which stimulates his/her interest in the details.

*Fantasy.* The way to develop students' imagination.

*Goals.* Students should be ready to define the goals and to achieve them in their professional activities. Most of the games provide players with clear objectives.

*Interaction.* The game (simulator) is a virtual world where players must interact with other players, game characters or objects. Readiness for interaction is of great importance in the real world, too.

*Outcomes.* Students are prepared for a mechanism of measuring in their future activities.

*People.* Depending on the type of game, other people can take part in it. Players can both compete and collaborate. Useful for teaching any subject (logistics in particular), it is a tremendous experience that can be used in future.

*Rules.* The activity is bounded by artificial limiting conditions, while in real life there are real circumstances which students should be ready to respond to.

*Safety.* Playing a game does not have a result in the real world, so students have the possibility of learning through experience in an imaginative environment in order to not make mistakes in their professional activities (Whitton, 2010: 23–24).

The advantages of the methods of virtual learning are determined by pragmatic factors (reduction of transport costs, rapid expansion and disposal of learning material, access to students from different geographical regions, possibility to study on-the-job, ensuring course completion) and instructional motives (per-

son-to-person interaction between a lecturer and a student, the ease of deployment of material for the selected period of time, visualization of the learning material, demonstrative capabilities with the use of computers, interaction between participants, specific communication conditions) (Clark, Kwinn, 2007: 13).

The advantage in virtual learning environments can be found in communication anytime and anywhere, but at the same time, it leads to information overload, difficulty in organizing what is really important, and the constant necessity to maintain the virtual environment created; as a result, time management becomes a problem.

There are also difficulties with the evaluation of qualitative characteristics of virtual teaching environment. For this reason, it is important to know the opinion of students and teachers concerning the events within the framework of the project, and also the opinions of stakeholders interested in the development of educational collaboration.

While teaching logistics collaboratively, despite the game nature of classes in virtual environment, we must consider the following methodological and scientific issues (McComas et al., 1998: 513):

- there always should be a way to the experiments, rational arguments, and scepticism;
- there is no universal scientific method;
- intercultural collaboration is important in contributing to science;
- there should be precise keeping of records, peer review and replicability;
- the collaborative creativity is of great importance;
- social and cultural traditions are inextricably linked with science;
- technology has tremendous influences on science and vice versa.

The effectiveness of teaching logistics management depends on the level of involvement of students in the educational process. In such a case, the factors providing a decisive influence can be specified (Hussey, Smith, 2003):

- the quality and level of interconnections and interrelations in the context of student-lecturer-content of a subject;
- the development strategy for curriculum for the purpose of coverage of academic disciplines issues;
- the use of incentive mechanisms and stakeholder engagement to improve the educational process;
- the overall climate of relations within the academic group during the learning process at the university as a whole.

Unlike traditional learning methods, the use of virtual games in logistics management studying creates the conditions for the application of innovative technologies, incentive mechanisms and the formation of a fundamentally new culture of education.

## **Conclusion**

The globalization of higher education is reflected in different kinds of activities, such as implementation of common curricula, the development of joint degrees

and courses, students' and teachers' mobility, cooperation in research and development. Higher education should give students the knowledge and possibility to obtain experience within international student and teacher groups while studying cases of real working practice from the different cultural environments around the world. Claims about the clarity and comparability of study programmes between European universities have permitted the formation of joint study programmes, joint study subjects, and different forms of collaboration in accomplishing study programmes at all study levels. Lecturers can develop their professional skills during contacting and sharing experiences with representatives of different cultures and most diverse students and expert groups.

In perspective, we need to study the forms, degrees and results of collaboration; the problems connected with the integration of Ukrainian education system into the international educational space and the ways of their solving; the programs of cooperation and the ways to implement them in terms of reforming the Ukrainian education system; and the main factors that restrain the integration process.

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## **Strengthening Students' Social and Environmental Awareness Through Business Virtual Games**

### **Introduction**

The extensive teaching experience of the authors of this chapter, in various European and Latin American universities for both undergraduate and postgraduate studies, covers a wide range of subjects within the areas of business administration and industrial relations and human resources management: labour economics, social economics, management of SMEs, local sustainable development, territorial intelligence, and project management. These three researchers/teachers have been involved in various projects of educational innovation within the framework of the European Higher Education Area and have always remained receptive to educational innovation in the classroom; these advances include the basic theoretical assumptions of what later, with the advent of audio-visual technologies, has come to be called “Edutainment”. However, the invitation to participate in the project GAMES<sup>1</sup> constitutes our first contact with *virtual business games*. In this project, our work has primarily consisted of designing a scenario for the management of companies in the field of services and of implementing it with different groups of undergraduate and graduate students. The objective of the GAMES project is to improve students' education in business management by fostering their skills for the creation and management of businesses in the future.

There is a strong social demand for universities to introduce major changes, both in academic training programs and in pedagogical methods, with the aim of honing the students' skills and profiles required in today's labour markets.

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<sup>1</sup> ERASMUS+ Strategic Partnership Programme. Virtual Game Method in Higher Education-2014-1-PL01-KA203-003548. (01/11/2014-30/10/2016).

However, although it is recognized that these labour markets are dynamic in nature and are subject to constant change, too often the depth of these changes is overlooked. The fact that our current learners will be the designers of all kinds of businesses whose markets, products and organisational formulas will be radically different from those used today remains scarcely addressed.

Since the beginning of capitalism, the predominant form of organization for the market-oriented production of goods and services has been the capitalist enterprise. However, its presence, especially in developing countries in which 80% of the population is concentrated, has always coexisted with those more traditional and family businesses whether in agriculture, small trading businesses, or in check protocol low value-added services. Over time, other types of enterprises have emerged in the field of social and solidary economics. These firms are based on non-capitalist principles, such as community service, democratic decision-making, and equitable income distribution. For these initiatives, the generation of profits has become a mere tool for their social purposes rather than an end in itself (Borzaga, Defourny, 2004). We are currently witnessing the rise of hybrid practices of economic and work organization, the so-called *collaborative economy*, which is based on participative principles such as *sharing* and *P2P* (Kostakis, Bauwens, 2014). These practices are radically changing the systems of property, founding and business management over a wide range of activities such as programming, commuting, personal services, and housing. Their scope and impact on the global economy has yet to be determined, and they are evolving extremely quickly. The manner in which all this diversity of businesses will be set in the future is of utmost importance for the development of inclusive societies with a good quality of life.

In this framework, this chapter aims to debate potentialities and limitations of the use of current *virtual business games* in higher education to foster students' management skills in this wide diversity of businesses, especially those with a more complex set of targets beyond the mere maximization of profit and market share, such as job creation, social integration, and the promotion of sustainable economic activities on different scales. The debate will be held in dialogue with the conversations that are under way in the academic world on the nature of the social innovation necessary to address the socio-ecological tensions affecting the current model of development. The discussion will take into account the latest institutional and pedagogical changes in the higher education system together with our background in research and experience with students in the classroom. In the following section, we discuss these socio-ecological challenges whose nature, from our point of view, demands a questioning the values inspiring human behaviour and the way they are being tackled in business schools and human resources management training. Section 3 addresses the main changes in higher education and the emergence of "Edutainment". In the fourth section, the characteristics of virtual games are discussed together with the influence of strategic business games on the generation of students' values. Section 5 suggests various ways to introduce social and ecological values in virtual business games. In the sixth section, our main conclusions are drawn.

## **Socio-ecological challenges and social innovation: rethinking the importance of values**

### **Socio-ecological challenges of the current system**

The economic model of production and consumption, upon which major industrialized economies are based, shows signs of exhaustion in terms of reaching its environmental and social boundaries. Thus, the perceived trends point towards certain major forthcoming transformations<sup>2</sup>:

- For the next decade, global GDP will continue to grow, especially in Central and South Asia. It is estimated that, by 2025, one thousand million people, that is, 12.5% of the population, will belong to the “global middle class” (with an income between 4,000 and 17,000 dollars per year) with 90% of them living in developing countries. However, given the current distribution of income, more than 80% of the population will remain below those levels, which implies an increase in all sorts of inequalities (ILO, 2016). From a demographic point of view, the world population growth will occur in parallel with an aging population in most industrialized countries; the progressive increase of urbanization is another ubiquitous observed trend, accompanied by the creation of suburbs and slums in which the poorest urban population gather, particularly migrants from even poorer areas.
- This is reflected in living conditions: a third of the world’s population is undernourished, while obesity continues to grow in industrialized countries; three thousand million people have problems accessing clean water; regarding health, 1 thousands of millions of people lack access to basic medical assistance which may lead to the appearance of new risks of pandemics and new diseases. Concerning the energy that drives the whole system, global energy demand will continue to grow, while it is estimated that oil production would have begun to stagnate (peaked) by 2025. If the current rate of growth of renewable energy remains unchanged it seems that it will barely have reached a supply of 15% out the total energy needed at that time. If current trends remain unchanged, then in 2030 the European Union will have to import 70% of the energy it uses.
- The climatic impact of this development model is well known, global warming is a fact, and agreements of the latest world climate summits seem to be insufficient to stop this trend. There is great uncertainty about what the impact will be on the agricultural system, on the proliferation of natural disasters, and on the extinction of species. According to Potts et al. (2006), we are losing species at a rate of between 1,500 and 40,000 times the natural rate of renewal. Whether human beings will be one of these species in the coming years remains an open question.

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<sup>2</sup> The figures in this section are summarised from the report “The world in 2025. Rising Asia and socio-ecological transition” (European Commission, 2009).



These trends engender significant tensions in at least three critical areas: firstly, between the methods of production and consumption and the future availability of non-renewable resources (food consumption, access to water resources, raw materials especially elements of rare earths, 80% of which are located in Africa, and energy); the second type consists of the tensions triggered by the relationship between centripetal forces due to the global and simultaneous process of the growing economic interdependence, and the centrifugal forces caused by increasing political, territorial and cultural differentiation; and the third refers to the tensions that occur between the growing spatial proximity in the context of rapid urbanization and the greater cultural distance at the origin of the processes of segregation, fragmentation and exclusion in expanding urban areas.

### **Growing and urgent demands for social innovation**

In most industrialized countries, the nature of these tensions is affecting all levels of resource and lifestyle management, energy systems, transport, food production, water and waste management, etc. This, in turn, is causing major changes in the functioning of labour markets, by positioning them under pressure from international competition, rapid technological change (ICT and robotics) and under the impact of migrations. Flexibility, instability, and exclusion of certain social groups from the labour system present major challenges for the sustainability of current welfare systems (education, health, and pensions).

The problem arises since social innovation based on unlimited economic growth, energy abundance, specialization and planned innovation remains impossible in this new scenario. Present-day infrastructures, technological models and the knowledge systems themselves need to be redesigned to provide: a drastic reduction of emissions, production and mobility based on renewable energy, connected but inclusive economies, suitable health systems, and sustainable social protection.

Several authors talk about socio-ecological transition in terms of a shift to a new development model (Fischer-Kowalski, Haberl, 2007). There is also a wide debate on how to foster and manage such a transformation (Breukers et al., 2012; Fischer-Kowalski et al., 2012). The point of agreement is found in the claim for a profound reorganization of every aspect of the whole system: institutions, policies, technologies, business forms, behaviours, etc. However, an issue rarely addressed, but which may be on the basis of any sufficiently disruptive innovation, is the need for these external changes to be guided by an internal change in the systems of beliefs, in values, preferences and worldviews towards a different set of values guiding us towards behaviours that are socially fairer and more ecologically sustainable (Crompton, Kasser, 2009).

### **The role of values in a context of profound transformations**

*Values* (from the Latin: *valēre*) reflect what humans consider desirable and important in a profound way, what humans believe to constitute our affirmation fronting the world (Rokeach, 1973; Schwartz, 1992). Understanding these values is crucial to the tackling of any long-term transformation, since they constitute the

higher-order motivations that organize human beings' attitudes and behaviours underlying human lifestyles (Emmons, 1989).

Research carried out in 2015 in the UK, involving interviews of a thousand people, has shown that we should speak about *value systems* instead of *isolated values*. That is, certain values tend to occur simultaneously, while other values appear to be inconsistent among them. Thus, people who attach importance to values such as *social justice*, also give importance to others such as *protecting the environment*, and, simultaneously, these people were less likely to give importance to other values such as *wealth* and *social power* (Common Cause Foundation, 2016).

The results of this study suggest that, in general, the operation of people's value systems is surprisingly complex.

- 74% of respondents place greater importance on compassionate values than on selfish values. We find this to be the case irrespective of age, gender, region, and political persuasion. We can be confident that this result does not arise from respondents seeking to cast themselves in a better light by downplaying the importance they attach to selfish values. We were able to test for such bias.
- 77% of respondents believe that their fellow citizens hold selfish values to be more important, and compassionate values to be less important, than is actually the case.
- People who hold this inaccurate belief about other people's values feel significantly less positive about getting involved – joining meetings, voting, volunteering. These people also report greater social alienation. They report feeling less responsible for their communities, and they are less likely to feel that they fit in with wider society– relative to citizens who hold more accurate perceptions of a typical British person's values (Common Cause Foundation, 2016: 1).

Confronted with these results, a question arises: why do people tend to think that the values of others are selfish but theirs are not? The answer, supported by research, is that these are the messages that are sent from all institutions that affect our attitudes and beliefs, such as government, business, media, and even the educational institutions themselves. In the end, people tend to think they are the exception. To remedy this situation, the authors of the study propose three types of solutions: “promote compassionate values through role models; convey a more accurate perception of others' values; and challenge assumptions about the values that most people hold to be important” (*Ibid*: 2).

The educational environment provides a privileged arena for the development of these solutions, for the display of alternative role models and new models of leadership to the students, for the carrying out of sound research into genuine values, rather than taking assumed values, and for the creation of spaces where students can converse and discuss the nature of these values. As teachers of economics, we should not shirk the responsibility of addressing these issues and reflecting on the impact that both the content and teaching methods cause on the formation of values of current generations, especially since these will shape the principal way they are internally equipped to face the challenges of a world undergoing a profound transformation. This is the main reason that led us to consider the potentialities and limits of virtual business games from this perspective.

## The new context of higher education: from the *broadcast model* to *Edutainment*

### Fostering student skills

Throughout the last two decades, we have witnessed major changes in European higher education systems. From the Sorbonne Joint Declaration in 1998<sup>3</sup>, the general guidelines of educational policies, which aim to create the European Higher Education Area, have transformed and harmonized architecture and principles of higher education in Europe. These political orientations have encouraged the modification of educational contents and methods in order to adapt them to the changing needs of labour markets and to foster the creation of a European *life-long learning* system.

Since then, teaching & learning systems have been organized around students' working hours instead of those of the teachers, as had hitherto been the approach. On the other hand, it is suggested that the teaching objectives of all kinds of subjects are listed in terms of *competences*: the combination of skills, knowledge, attitudes and values necessary to achieve suitable performance (Ry-chen, 2003a: 114), which the students would develop during the course. From the main focus being centred on the transmission of knowledge, higher education systems have evolved towards a greater emphasis on the expertise of students (*savoir faire*, skills) as well as on their attitudes (values, interpersonal skills).

Given the continual changes in the labour market, the skills required also vary. The "Future of Jobs Report 2016" of the World Economic Forum (written on the basis of a sample of 371 leading global employers, representing more than 13 million employees, across nine broad industry sectors in 15 major developed

Table 1. Evolution of the top 10 skills in the labour market

2015	2020
1. Complex problem-solving	1. Complex problem-solving
2. Coordinating with others	2. Critical thinking
3. People Management	3. Creativity
4. Critical thinking	4. People Management
5. Negotiation	5. Coordinating with others
6. Quality Control	6. Emotional intelligence
7. Service orientation	7. Judgment and Decision-Making
8. Judgment and Decision-Making	8. Service orientation
9. Active Listening	9. Negotiation
10. Creativity	10. Cognitive flexibility

Source: Future of Jobs Report, World Economic Forum, 2016.

<sup>3</sup> *Sorbonne Joint Declaration*. Joint declaration on harmonization of the architecture of the European higher education system, by the four Ministers in charge for France, Germany, Italy, and the United Kingdom. Paris, the Sorbonne, 25 May, 1998. [http://www.ehea.info/uploads/declarations/sorbonne\\_declaration1.pdf](http://www.ehea.info/uploads/declarations/sorbonne_declaration1.pdf)

and emerging economies and regional economic areas) shows the change in the valuation of these competences by the global business community.

As Table 1 shows, the innovation-related skills, such as *complex problem-solving*, *critical thinking*, and *creativity*, have moved up in recent years to occupy the top positions, and another related skill, *cognitive flexibility*, has entered the list. On the other hand, the other most-valued set of skills involves those that have to do with personal relationships: *people management*, *coordinating with others*, *emotional intelligence*, *service orientation*, *negotiation*. For all of these skills, the key competence refers to the workers' criterion for autonomous decision-making: *judgment and decision-making*.

It should be noted that we are educating people for a future that is hard to imagine. For this reason, we have to consider these competences in a broader perspective, without neglecting the approach in the short term, CHECK LOGIC which contributes towards economic success and social development, but we also have to focus simultaneously on the long term, to enable students to live a successful life in the context of an increasingly interdependent, rapidly changing, and, at times, conflict-prone world (Rychen, 2003a: 101).

In this rapidly changing environment, perhaps the most sensible path to follow is that given by an open model based on the three Rs: Reasoning (comprehensive set of thinking skills that a person needs to be an engaged, active citizen of the world), Resilience (persistence in achieving goals despite the obstacles that life places in our way), and Responsibility (a skill which covers the ethical and moral dimension of development) (Minelli de Olivera et al., 2015: 82; Sternberg, 2008). Again the key issue of values arises, either as a competence in itself, or as a basic substrate on which all the other competences are to be constructed (Rychen, 2003a: 115).

## **Digital “learners”**

All these transformations have occurred in parallel with the exponential development of information and communication technologies. Today, digital networks allow the almost instantaneous processing and exchange of vast amounts of information at a marginal cost tending towards zero from the first units. It is important to stress that technology is more than a set of tools with which we do things. It has been confirmed that “Technologies are organized ways of doing things... Technologies carry a deep cognitive load. Technologies enable us to do things we couldn't do without them – fly, work in a modern office – but they also enable us to think thoughts and understand ideas that we couldn't think or understand without them” (Noë, 2015: 25). The technological environment surrounding people is crucial to explain the way in which they act, think and learn.

In recent years, extensive literature has appeared on the subject of how ICTs have influenced the ways of learning of the generations who were born in the course of its development: the so-called “digital natives” (see Prensky, 2001a, 2001b, 2005; Tapscott, 1998, 2009; Palfrey, Gasser, 2008; Bullen, Morgan, 2008, 2015; Bennett, et al., 2008; Wach-Kąkolewicz, 2014). The essential approach is that digital immersion of the “net generation” (Tapscott, 1998, 2009) has sub-

stantially influenced their behaviour and attitudes towards learning. Thus, it is usually supposed that they are accustomed to processing information rapidly (despite experiencing certain difficulty in selecting the most important elements), to dealing with several processes simultaneously, (although this can lead to fatigue and lack of concentration), to preferring images and infographics rather than text, to being permanently connected to their network of virtual relationships, to preferring active learning in relation to the immediate rewards of the environment of video games, to keeping a greater connection between body and mind within the learning process, and to coping with comfort in virtual environments. In short, “they are accustomed to intuitive learning based on experimenting and independent exploration as well as maintaining a simultaneous virtual relationship with other learners” (Wach-Kąkolewicz, 2014: 21). It follows that the adaptation of teaching and learning processes to these new profiles would force the abandonment of the usual broadcast model and an advance into the development of digital, interactive, collaborative and constructivist learning environments.

However, other recent studies point to the scarcity of the available empirical evidence about the real behaviour and ways of learning of the latest generations. Research based on in-depth and focused group interviews with students at two Canadian universities and a Spanish university concluded that at least three major types of profiles can be identified in terms of the social and academic use they make of technology: instrumental users (or tool-limited, tool-specific users), separators, and integrators (Bullen, Morgan, 2015: 15–17).

The first, the *instrumental* users “make use of largely one tool for many purposes, for instance, email communication, they are highly task-oriented in their use, for example, they only go online or use a technology for a specific purpose such as gaming, they do not have a broad understanding of affordances or constraints of technology and generally seem less knowledgeable about technology; *Separators* consciously or unconsciously separate their academic and social practices, while the same tools may be part of both systems, for the most part, the community mediates the activities differently... They are increasingly aware and concerned about their privacy and online activity and have begun resisting certain technologies such as Facebook” (Bullen, Morgan, 2015: 15–16). The group whose characteristics are comparable to those attributed to those “digital natives” is that of the *integrators*, who use the same tools and develop the same practices both in the social and academic domain.

The result of this analysis indicate that it is advisable to design teaching methods based on the real needs our students present. We cannot assume that everyone is prepared and ready to function with sufficient reliability in the digital environment, especially in geographical areas where access to technology is or has been limited, or where the primary and secondary school systems have not favoured the digital immersion of students. On the other hand, it should also be noticed that the development of life-long learning is bringing people of all ages, with different digital profiles, into the higher education system. Hence, the authors of the quoted study suggest the use of the term “digital learners” instead of “digital natives”.

Regarding student preferences, these are not entirely clear. Some research shows that students may still prefer mixed models combining “face to face” with small doses of “e-learning” methods (Kaznowska et al., 2011). It is possible that these results appear because the respondents maintain their social and academic worlds apart and they are not able to imagine how a teaching/learning experience could incorporate all the technologies they use in their daily lives. In fact, it seems to be the teachers, as digital immigrants reflecting on their teaching practice, who understand this potential more clearly. Hence, it is necessary to assume responsibility for the generation of meaningful and motivating educational experiences so that students manage to become true *integrators* of their digital skills, even if it involves challenging their current preferences.

## **Edutainment**

The shift to competence-based training and the development of ICTs has led to changes in the pedagogical approaches of Higher Education. The traditional broadcast model has been progressively complemented by another model built on methodologies of a more interactive and participatory nature. Simultaneously, the gradual generalization, though not without controversy, of the multiple intelligence (MI) theory of Howard Gardener (1989, 2006), (who claimed that each student has eight cognitive modules, each of which addresses a specific domain of content), together with the modality theory of learning styles (LS) (Barbe, Milone, 1980) (which claims that groups of students prefer to learn through different perceptual channels), have led to the increasing incorporation of various techniques and methods in the classroom such as audio-visuals and kinetic workshops, aimed at stimulating distinct approaches to the world by different individuals (Klein, 2003).

In addition to this, the emotional aspects of learning are gaining greater importance. Thanks to the development of neurosciences (Damasio, 1994, 1999, 2003; Maturana, Varela, 1987) and behavioural sciences (Kahneman, 2011; Dolan, 2014), Spinoza's holistic perspective is currently being reconsidered, which, in the seventeenth century, was opposed to Cartesian dualism, by claiming an integration between reason and emotion, between mind and body. Recent research in neuroscience has clearly demonstrated that thinking and learning both depend on emotions (Gee, 2008) and this has serious pedagogical implications:

*“Introducing a concern for affect in the classroom is vital for learning. Even though learning is often associated with the cognitive, the thinking part of learners, it cannot be disassociated from the affective. Jensen (1998: 71) points out that ‘the affective side of learning is the critical interplay between how we feel, act, and think. There is no separation of mind and emotions; emotions, thinking and learning are all linked’. Likewise, in his work on the neurobiology of affect as related to language learning, Schumann (1994: 239) stresses that ‘in the brain, emotion and cognition are distinguishable but inseparable. Therefore, from a neural perspective, affect is an integral part of cognition’. One of the reasons that this is so is that an affectively positive environment puts the brain in the optimal*

*state for learning: minimal stress and maximum interest and engagement with the material to be learnt” (Arnold-Morgan, Fonseca-Mora, 2007).*

This greater openness to methodological pluralism, lending greater importance to the role of emotions in learning processes, has found a strong ally in the development of computer games. The characteristics of these games, in that the student identifies with a relaxed entertainment situation, which in turn allows players to learn through playing, facing simulated situations, with pre-established rules that permits them to experience a great variety of situations, and to learn to relate and to draw conclusions, explains the favourable reception they have had in Higher Education.

*“A growing body of research suggests that computer games can help players learn to integrate knowledge and skills with values in complex domains of real-world problem-solving. In particular, research suggests that epistemic games, games where players think and act like real world professionals, can link knowledge, skills, and values into professional ways of thinking” (Bagley, Shaffer, 2009: 1).*

Using these computer games, originally designed for entertainment, with educational purposes has been labelled “Edutainment” (Charsky, 2010).

This is not a purely hedonistic approach to learning. The *Edutainment* tries to create a positive experience for students, thereby fostering their motivation: a mixture of pleasure and purpose. That is, it creates the conditions for students to identify a purpose in their learning. Paul Dolan (2014), after a decade of research into the causes of happiness, claims that it is always a combination of pleasant and purposeful experiences. Thus, an effective virtual learning game would be one that is capable of combining pleasurable activities in a suitable manner, simultaneously generating a sense of purpose in the participants, increasing their higher-order thinking skills. As Charsky states, the creation of a virtual game for educational purposes is a complex task and a huge challenge for its designers. This is the reason why he uses the term “serious game”:

*“Serious games will not succeed just because they are games with educational content. Serious games are not going to be motivational “holy grails” despite each characteristic’s motivational prowess. Game designers and instructional designers must bridge the gaps in their respective crafts by entering into a dialogue on the game characteristics: competition and goals, rules, challenges, choices, and fantasy. The identification of how these particular characteristics can facilitate learning constitutes an attempt to establish a common vocabulary that can propel this discourse and meld the talents of game designers and instructional designers” (Charsky, 2010: 193).*

In the following sections, these virtual business games are examined by focusing on their plausible impacts on the formation of students' values and on the increment of their social and environmental awareness.

## **Virtual business games and learners' values**

### **Principal characteristics of Virtual business games**

The development of *gamification* in higher education occurs in this context, in which attention of the teaching systems is moved towards self-employment of the students themselves, a greater diversity of methods is introduced in the classroom, and the creation of an emotionally positive environment in the classroom is attempted in order to increase student motivation. All this is attained in a safe and controlled learning environment where students can explore the world created by the game, draw their own conclusions, and imagine alternatives.

The games business sector has been rapidly expanding in recent years. A reference article by Faria et al. (2009) covers the evolution of forty years of the history of business games. It examines the changing technology employed in the development and use of business games, why business games have been adopted and used, changes in how business games are administered, and the current state of business gaming. These authors report that at the end of 2004, these games were used by more than a third of a sample of one thousand American professors. A more current state of the question can be found in the book *The Strategic Management. Game Virtual Methods in Business Education* (Gaweł, Pietrzykowski, 2014), coordinators of the GAMES project (see note 1).

Business games have evolved in parallel with the development of computers and the Internet; hence they promptly became *virtual* business games. The evolution of technologies has considerably increased the complexity of these games. Today there are free versions, which can be played online with better systems for adequate monitoring and evaluation of students' performance.

According to Charsky (2010: 181–190), most games have similar elements:

- Competition and goals: in most virtual games, the objective is to create a profitable and competitive business. Each player receives starting capital, which can be employed to develop a virtual company according to its own unique scenario.
- Rules: these are constraints that limit the actions a gamer can and cannot perform. They are typically fixed and should be set to represent reality or real phenomena. Games are always partial imperfect approximations to the world, but in order to be successful, they must provide a certain sense of integrity and internal consistency. We will see in the next section that the rules of the game exert a major impact on the formation of players' values.
- Strategic choice: this refers to the gamer's ability to change certain game attributes, such as level of difficulty, allotted time, and number of players.
- Fantasy: nearly every game contains fantasy elements in an attempt to provide motivating and exciting game play (Charsky, 2010: 190).



Games can be used as central elements of a course or as a supplementary educational tool. Rabassa-Figueras et al. (2015: 174–175) provide a list of the benefits of the use of these games in educational contexts. First, they are able to convert the class into a pleasant environment for learners. Second, they require the student to make decisions on situations and strategic aspects. This allows students to develop their skills in decision-making in various scenarios. Games can promote teamwork and improve motivation. In fact, some authors present empirical evidence that, although not all games are able to reach adequate learning objectives, in most cases, students' motivation grows (Lin, Tu, 2012; Taoa et al., 2009). Overall, the game promotes the practical application of theoretical concepts for knowledge transmission in a more active way, together with fostering a better integration of ideas. Certain scenarios can also improve negotiation skills and develop leadership. Nevertheless, as has already been mentioned, none of these positive effects is generated automatically. Virtual business games require careful instructional design, both in the virtual tool and the implementation process in the classroom, to avoid the danger that learners perceive a gap between the game and the syllabus. In fact, these games require a great investment of time and effort from their designers as well as highly specialized pedagogical and computer skills (Gaweł, Pietrzykowski, 2014).

One aspect, largely ignored in the review literature on potentialities and limits of these games, is the impact that they can have on the formation of students' values and attitudes, particularly with regard to social and ecological awareness. In our opinion, this is a crucial issue. As we discussed in the first sections, the social and ecological challenges that current societies are facing require a radical change in people worldviews and mind-sets towards a more integrated and responsible perspective. We are training people today who will make the decisions and will create the business of the future; to pay attention to these aspects of their learning process is no longer a purely moral issue. Rather, it is assuming the task of equipping students with a comprehensive view of the consequences of their decisions on different scales and of providing them with a set of basic evaluations that enables them to successfully deal with the difficult challenges they will inevitably face.

### **Business as a game and its impact on students' values**

As teachers with experience in various faculties of humanities, social sciences, and health sciences, we have always been surprised by the lack of awareness of ethical conflicts shown by business management students, not only at the firm level, but also in the social and environmental consequences of aggregate individual behaviour. Very little empirical research exists regarding this issue, but certain studies demonstrate the very low levels of recognition of these conflicts. Lowry (2003) has reviewed some of these studies and has carried out research based on students' responses to case studies regarding ethical conflicts. Using a previously validated scale, it shows that, in general, participants in the study show very low concern about the ethical implications of business activities. What is striking about the results is that this disregard for ethical conflicts is higher in the upper years of the courses than it is in the lower years. The conclusion is that

it would appear that business administration degrees teach students “to learn to disengage in moral reasoning” (Lowry, 2003: 15). Possible reasons for this to occur are described below.

At this point, the question posed becomes how the use of virtual business games can help to enhance or reverse this generalized lack of moral awareness on the part of the students. In principle, a non-attentive pedagogical use of these methods could strengthen disengagement in moral reasoning. We consider this to be due to two interrelated reasons.

The first more general cause has to do with the widespread use of the metaphor of *business as a game*, which may affect the ethical behaviour of people immersed in this world (Hamington, 2009). The second reason, more specific to the use of virtual business games, is due to the very *game situation* created on the *metaphorical game* with which business is suppose to be identified. In this second point, the relaxation of the attention paid to the moral implications of their actions would be given by the tendency of people in a game situation, that is to say within the specific context of the game, to behave with a different morality than that which they would employ in their ordinary life (Reall et al., 1998).

With regard to the first reason, according to Hamington (2009), the problem arises from the fact that over the years the *metaphor* of business as a game has become almost a *definition*. The truth is, however, that businesses can be like a game, but they are not equivalent to a game. This confusion affects how people understand the world of business and it brings about detrimental consequences for ethical behaviour (Hamington, 2009: 474).

Indeed, in real life, the identification of businesses with games has enabled business environment to be considered as a morally separate domain from the rest of human existence, as if it were a sports game with its own rules and its own morality. Consequently, it is assumed that a business professional is a person who knows the rules of this specific morality, and is not influenced by those of the “outside world”. The same compartmentalization is also observed when values of the individual and those of the corporation are perceived separately.

Although strong resemblances between games and business can be recognized, such as competition, goal achievement, and coordinated group efforts, similarities do not constitute an identity, especially since the consequences of business actions can have a major impact on people who are not directly part of the rule-formation process.

On the other hand, temporality in business is different from that of the games. Businesses, unlike most games or sports that have defined starting and finishing times, run for undetermined periods, sometimes for decades or even centuries.

Ultimately, it cannot be affirmed that businesses constitute an autonomous area that can be played with their own autonomous rules and moral considerations. Businesses are embedded into the system of social and natural relationships and a handful of simplified rules remain insufficient to account for the complexity of conflicts of interest and ethical dilemmas of human existence.

On the other hand, another problem of this identification between games and business is that it reduces business relationships to the merely competitive.

Although companies promote internal cooperation and create cooperation links with other partners, companies, and/or stakeholders, this cooperative behaviour is always oriented towards external competitiveness. This reinforces a view of human agency based on hypotheses (individual rational egoism combined with some kind of natural selection mechanism) that have been strongly questioned by research on anthropology, psychology, biology, and modern economics, which has demonstrated that cooperative relations are equally essential for the functioning and improvement of societies and that there is no empirical basis to suggest that the development of societies, or even markets, is based solely on competitive behaviour (Graeber, 2011; Kahneman, 2011; Bolier, Helfrich, 2015). The consequence is that competitiveness reinforces the limited vision of business as a game and supports the impression of separate moral domain, which justifies the irresponsible behaviour of firms and individuals regarding the external consequences of their actions on the “outside” world. The expression “this is just business” sums up this situation in a very illustrative way.

Virtual business games create real, non-metaphorical game situations in the field of business, which at the same time are supposed to be metaphorical games. Therefore the same consequences of the identification of business as a strategy game in real life can be inferred for virtual business game situations but in a more intensive way. According to Reall et al., “when individuals are playing competitive ‘games’, the level of moral reasoning can be significantly lower than during non-game moral reasoning. The use of a ‘game’ metaphor may help businesses to identify, analyse, and choose moves and possible outcomes. However, the use of a ‘game’ metaphor may also contribute to the attenuation of moral reasoning sometimes found in business” (Reall et al., 1998: 1209).

Nevertheless, these reflections on the ethical effects of the use of the game metaphor do not prevent the use of virtual business games in higher education, rather the contrary, and for a couple of reasons. Firstly, the game-business identification is clearly installed into the current dominant worldview with which everyone is familiar. The vision of a business as a game is a common place that can provide a good departing point for students to debate the consequences of such identification and the implicit set of values that it embodies. Second, virtual business games can become very powerful tools for the determination and debate of the ethical, social and environmental implications of business decisions, thereby allowing students to experiment with different types of behaviour and value systems and to analyse and discuss the consequences of their materialization within a controlled environment.

In this regard, an appropriate instructional design could convert these virtual business games into laboratories which would enable students' interpersonal, social and ecological awareness to increase.

## **Ways to introduce social and ecological values in virtual business games**

The first and most immediate way to introduce environmental concerns in virtual business games is by designing games that explicitly include these considerations. However, as already stated, the production of these games requires multidisciplinary technical skills and an abundant employment of time and resources, which together make it difficult for non-specialist teachers to produce these games, and hence the most convenient option is to utilize some of the games created by specialized teams.

In a recent article, Katsaliaki, Mustafee (2015) carry out a survey on current available games that introduce sustainable development concerns in higher education. They analyse 49 games: 11 from academic sources and the remainder from online resources. Five of the games can be considered virtual business games, which entail: learners running a company and making decisions which minimize environmental impact while maximizing profit; and consideration of environmental, economic, and technological issues. We have reviewed the websites of these games, and, for illustration purposes, their main objectives are listed below:

- **BETTER BUSINESS DILEMMAS<sup>4</sup>**: Groups of 'players' design a business strategy to deliver triple bottom-line payoffs, using a full-colour Monopoly-style board game backed up by online scoring and feedback.
- **CEO2**: This is a role-playing game that helps students to explore different business strategies in order to maximize profit, to significantly cut CO<sub>2</sub> emissions, and develop low-carbon products by 2030. No longer available on-line.
- **ECLIPSING THE COMPETITION: THE SOLAR PV INDUSTRY SIMULATION<sup>5</sup>**: In this live web-based simulation, participants play the role of senior management at SunPower, a leading firm in the solar photovoltaic industry. The game simulates the solar PV industry as described in the SunPower case study. Users compete against other firms, simulated by the computer, and set the industry conditions in order to learn about strategy under different conditions related to learning, knowledge spillovers, and competitor behaviour.
- **OILIGARCHY<sup>6</sup>**: This is rather an adventure game. Each learner's oil firm should explore and drill around the world, deal with corrupt politicians, stop alternative energies, and increase oil addiction until the resources begin to deplete. The game is licensed under a Creative Common licence.
- **SHORTFALL<sup>7</sup>**: the goal of each team is the creation of a profitable and environmentally benign supply chain.

These games constitute examples that enable students to analyse aspects related to values and social and environmental consequences of company behaviour.

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<sup>4</sup> <http://www.bitc.org.uk/services/advisory-services/better-business-game>

<sup>5</sup> <https://mitsloan.mit.edu/LearningEdge/simulations/solar/Pages/default.aspx>

<sup>6</sup> [www.molleindustria.org/en/oiligarchy](http://www.molleindustria.org/en/oiligarchy)

<sup>7</sup> [www.coe.neu.edu/Groups/shortfall/](http://www.coe.neu.edu/Groups/shortfall/)

However, it is also possible to include a structured debate on these issues even when the game itself is not specifically designed for this purpose. For example, BUSINESS ARENA<sup>8</sup>, the game developed by Poznań University of Economics and Business for the GAMES project (see Note 1), is a game for strategic management that was not originally conceived to address these issues. However, the adaptability of its design allows scenarios to be created that can include diverse aspects related to Corporate Social Responsibility (Carroll, 1999; Lindgreen, Swaen, 2010). It is also possible to adapt these scenarios so that the results of the business can be evaluated on the basis of alternative balance-sheet instruments, such as the Common-Good Matrix, proposed by Christian Felber (2015), which assesses the impact of business decisions regarding stakeholders (suppliers, investors, employees, business owners, customers, business partners, and social environment) on basic dimensions, such as human dignity, cooperation and solidarity, ecological sustainability, social justice, as well as democratic co-determination and transparency.

In addition, players could be asked to establish the mission and vision of the company and to jointly reflect on the values that will guide their decisions during the game, that is, the meta-rules of the game, and, once these values are set, to assume the compromise to respect them.

Through their own practical experience, by playing multiple games with various sets of previously agreed values, students can study, in a direct way, the different aggregate impacts of each value system in terms of economic and social sustainability of the whole system. Furthermore, the class could discuss the system of incentives that would be advisable to attain corporate behaviour to have a more favourable global impact. This method is far from abstract indoctrination about the supposed dangers of purely capitalist market behaviour, instead, the students, on the basis of their own experience, would be able to analyse practical and specific results of the process of decision-making: who decides, what is decided, how and why decisions are made, and with what consequences.

Games can help integrate these considerations into the curriculum rather than these questions being approached in isolated modules of business ethics that are often perceived by students as a catalogue of idealistic recommendations disconnected from all the other subjects of the syllabus. In short, a suitable methodological approach using virtual business games could prove very effective for the integration of social and environmental awareness of the learners into the whole curriculum in a more effective way.

## **Conclusions**

We began this chapter by stating that the current social and environmental challenges require going beyond educating students so that they may adapt to the demands of existing labour markets. Today's society needs more ambition; it needs leaders with innovative and creative vision capable of redirecting our current

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<sup>8</sup> <http://bizarena.ue.poznan.pl/>

socio-ecological systems towards the sustainability of human life. After all, it must not be forgotten that when we talk about sustainability, we do not strictly refer to the survival of the planet, but instead to the viability of human beings living on the Earth.

We have argued herein that the “game metaphors seem to reinforce a Hobbesian view of human nature that overshadows the human capacity to make common cause” (Hamington, 2009: 481). Since so much of what we do is bound up with what we believe is possible, this adversely affects the formation of the set of values and consequent behaviours that would be needed to generate a more sustainable and fair development model, especially those related to cooperation. We have also argued, however, that a carefully designed pedagogical experience with virtual business games can enable students to become explicitly aware of the assumptions being made, and this “can help to open up and explore variety and complexity in human behaviour and potentially unanticipated side-effects” (Ranner et al., 2016).

Recognising fundamental ecological and social problems and developing new ways to respond to these issues forms a substantial part of enabling sustainability. However, strengthening the social and environmental awareness of students cannot be an isolated task within an isolated discipline; it requires a multidisciplinary effort and the inclusion of this objective throughout the graduate or post-graduate syllabus, by fostering a learning environment that permeates all levels of the educational institution. After all, as an old African proverb says: “It takes a whole village to raise a child”. Obviously, virtual business games constitute nothing more than a tool for this purpose, but as we have argued, under a good pedagogical design, they are full of potential.

One final note should be made in order to leave the debate open. If, as Hamington (2009) suggests, conceptual metaphors shape perceptions, and the relationship between metaphor and behaviour is dynamic, each influencing the other, and perhaps his proposal to change the metaphor “game” for “journey, quest or mission” should be seriously considered: “a travel metaphor may open a new imaginative space for moral reflection that complements game metaphors. If we can loosen the sediment of game metaphors, then perhaps we can avoid some of the pitfalls of ethical game playing” (Hamington, 2009: 484).

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## **Learning Business Through Simulation Games. Survey Among Students Who Played Developed Games**

### **Games and learning**

It is not big news for educators anymore that nowadays students are increasingly audio-visual-driven learners with diverse learning styles. While educators have adopted various methods to cater to each new generation of students' needs to make learning more likeable, such efforts do not yield the same effect as playing computer games, where game players are willing to learn as they play (Wong et al., 2016: 731). The use of games in education (also called edutainment) combines education and fun, involves students in education and allows experimentation with different aspects of education (Poznań University of Economics, 2014). Rodkroh et al. wrote that "the digital games concept has been used in education since the end of the 20th century because games have the potential to promote the student' skills through problem solving" (2013: 336). This paradigm, known as game-based learning, was one in which Conati (2002) identified games utilization as a medium for conveying learning content. Computer games present an engaging experience within the virtual world where most participants are willing to spend hours being immersed and amused (Wong et al., 2016: 731). The most common game genres for educational games are simulations and role-playing games (RPGs) (Wong et al., 2016: 729). Simulations increase the level of organisational reality during training and provide the trainees with an opportunity for unstructured learning (Poznań University of Economics, 2014) and "the learner is given full control of the gameplay and can react as the hero of the game" (Wong et al., 2016: 729). There are positive and negative impacts in using games in education. According to Wong et al., computer games often have a negative impact on people because most people treat computer games as an addiction for the learner; thus, computer games have great potential to assist or replace teach-

ers and engage learners in a new and challenging way (2016: 729). Because of active participation within the gameplay and interactive storytelling, players are motivated to engage in activities within the game world (Wong et al., 2016: 731).

## **Learning and personality**

The one aspect needed to consider in educational games is players' personality type. Students in classrooms differ in social economics, and political and cultural aspects, and so there are also different personalities. The Myers-Briggs Type indicator (MBTI) has proven to be useful for educational purposes. It is used with students ranging from junior high to college. The MBTI has become the most widely used personality measure for non-psychiatric populations (Myers, Myers, 2010: xxi). The MBTI not only identifies type in students, but also helps them to understand their various learning styles as well. Through the indicators, a student can come to know how he/she understands material most effectively, and to know what his/her learning style is. The benefits of knowing a student's learning styles are first, through an understanding of his/her learning styles, the student knows more accurately how he/she can better process and put new information to use. Second, the teacher will know how each student is most likely interpreting new information and whether or not a particular lesson or project is suitable to each student's learning style. In addition, knowledge of learning styles can help a teacher better understand each student's strong and weak points and can promote better communication in the classroom (Brownfield, 1993). So this tool could be useful to select students who can learn through simulation games better than by using other methods.

The MBTI was developed by the mother-daughter team of Katherine C. Briggs and Isabel Briggs Myers. They began developing this personality test in the summer of 1942, basing their ideas on Carl G. Jung's theory of psychological types. Despite the fact that the developers had no formal psychological or statistical training, they began developing an item pool that would test the attitudes, behaviours, perceptions, and feelings of the different psychological types, according to their understanding of them (Myers, Myers, 2010). After tryouts and research, the indicator was created. The indicator involves four preferences, each of which has two sides. They include Extrovert vs. Introvert, Sensing vs. Intuitive, Thinking vs. Feeling, and Judgment vs. Perception. There are sixteen types, each being a combination of the four preferences. Types are illustrated by four letters, such as "INFJ". The four letters indicate the preferred side of each of the dichotomous preferences, though both sides of each dichotomy are used by a person at one time or another. The MBTI is used in counselling, in business and industry, in public schools, and at colleges and universities. Some advantages of the MBTI are that it provides personal insight in a positive constructive way; it is almost completely self-administering; it has no time limits; it has several forms to accommodate various purposes; and the results are easy to interpret and understand (Briggs, Briggs-Myers, 1987). Information about an employees' personality type can inform a manager on how to manage and motivate them, and will help

to integrate new team members quickly while also developing their leaders and leadership (Bajic, 2015).

## **Games and business education**

One of the areas where games are used is business education. A business game is a simulation or model of either the whole or a part of a business organization. Simulations and games are experimental training activities which incorporate and utilize the various mental abilities of students. Business games are considered as a trial-and-error method, which permits a deeper insight into business management problems (Poznań University of Economics, 2014).

One of the significant aspects of educational games is the user interface (Adcock et al., 2008). This is because without the user-friendly and easy-to-understand interface, learners will grow bored and frustrated and end up leaving the game. The user interface also represents the first impression delivered to the learner about the game. A clear and simple interface will make the learner feel more comfortable (Wong et al., 2016: 730). Helme and Clarke state that “students need to have both the will (motivation) and skill (capability) to be successful learners” (2001: 136) and that “the individual brings to the learning situation numerous characteristics that influence their cognitive engagement. These include: skills, knowledge, dispositions, aspirations, expectations, perceptions, needs, values and goals” (2001: 138). Buchanan (2004; from Rodkroh et al., 2013) insisted that digital games should be designed to support the learning of cognitive, affective, and psychomotor skills and abilities, enhance problem-solving thinking skills, and promote creative exploration.

Amory and Seagram (2003) presented a model called the “Game Object Model” (GOM), which combines education theory and game design. This model consists of both pedagogical dimensions and game elements. Pedagogical elements are play, exploration, challenges, engagement, goal formation, goal competition, critical thinking, discovery, competition and practice. On the other hand, games elements that are interaction, storyline, feedback, fun, graphics, sound and technology. Therefore, there are lots of demands game constructors need to fill.

## **Project GAMES**

Project GAMES is the follower of the project *Strategic Management Games –innovative teaching method for business education* (project number 2011-1-PL1-LEO05-19884), implemented within the Leonardo da Vinci Transfer of Innovation programme. The principal objectives of the first project were to develop and test business games scenarios, as well as to create teaching notes on the basis of strategic game engine prepared for the purposes of the project (Gaweł, Pietrzykowski, 2014). The name of the following project is *Virtual Game Method in Higher Education* (acronym GAMES) in the programme ERASMUS+ in the field of Strategic Partnerships for higher education. In the second project, education tools were created to establish and run social companies, which take care

not only of economic effectiveness, but also fulfilling social needs, so the game scenarios are service-based.

During the GAMES project, a virtual game in higher education will be developed as an innovative education method. The students as players put themselves in the position of business managers in various aspects of company management. During the game, their task is to make decisions within their area of competence, and the quality of those decisions has an impact on the performance of the virtual company. Business games force the participants to take a sequence of managerial decisions, and later on the players receive feedback regarding the consequences of those decisions. In the project were partners from four countries: Poland, Spain, Finland and Estonia. Each of the partners developed different game scenarios in the same platform. Spanish students played a coffee shop simulation game, Estonians a car wash, Finns in social care, and Poles a fitness club scenario.

## Data and Methodology

After playing the simulation game, students filled a survey questionnaire conducted with the LimeSurvey application. There were different students in different countries, and it was interesting to compare results by curriculum, gender, nationality and where they had played a similar game before. The curriculum of students who played the game were classified as business studies (group A) or not, where students studying social work and tourism gathered (Group B). Respondents' data are presented in Table 1.

Table 1. Respondents by nationality. age. gender and curriculum

		Frequency*	Percent
Nationality	Spanish (ESP)	16	13.6
	Estonian (EST)	33	28.0
	Finnish (FIN)	38	32.2
	Polish (PL)	31	26.3
Age	under 18 years	6	5.0
	18–23 years	82	69.5
	24–34 years	24	20.3
	35+ years	6	5.1
Gender	Female	96	81.4
	Male	22	18.6
Curriculum speciality	Business and Administration	26	22.0
	Social Work	40	33.9
	Tourism Studies	14	11.9
	Project Management	7	5.9
	International Business	31	26.3
Previously played a similar virtual game	No	70	59.3
	Yes	48	40.7

\*Same counts are presented also on figures after group name.

Figure 1 shows that business students and students from Spain and Poland are played similar games before and others not. In the figure numbers on the coloured areas indicate the number of respondents and length of the coloured areas indicate groups' distribution by percentage

When using a computer-based game for teaching students, it is important to know how students assess their digital skills. There were a few respondents who said that they hate info technology (IT) and they rather feel confused using new electronic devices and usually have problems adapting to new electronic environments.

Based on Figure 2, it can be concluded that most students do not afraid computers and are willing to play simulation games. Students not studying business, especially students from Estonia and from Finland, and those who not played similar games before, found that the way that this virtual game deals with market dilemmas was interesting. Half of the business students, 58% of students who played similar games before, 65% of Polish and 75% of Spanish students, disagreed with this.

The same apportionment was among different groups of respondent's answers' for the questions "The scenario of the virtual game captures important issues", "Problems provided in this virtual game are diversified" (see Fig. 3) and "The structure of the virtual game is consistent".

65% of Estonian respondents agreed that they can draw conclusions relevant to real market situations; in other groups, respondents agreed with this less than 50%, but 23% of the Spanish students, in addition to students who had played similar games before, totally agreed with this. Up to 20% of respondents agreed that information in the instruction is sufficient for making decisions in the virtual game and that the story provided in this game scenario was coherent and clear. So it can be concluded that after once playing the game, it is not easy to understand

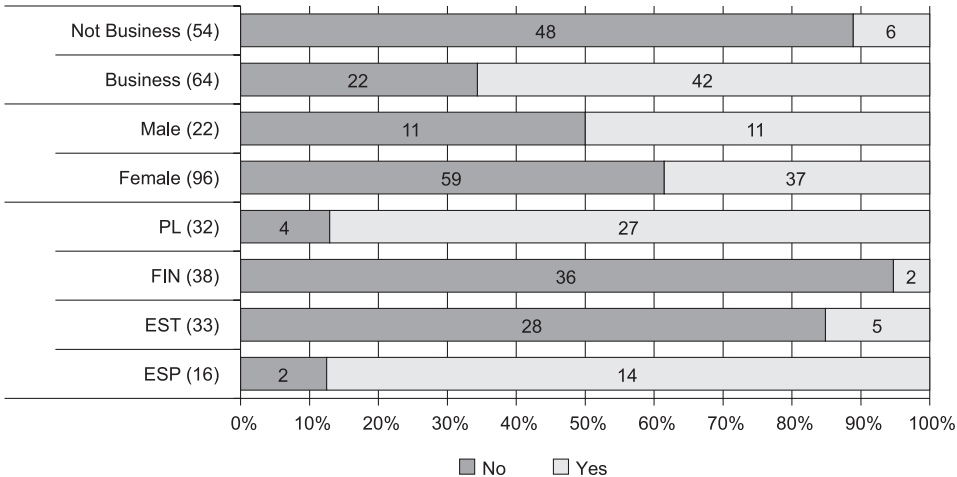


Fig. 1. Have you played similar games before?

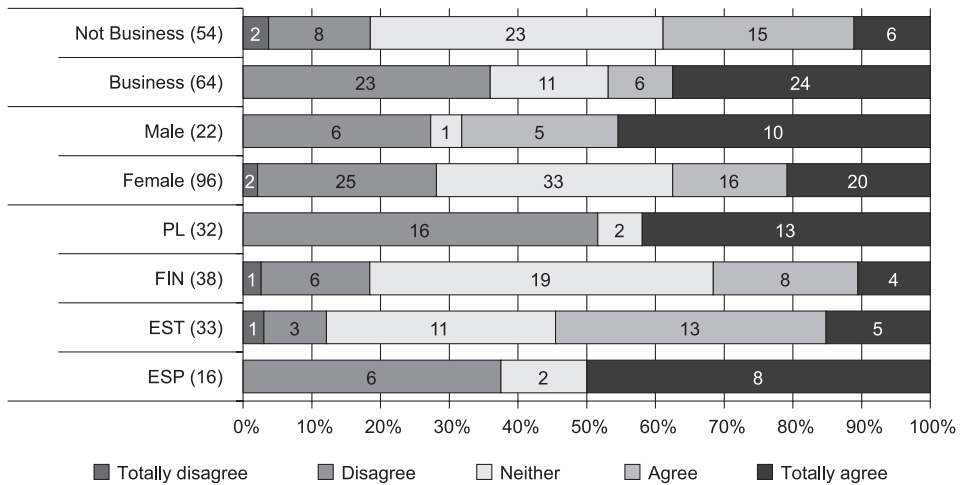


Fig. 2. I love IT and feel comfortable in using different media formats in everyday life, study and at work

the game properly. Less than 30% of respondents from all groups agreed or totally agreed that the duration of the game was properly predicted.

Respondents who had the most convenience in playing the game were male (32% totally agreed, 23% agreed), Polish students (40% totally agreed), studying business (27% totally agreed, 7% agreed), and students who had played before (31% totally agreed, 1% agreed). Also, 33% of the Estonians and 29% of the students who had not played similar games liked to play the game. For them, it was a new learning method, and so it was interesting. The game demands lots of business knowledge, so it is convenient for students who are more experienced

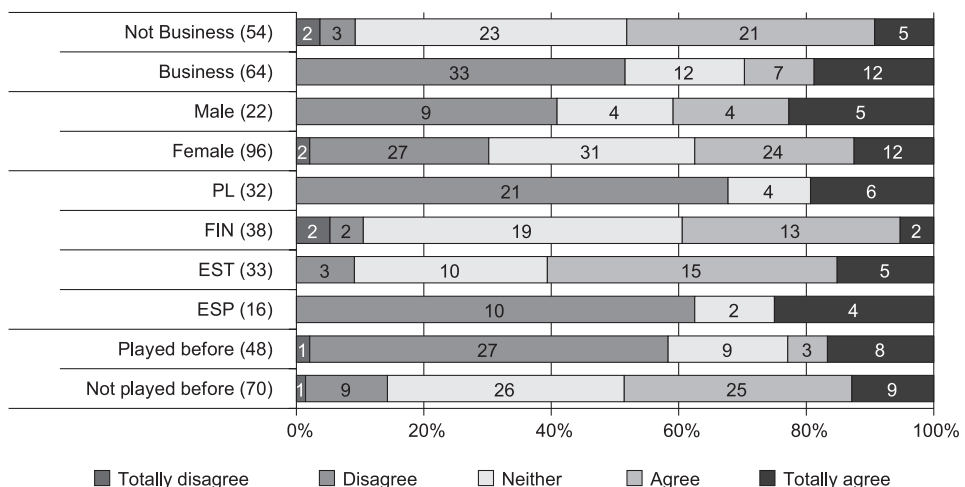


Fig. 3. Problems provided in this virtual game are diversified

in business and simulation games. None of the Estonian students disagreed with wanting to participate in similar classes, but approximately 55% of Polish and Spanish students do not want to do this again (see Fig. 4).

60% of the students wanted to change some game elements. They made the following suggestions:

“It took too much time to wait other players to move to next round” (EST 3, FIN 5 players)

“If we would have read the manual, everything would perhaps have been understandable, but while playing the game the so-called pop-up windows could appear on to draw attention to what you can do with the new round” (EST)

“More clear instruction, feedback from the last turn (tips, what should be improved), different professionals should be able to work in the same office” (FIN, 5 players)

“The game might say, as a kind of important thing is not checked (such as pricing)” (EST, 3 players)

“Specify the need for different workers for different services” (FIN 4 players)

“Adapt taxes also into the game” (EST)

“Would be nice if the software were somehow easier to use and navigate” (FIN)

Respondents were asked to assess how important some factors were while playing this specific game. The first factor was “To receive an achievement within the game-context”. For 55% of Polish students, it was not important; on the other hand it was very important for 39% of them, as it also was for most of the other groups’ respondents. Less than 18% of those not studying business, as well as Finnish students, considered receiving an achievement very important, and 60% marked it as important. So, achievement is important for students.

The second factor was “To explore the game and its environment”, and this was important for all the Estonian students to whom the game was introduced

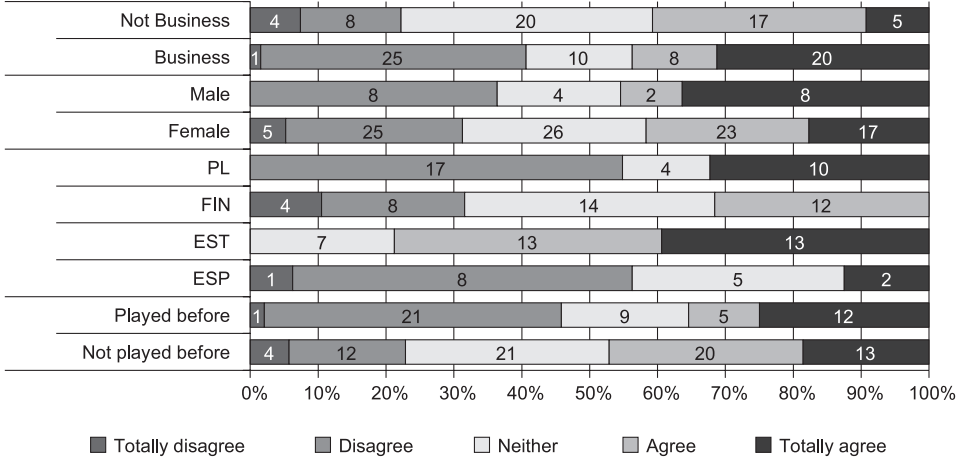


Fig. 4. I would like to participate in similar classes



as a prototype they needed to test. This factor was also important or very much important for students not studying business and those who had not played a similar game before. 55% of Spanish and 41% of Polish students marked this factor not important, despite that in conformity, 22% and 54% of students of the same countries marked it very important. Approximately the same proportions were among business studying and students who had played before.

The third factor was cultural, and the question in the questionnaire was, “To socialize with other team members or players” (see Fig. 5). For 88% of Spanish students, 65% of the students who had played a similar game before, and 61% of Polish students, it was not important. 94% of Estonian students considered this factor important or very much important (42%). Less than 30% of the respondents of other groups considered it as a very important factor.

The last factor was “To impose upon others (to dominate/ win the game) by any necessary tools”, and almost same proportion (30–45%) of students from every group considered it important or very important.

Students also assessed the learning process with the virtual game. 81% of Spanish and 68% of Polish students disagreed that learners use their previous knowledge in building new knowledge; half of the business students and those who had played similar game before also disagreed. Approximately half of the students agreed or totally agreed with this statement; only Estonian and students who had not played similar games before agreed more than others, with a conformity of 96% and 70%. Similar results were also obtained for the statement “Authentic tasks in a meaningful context are encouraged”. 69% of Spanish and 49% of Polish students disagreed that virtual games encourage reflection on prior knowledge and the task. 81% of Estonian students agreed or totally agreed with it, and Finnish students preferred answer “Neither”.

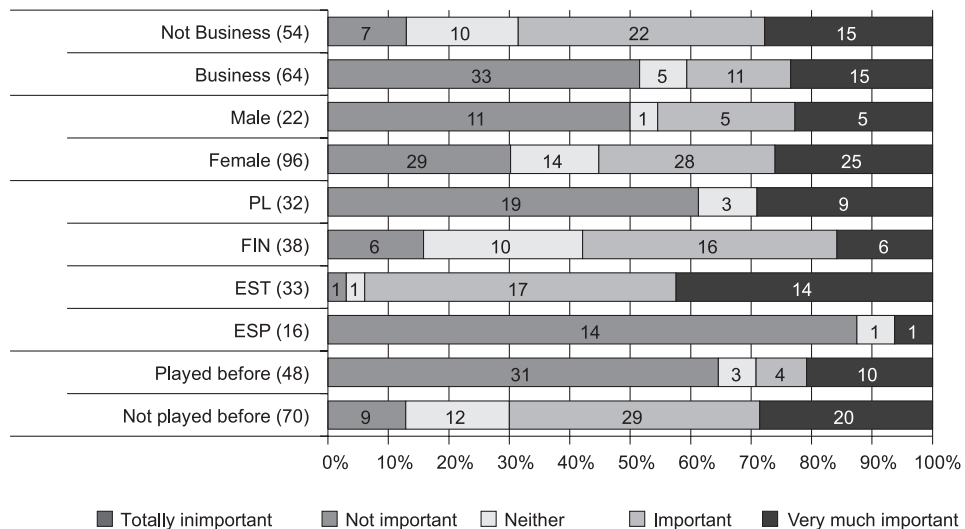


Fig. 5. To socialize with other team members or players

Almost 60% of Polish and Spanish students marked that collaborative work was not encouraged, but 91% of the Estonians, 69% of students not studying business and who had not played similar games before, and 58% of Finnish students declared that it encouraged collaboration. Similar trends were also seen in regards to the opinion that learners experience new situations and explore them in finding the right solutions (Fig. 6).

40% of students agreed that learners get feedback on their activity.

Students assessed in the five point Likert scale which skills are necessary to successfully progress with this specific game, and which skills are developed while playing the game. The mean scores (Mean) and standard deviation (SD) by different groups are shown in Table 2.

Not one of the named skills received a total average score below “3”, so every skill was counted as necessary and developed. Students indicated that the three less necessary skills for success with this specific game were independence, computer and time management skills, and less developed skills were rated the same. The most needed skill was the decision-making skill and this was also most the developed skill by students. Differences between students’ groups are shown in Table 2.

There was a question about feelings during the game. Students were asked to mark just one feeling of eight (see Fig. 7) and these feelings were coded on an 8-point-scale (feelings presented in a different order than in the questionnaire): 8 – “Self-confident and challenged”; 7 – “Cheerful and in good spirits”; 6 – “Amused”; 5 – “Neutral”; 4 – “Cannot tell”; 3 – “Disoriented”; 2 – “Bored”; 1 – “Irritated because things did not go as I wanted”. Coding the variable like that allows the researchers to use parametric tests, like independent samples t-Test

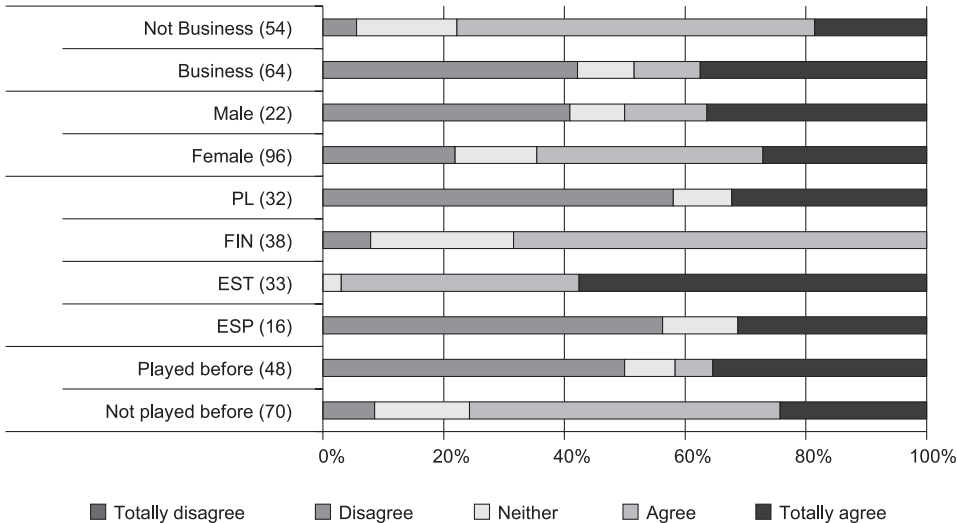


Fig. 6. Collaborative work was not encouraged

Table 2. Necessary and developed skills by students (n=118)

Skills	Played a similar game		Gender		Nationality				Business Curriculum		Total																																																																																																																																																																																																																																													
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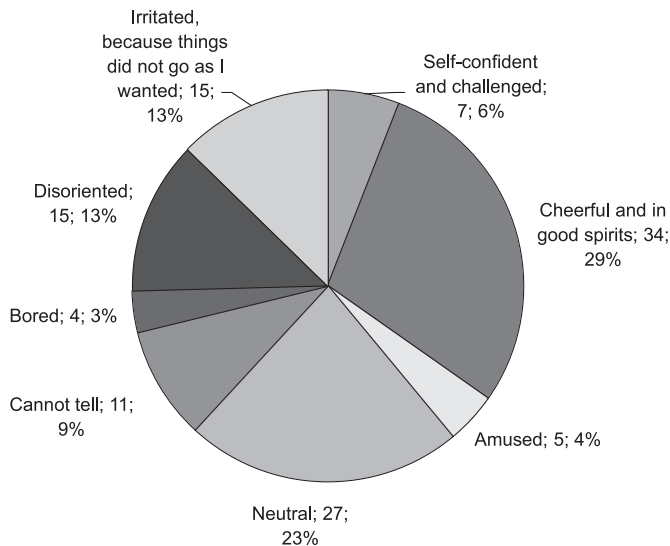


Fig. 7. Students' feelings after playing the game

Table 3. Differences between dichotomous variables by t-Test

	Played a similar game		Gender		Curriculum	
	No	Yes	Female	Male	Business	Not business
N	70	48	96	22	64	54
Mean	4.39	5.73	4.63	6.27	5.81	3.89
Std. Deviation	2.07	1.63	1.97	1.64	1.74	1.82
F	5.726		3.880		.349	
Sig.	.018		.051		.556	
t	-3.927		-3.642		5.868	
df	113.681		116		116	
Sig. (2-tailed)	.000		.000		.000	

and analysis of variance (ANOVA) to compare groups’ differences. In Table 3, the results of comparison are shown.

The largest part (29%) of students felt cheerful and in good spirits after playing the game, but there was also 32% of students who stand neutral or could not tell about their feelings. The third biggest part (26%) was irritated or disoriented.

There is a statistically significant difference for all variables. The highest average score was from males, who were more than amused but not so high as to be cheerful. Experienced players and business students were on average amused, while unexperienced players and females were neutral. The lowest average score was for students not studying business, who marked themselves between “cannot tell” and “disoriented”. By the standard deviation score, it can be noted that the variance is quite high, so there are many students who are below or above average score. This result is also adumbrated from Figure 7.

Statistically significant differences were noted between Finnish students and those of other nationalities (Bonferroni multiple comparisons were used in ANOVA test). Finnish students marked themselves feeling, by average score, between “disoriented” and “cannot tell” (see Table 4). Estonians also received the lowest score, but it was statistically significant from Polish (p=0.042) and Finnish (p=0.006) students’ scores.

It is also important to look at results not only by average; in Figure 8 are feelings by nationality and by percentage.

Table 4. Descriptive Statistics in ANOVA test for the question “How did you feel while playing this game?”

	N	Mean	Std. Deviation	Minimum	Maximum
ESP	16	5.88	1.67	1	8
EST	33	4.94	1.92	2	7
FIN	38	3.55	1.72	1	7
PL	31	6.13	1.57	3	8
Total	118	4.93	2.01	1	8

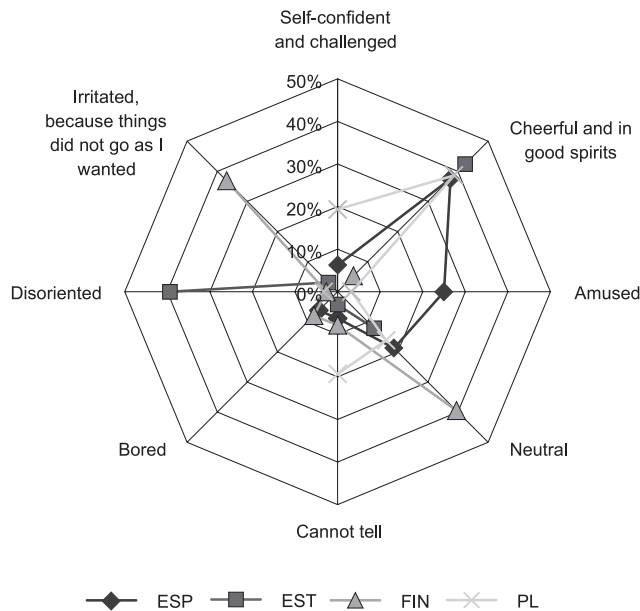


Fig. 8. Feelings by nationality

Estonian, Polish and Spanish students were in almost the same proportion cheerful and in good spirits, but only 5% of Finnish students felt the same way; they were mostly neutral or irritated. Estonian students were also disoriented while others were not. For Estonian students, it was the first time playing such a simulation game, which might be the reason for this kind of answer.

There was also the idea that students differ by personality. In the questionnaire, the simplest version of the Myers-Briggs Type indicator was used, and it consisted of eight agree/disagree statements. Only one question has statistically significant difference ( $p=0.007$ ) for the feelings variable, and this was the statement about how the respondent gets his/her energy: “I get energy by spending time alone; I am focused on my inner world and I rather like to think, then speak”. Those students who disagreed with this statement got a higher average score between “Neutral” and “amused”, and others between “neutral” and “cannot tell”. The same result by all MBTI statements and feelings variable are shown in Table 5.

There are no clear types of personality, so the students were given some statements and they did not know which kind of personality type these sentences covered. The self-confident and challenged marked themselves as extroverts, sensing, thinking and judgment personality type, so their personality type is, by theory, “ESTJ”, and this type is, according to the results of this survey, the best player of developed games. The cheerful and in good spirits are type “EIT(J/P)” but there is no such clear separation of personality types. Neutral is “ISTP”, cannot tell “EITJ”, disoriented “(E/I)ITJ”, and irritated the “EIFJ” personality type. Amused and bored students’ counts were so small that their personality type does not appear clearly.

Table 5. The Myers-Briggs Type indicator statements comparison with feelings about the game students played. (Number of respondents=118)

The Myers-Briggs Type indicator statements		Self-confident and challenged (7)*	Cheerful and in good spirits (34)	Amused (5)	Neutral (27)	Cannot tell (10)	Bored (4)	Disoriented (14)	Irritated, because things did not go as I wanted (13)
Extravert	Agree (69%)	100%	74%	100%	44%	90%	50%	64%	77%
	Disagree (31%)	0%	26%	0%	56%	10%	50%	36%	23%
Introvert	Agree (47%)	14%	35%	40%	56%	40%	50%	64%	69%
	Disagree (53%)	86%	65%	60%	44%	60%	50%	36%	31%
Sensing	Agree (60%)	86%	62%	80%	59%	50%	75%	57%	46%
	Disagree (40%)	14%	38%	20%	41%	50%	25%	43%	54%
Intuitive	Agree (64%)	29%	76%	60%	52%	80%	75%	64%	69%
	Disagree (36%)	71%	24%	40%	48%	20%	25%	36%	31%
Thinking	Agree (64%)	71%	65%	80%	63%	70%	50%	79%	46%
	Disagree (36%)	29%	35%	20%	37%	30%	50%	21%	54%
Feeling	Agree (53%)	43%	59%	80%	52%	40%	75%	36%	54%
	Disagree (47%)	57%	41%	20%	48%	60%	25%	64%	46%
Judgment	Agree (69%)	100%	68%	60%	59%	80%	75%	79%	77%
	Disagree (31%)	0%	32%	40%	41%	20%	25%	21%	23%
Perception	Agree (64%)	43%	68%	100%	67%	60%	75%	50%	54%
	Disagree (36%)	57%	32%	0%	33%	40%	25%	50%	46%

## Conclusions and the limits of the survey

In the article, we wanted to bring up the need to consider the personality type of the players of educational games. The problem arose when teachers of Estonian partners played the game and different attitudes appeared. There was also literature where we found support for our aims. In the survey, students marked how they felt after playing the game and the feelings were divided for three similar-sized groups: good, neutral and bad. So this result indicates that there are differences, but it is hard to say if they are caused by personality types, as statistically significant differences also appeared between gender, curriculum, and experiences of this kind of games. There were 118 respondents in our survey from four countries, and the cultural differences of these countries might also be the reason, in addition to the quite small number of respondents, which may be why the results were not so reliable and clear. We can say that respondents are not afraid of computers and are willing to play simulation games. The students who had played similar games did not find the game developed during this project very interesting and different from games they played before. The students who not played similar games before assessed the game as interesting, but they also concluded that during the first time playing, it is hard to understand the game logic. So-called “beginners” also often agreed with statement that learners can

use their previous knowledge in building new knowledge and that collaboration was encouraged during the game, while “experienced” players did not agree with this. The most needed skill in the developed game was the decision-making skill.

There are also some limits of this survey. At first, the number of respondents was lower than expected and all the compared groups were not statistically equal, but their answers gave at least some directions for conclusions. Secondly, the personality types questions needed to be measured on at least a 5-point Likert scale or a scale which have two opposite ends. And lastly, a limitation is that there were four different games, and because of that the feelings after the game might differ.

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## **Game-based Learning in Entrepreneurship Studies in the Social and Health Field**

### **Introduction**

Playing games using various electronic devices has increased in Finland and in the whole Europe during the past decades. Young people spend an increasing proportion of their free time at computers (Pääkkönen, 2014), although digital games have not superseded fiction in Finnish society (Kallio et al., 2009: 11). The use of games and gamification or the use of game elements in non-game contexts (Kirvesniemi, Weiss, 2016) are closely related to the development and expansion of European information societies, also in the field of education. In Finland the recent education policy, steered and managed by the Ministry of Education and Culture, has been to promote the introduction of new learning methods, especially those employing information technology in all levels of education. Digitisation, including game-based learning, is a national target in learning for any certificate or degree in Finland. The aim is to use electronic, freely accessible internet material to support learning and to provide high standard e-material, including games and simulation applications for all national curricula (Opetus- ja kulttuuriministeriö 2010: 14).

The increasingly common use of digital services has fostered a change in the Finnish culture of learning. The use of games and gamification may meet today's students' needs well, taken their familiarity with digital material. Games can provide good opportunities for collaborative and participatory learning and teaching. They may not always be easy for teaching staff to embrace, as most teachers tend to adhere to traditional pedagogical practices. There is also a risk that traditional models of teaching are transferred unaltered to instruction that uses digital technologies. In this sense, the teachers' continuing professional development is a great challenge in Finland. Various development projects can help to create space and prerequisites for a new kind of learning and studying (Opetus- ja kulttuuriministeriö 2010: 8–12).



In social and health care education, virtual learning is well known and practised, but games are not a common feature of social and health care education; they are far more prevalent in preschools and primary schools than in higher education (Ketonen, 2006, Sipilä 2013, Pajulahti, 2015). The few examples of using games in social and health studies have been related to practicing a client-centred approach, establishing a home help enterprise (Kirvesniemi, Weiss, 2016) and supporting self-help in rehabilitation. For example, studies have been conducted on how games could be used to counsel and support young people with mental health problems (Raitio, Hopia, 2015: 106–107; Fleming et al., 2012).

The aim of this chapter is to give answers to the question of how virtual games are used and how they could be developed as a functional part of social and health care studies. The chapter discusses students' responses to the virtual game method in the context of social work education. Our goal is to build a bridge between gamification research and practice in the field of social and health care. We will also discuss how gamification and the practice of social and health care are bound together.

As mentioned above, gamification means bringing elements of games into non-game contexts (Kirvesniemi, Weiss, 2016). It can provide tools and problem solving skills within non-game contexts (Jagoda, 2013). Games, on the other hand, can be seen as metaphors for reality, useful in learning new contents. In the construction of social reality, games can have a function of familiarization in learning (Lakoff, Johnson, 1980). Games and gamification can help understand complex chains of events and connections between phenomena. For example in social and health studies, they may help students understand the stages of setting up enterprises and the real-world conditions of successful business activity. Games can be used to construct narratives about starting as entrepreneurs. The different dimensions of the narrative affect the outcome of the undertaking.

This chapter describes an example from Seinäjoki University of Applied Sciences, where students of social work and health care tested a digital game on starting a home help enterprise. First, the advantages and challenges of gamification and the use of games are discussed from the viewpoint of social and health field. Secondly, we describe the social and health service provision system and its current changes in Finland. Thirdly, the chapter presents a description of how entrepreneurship is visible in the core contents of social work studies in Universities of Applied Sciences. This is followed by an account of the process of developing and testing the game and a comparison of Finnish and Estonian students' experiences of playing the game. The chapter ends with a discussion of the evaluation and development concerning gamification and use of digital games in the social and health field.

## **Pros and cons of gamification and digital games in the social and health field**

In Finland, much of the social and health services have been digitized. For example, client contacts to various officials, as well as the advice, counselling and information of decisions given to clients, mostly occurs digitally. Despite the wide-

spread digitization, the use of games or gamification are not common tools in the social and health sector. They are sometimes applied to create a more informal setting, to bring variety or welfare to work, or to facilitate the adoption of new roles at work. They can also be used to collect information from staff or to create improvement suggestions.

Engaging staff in these efforts may become a problem, however, because transfers are common in the social and health sector, especially in social work (Ailasmaa, 2015). Many employees are not interested in interviews or electronic surveys designed to develop their work. They do not always have a possibility to concentrate on the time consuming development projects (Palukka, Tiilikka, 2011: 113). The game method, however, would not necessarily demand much time and would thus provide one possibility to learn and to develop social and health care work. Games and gamification could also bring empowering elements to the psychologically and physically demanding field.

Similarly, it is important that students of social work and health care benefit from a wide range of pedagogical methods. Gamification and the use of games constitute one technique of learning and developing client work. It has several advantages: It brings the real world into learning, facilitating effective studying (Gaweł, Pietrzykowski, 2014) and it can produce in-depth, authentic and active learning (Heimo, 2014: 2). Game playing can consolidate the knowledge gained and help combine theory and practice in the social and health field (Heimo, 2014: 14; Sealover, Henderson, 2005). Further advantages are that students can play in any place, and the same game can be offered to an unlimited number of students. This allows studying irrespective of time and place and engaging in interdisciplinary and international collaboration between different cultures (Heimo, 2014). Active interaction and participation can be encouraged; games and gamification can help integrate communication, activation and creativity into learning (Sipilä, 2013). The teachers can also use the opportunity to develop their pedagogical and technological competence and become active in international collaboration (Raitio, Hopia, 2015; Heimo, 2014).

Game-based learning can also motivate students to learn about entrepreneurship. For many students of social work and health care, entrepreneurship and starting a business seem like a distant idea. Very few Bachelors of Social Services or Registered Nurses become entrepreneurs directly after graduation, which may render learning about entrepreneurship frustrating. Playing in teams and competing against other teams may increase motivation; team play calls for social skills and ability to compromise and listen to others. These are skills required in all social work and health care, which largely take place in teams and networks. Games are often in English and they can improve students' language skills. Games and gamification can be engaging; they can be educational, fun and refreshing (Sealover, Henderson, 2005).

Despite all these advantages, game-based learning does not interest all students and teachers in the social and health sector. It is not easy to organize games, if there is no genuine commitment. In our case, for example, it was difficult to arrange a game day for teachers; not enough teachers registered for the

day or were interested in testing the game. We can only guess at the reasons for teachers' lack of participation. It is our assumption that some teachers might have been interested in testing the game, but all teachers were very busy and had tight schedules at the time. We do not know much about the students' degree of interest at Seinäjoki University of Applied Sciences, either, because game-based learning is not included in the courses students can choose from.

It is possible that lack of interest or time can make learning difficult and the use of games can even become an obstacle to learning. In games, the phenomenon to be studied or developed is often pulled into the world of winning and losing. Playing games is strongly associated with success and failure; the player either loses or wins. Successful playing should not mean winning the game (Heimo, 2014, 12). For example in entrepreneurship games designed for the social field, winning should not be the most important thing. Instead, it is important that students learn the terms under which enterprises can successfully operate in Finnish society. Taking part in the game and learning from one's mistakes should be the essential thing from the perspective of learning.

The scarcity of game-based learning in the education and practice of social work and health care can be partly explained by the fact that games are mostly played by boys and young men (Raitio, Hopia, 2015: 106). Playing games is a popular hobby for many Finnish boys and men; for them it is natural to accept game-based learning as part of their studies. According to a study published in Finland in 2007, very active players of digital games were predominantly men. Almost four out of five of them were 15–34 years old (Kallio et al., 2007).

Students and staff working in the social and health sector are mostly women; in Finland, their share is over 90% (Ailasmaa, 2015). Women have not yet embraced gamification and game playing to a similar degree as men. As they are not interested in playing games in their free time, accepting them as part of the studies is not quite so easy. On the other hand, there are recent indications that various mobile and Facebook games have increased in popularity, and it has been estimated that today, almost half of digital game players are women in Finland (Raitio, Hopia, 2015, 106). Girls play a lot, but they are partly interested in different games (Kallio et al., 2007).

The attraction of virtual games is reduced by technical problems, which are quite common. Often the computer or internet connection does not work properly (Ketonen, 2006; Heimo, 2014). Players' lacking skills may also be a challenge (Pajulahti, 2015). For example older students and teachers are not as competent players as younger people. In general, however, Finns have good digital skills and they can use various digital services (Tieto hyvinvoinnin ja uudistuvien palvelujen tukena 2015: 10). The use of digital learning environments is common in social and health studies, which is also likely to facilitate the use of games in learning.

## **Enterprises as part of the social and health service provision system Finland**

The Finnish social and health care system is characterized by universal coverage based on citizenship. The public and private social and health services combined constitute the largest industry in Finland, if measured by number of staff. In 2013, the number of social and healthcare employees was 386,364 (Terveyden ja hyvinvoinnin laitos, 2015). The industry has experienced one of the greatest increases of all business sectors in Finland in recent years (Hasanen, 2013: 10). Private social and healthcare services are also a growing sector in Finland. During the 1990's, new liberalist competition practices were adopted from economics and from the private sector into Finnish public social and health care (Aaltonen et al., 2014: 245; Laiho, Ruoholinna, 2011: 13), so economical aspects are much highlighted as a basis of the services. Business in care services is a topic much discussed among professionals and students, especially among those, who are planning to ground care companies of their own (Aaltonen et al., 2014: 245; Laiho, Ruoholinna, 2011: 13).

The discussion is related to the problems which people must solve when they want to start running their own enterprises. The legislation is very complex and an entrepreneur must have a lot of knowledge about entrepreneurship. Nearly all entrepreneurs need finance and the risks are high in the startup phase. Traditionally communities have organized their own social and health care services, but now communities have to decide whether to increase the share of private and third sector in their services (Kunnat, 2016). The question is, would it be better for the community to organize the services as before, and would there be any disadvantages when allowing the private or third sector provide the services.

The major part of the social and health services has traditionally been provided by local authorities (municipalities). From the public discussion one might glean the impression that a strong privatization of the services has occurred. According to statistics, however, the proportion of outsourced social and health services only increased 1% per year between 2005 and 2010. Part of the public services are provided by national limited liability companies or companies owned by organizations. There are also family enterprises, in which the owners take on much of the workload, and a few franchising chains. A minor proportion of the municipalities have established municipal enterprises to provide housing services (Hoiva, 2020, *yksityisen hoiva-alan tulevaisuus*, 2015: 34–35).

According to Statistics Finland, there were 2,179 private social sector enterprises offering community services and 1,123 enterprises providing housing services in 2013. They afforded employment to 31,000 people. The majority or 92% of the enterprises providing community services were small enterprises with less than 10 employees. Private care providers constitute a fragmented sector of various groups. Besides private businesses, organizations provide a large part of the services by maintaining 2,416 units offering social services. Elderly services and child day care are the major fields, with approximately three fourths of the social

sector employees. The private sector is most visible in elderly services, whereas the proportion of private day care is only 10% (Sosiaalipalvelut, 2013).

All in all, the private providers of social services, including private enterprises and organizations, employed approximately 70,000 people in 2013 (Sosiaalipalvelut, 2013). Despite this, municipalities continue to bear the main responsibility for organizing social and health services, and also provide most of the services. In recent years, however, the purchaser-provider model or outsourcing has become more common, which means that the municipalities buy social and health services from private providers of services (Hoiva, 2020, yksityisen hoiva-alan tulevaisuus, 2015: 35).

The Strategy for social and health policy, published by the Ministry of Social Affairs and Health in 2011, stresses the aim of a socially and economically sustainable, effectively operating and dynamic society. Central aims include narrowing the differences in health between population groups, making working careers longer and reducing poverty and marginalization. Other important aims involve improving the availability, quality and effectiveness of the services. The social and health service provision is also undergoing a structural change following the Finnish government's acceptance of the so-called SOTE model. The reform aims at more client-centred, efficient, cost-effective and better integrated services (Sosiaalibarometri, 2016, erityiskatsaus toimeentulosta ja sote-uudistuksesta, 2016: 69).

The responsibility for organizing social and health services will be transferred from individual or joint municipalities to larger, independent regional entities in 2019. After the reform, service users will be able to decide, whether they want to approach public, private or third sector service providers. Municipalities will no longer have a decisive role in funding social and health services either, as it will mainly become responsibility of the state. Each region will produce the services either independently or in collaboration with other regions, and they can use private or third sector services. Besides the reform of the administration and funding, steering of the service provision and the use of action models will also be reformed (Sosiaalibarometri, 2016, erityiskatsaus toimeentulosta ja sote-uudistuksesta, 2016: 69–70).

To sum up, the main principles in the reform of social and health services include a regional administration model, citizens' freedom of choice and the diminished responsibility of municipalities in organizing services. In the new regional model, the role of private enterprises and organizations will increase. Competition neutrality is sought, which means that the public, private and third sector all have equal opportunities to operate in the market (Kunnat, 2016.) As a result, the importance of entrepreneurship skills and competence will grow in the social and health sector.

## **Entrepreneurship studies for Bachelors of Social Services at Seinäjoki University of Applied Sciences**

In recent years, an effort has been made to develop entrepreneurship studies in all educational fields at Seinäjoki University of Applied Sciences, where entrepreneurship is one of the central values. As it was found that students of social work and health care had too little entrepreneurship studies, a course of 3 credits was added to the curriculum in 2011. The aim is that students adopt an entrepreneurial mindset, familiarize themselves with the business environment in their field and learn to collaborate with other professional groups. Various pedagogical approaches have been used during the course, for example group work, online studies and company visits. The course also involves planning, marketing and implementing an event in an entrepreneurial fashion (Volanto, 2011: 142). According to the curriculum, the course aims are, among other things, that students understand the role of entrepreneurship in the social and health sector, learn basic business concepts and are introduced to business planning, financing and legislation (Sosionomikoulutuksen opetussuunnitelma 2015–2016).

The Degree Programme for Bachelors of Social Services was launched in Seinäjoki University of Applied Sciences in 1992, first as an experimental programme, and later, since 1995, on a permanent basis (Varmola, 2006: 16–17). The extent of the Degree Programme is 210 credits. During their studies, students learn to understand people's different life situations, needs and resources. They learn how to apply methods of social work to improve individuals' welfare, social functioning and participation in various groups and communities. Students also learn about the structure of society and culture and about their effect on our lives. International co-operation is an important part of the studies; many students carry out part of their studies as exchange students at universities in other countries (Sosionomikoulutuksen opetussuunnitelma, 2015–2016).

Since the very beginning of the programme, the School of Health Care and Social Work of Seinäjoki University of Applied Sciences has been involved in a national network for social field education. This network for universities of applied sciences has drawn up a national set of competences to describe the skills and competence required from Bachelors of Social Services. The competences, revised in spring 2016, guide the planning of the curriculum and learning contents.

The competences defined for Bachelors of Social Services involve:

- Ethical competences in social work;
- Competence in client work;
- Service system competence in social work;
- Critical and inclusive societal competence;
- Research-oriented development and innovation competence;
- Work, community, management and entrepreneurial competence (Sosiaalialan ammattikorkeakoulutuksen kompetenssit, 2016).

The last competence above is related to entrepreneurship. It involves the aim that Bachelors of Social Services should be able to collaborate in interdisciplinary teams and work communities, as well as in international environments. They

must learn how to work as first-line managers, know the essential labour legislation and promote occupational safety. In addition, they should learn to manage themselves, promote their own and the work community's occupational welfare and evaluate work quality, outcomes and effects. Bachelors of Social Services must be familiar with the role of economics and strategic management in their work, and they must learn the basic conditions for entrepreneurship in the social sector. Finally, importantly for our topic, the competence in client work involves the ability to instruct in different electronic operational environments and to advise clients in using electronic services (Sosiaalialan ammattikorkeakoulutuksen kompetenssit, 2016).

Studies pertaining to the entrepreneurial competence are arranged jointly for students of all fields during their first year. The course does not discuss how to start or operate a business; instead, the expected learning outcomes involve understanding the role of business operations as part of social and healthcare services. The social work students, who tested the game, were taking a last semester course on the organization, management and development of social services. Below is a description of how the development process of the virtual game took place and what special questions came up when using the virtual game with students.

## **The game as part of an international project**

The Degree Programme of Social Work of Seinäjoki University of Applied Sciences was involved in an international project called the "Virtual Game Method in Higher Education" (GAMES). The other participants were the Project Coordinator Poznań University of Economics and Business in Poland, the University of Tartu in Estonia and the University of Huelva in Spain. The project was financed by the Erasmus+ Programme and it was conducted in the years 2014–2016. The project aim was to create a virtual game under the guidance of Polish partners for each participant. A platform created at the Poznań University of Economics and Business was employed to create games that were suitable to the needs of education in each participating country. A game on home help services was created at Seinäjoki.

The idea was that the game should correspond to the real conditions in Finland and in the municipalities selected for the game. Because of this, 8 second-year social work students were recruited to seek information about the age structure, employment situation, existing home help services and price levels of suitable facilities in the municipalities. Information was also sought about salary levels of relevant professional groups and about the cost of continuing professional education, clinical supervision and use of various marketing channels. These real facts were used to create the variables for the progress of the game. Unfortunately, not all information could be used, because the game structure did not allow the number of variables desired. The planners succeeded, however, in creating a game based on realistic data.

## Progress of the game

In the game, the players start a home help enterprise, which can be placed in four municipalities in Finland: Seinäjoki, Tampere, Inari and Siilinjärvi. The enterprise can have activities in one or several municipalities. The size, location and age structure of the municipalities varies a great deal (cf. Table 1). Tampere and Seinäjoki are both growth centres with a rather good coverage of social and health services. Both municipalities also provide education in the social and health field, which increases the availability of work force. Siilinjärvi, in contrast, is a small municipality, with a great part of its social and health services provided by the nearest city, Kuopio. Many residents of Siilinjärvi work outside their home municipality. The fourth municipality, Inari, is located in the north of Finland. It is the largest municipality in Finland by area, which means that long distances make running home help services challenging. Finding employees may also prove difficult, because many young, educated people move to larger cities. The share of retired population is nearly 30% in Inari. Another relevant feature is the fact that Tampere and Seinäjoki both have a central hospital, whereas the people of Siilinjärvi use the central hospital of the neighbouring municipality, and the residents of Inari have to travel 300 kilometres to reach the central hospital of Rovaniemi. The distance to the nearest hospital affects the decision on when a client is physically fit enough to be discharged and to become a client of home help services. The distance to the hospital also affects the decision on what kind of services can be profitable for the enterprise.

Based on the information provided, it is the players' task to decide about the size of the enterprise and the services to be provided successfully in the various municipalities. The players have to decide between three sizes: the smallest enterprise has 1–5 employees, the middle-sized 6–10 and the largest 11–20. Finland is a small country and the players know the various municipalities. They are also aware of the structural and cultural differences between northern and southern Finland.

Secondly, the players must define the brand of their enterprise. This is carried out numerically by choosing a value between 1 and 10 to define the level of professional services to be provided. A low value refers to basic services and high value to services requiring special competence. When deciding about the brand, the players need to understand that the level of the services affects their choice of employees and the services their enterprise can start marketing. Besides the pro-

Table 1. Information about the municipalities introduced in the game

Municipality	Area	Population	Share of retired population
Tampere	689.6 km <sup>2</sup>	220,446	21.8%
Seinäjoki	1469 km <sup>2</sup>	60,354	21.6%
Siilinjärvi	401 km <sup>2</sup>	21,567	21.6%
Inari	17 334 km <sup>2</sup>	6,794	29.0%

Source: Statistics Finland (2016).



professional competence level required, the quantity of the services must be defined. Some services require more time from employees than others.

Following this, the players hire employees. The game has three groups of employees: home care assistants, practical nurses and bachelors of social services/registered nurses, whose competence levels have been determined with help of three attributes. The players must be aware that the employees' scope of practice is regulated by law. This means that the staff's educational background must reflect the brand and products offered by the enterprise. The players cannot market services that area beyond the staff's competence.

The players must also define a suitable level of salary for their employees. In Finland, a minimum salary has been defined for each professional group. For example, the minimum monthly salary for practical nurses is approximately 1,700 euros and for registered nurses circa 2,500 euros. If the players offer too little, they will not be able to hire employees and market their services. Paying too high salaries, on the other hand, means that despite motivated employees, the company income will not cover expenses. The game allows players to provide further training to their employees. Players can also affect the staff's working efficiency and permanency, for example by offering clinical supervision and vouchers for cultural activities.

As the participants play against each other, their enterprises must remain competitive. The outcome depends on how well they have succeeded in making decisions concerning the locality, company brand, selection and pricing of services, recruitment of the right kind of staff with appropriate salaries and marketing.

## **Students' experiences of the game**

In Finland, the virtual game was tested at Seinäjoki University of Applied Sciences in April 2016. The participants were a group of third year students of social work. They were 41 students undertaking a course in administration and leadership in spring 2016. We were only able to allocate four hours to play, which is why we did not complete the whole game. Instead, students played five out of the eight rounds. They all played in same classroom, which was rather challenging, given their large number.

Four teachers took part in the testing day. One of them was the instructor for the students' entrepreneurship course, while the other teachers were researchers in the game project. The teachers' role was to support the students. Two teachers provided technical help, whereas the other two observed the progress of the game, writing down their observations about how the students used and related to the game. The teachers' field notes were used as part of the data for this chapter.

First, one of the teachers, the game leader, gave instructions orally. The students also received the instructions on paper. They played in teams of three, with advice and help available from two teachers on request. After all teams had finished a round, the game leader ended it and started a new round. At the end of the game, she reported the results and announced the winning team with the best results.

After the session, the students gave feedback for the game, using a computerized questionnaire planned by the Estonian project partners from Tartu University department Pärnu College. In this Erasmus project, all the participants used the same questionnaire when collecting feedback from students. The questionnaire consisted of 16 items: 3 background questions, 5 questions on the implementation of the game and 8 on students' personal skills and experiences pertaining to the game. The web-based survey tool Lime Survey was used, with questions in English. The students replied anonymously. The survey did not require much time. The background questions concerned the respondents' age, sex and nationality. Most items were multiple choice questions. There were also a few open questions, but they did not attract many responses.

Feedback was received from 38 students, all of whom were female. The results were relatively difficult to analyse and it was not possible to draw clear conclusions based on them. First, the number of students was quite low, making statistical conclusions impossible. The second problem was connected with the survey itself. In several questions, the response options were: totally disagree, disagree, neither, agree and totally agree. In many cases over 20% of students chose the option "neither". We cannot, however, know what this means. It might suggest that the student had no opinion, but it can also mean that she did not want to share it.

There was great variation in the students' answers. Approximately 20% of them expressed a critical attitude towards the game. Six out of 38 students had played the game before. Over 20% of the students felt that, based on the game, they were able to draw conclusions relevant to the real world market situation. Circa 27% of the students reported that they found the game's way of presenting market dilemmas interesting.

Nearly 40% of the students experienced playing the game as neutral, while over 30% of them felt irritated. Very few students felt bored, disoriented or cheerful. Their criticism mostly concerned the information given to them for making decisions during the game. Over 20% of the students reported that the instructions had not been clear and the story provided in the game scenario had not been coherent or clear. On the other hand, circa 20% of the students regarded the structure of the game as consistent.

According to over 20% percent of the students, many problems were presented during the game. Only circa 13% of the students answered that it had been agreeable to play the game and no more than 15% percent would recommend the game to others. Only 17% of the students would like to participate in similar classes in future. Over 36% would like to change some elements in the game. Many of these students told that they would like to change the game so that starting from the very beginning, it should be possible to make more decisions during each round. Some students were frustrated because in game only allowed for each enterprise to hire one kind of workers, for example nurses or practical nurses. This version of the game still involved some technical problems, which irritated the students. As many students were playing at the same time, some of them felt bored, because they had to wait for slower groups before starting the

following round. Many students needed the teachers’ help and were frustrated because they, too, had to wait for their turn.

### Comparison between Finnish and Estonian students’ feedback

Finnish and Estonian cultures are relatively similar nowadays and even the languages resemble one another. Finland has been an independent country since the year 1917, whereas Estonia was a part of the Soviet Union during the years 1940–1991. The population of Finland is over five million, while Estonia has a population of over one million. The economy in Estonia is developing very fast, with a large number of small enterprises. The taxation and salary levels are lower in Estonia compared to Finland.

As mentioned before, the Games project participants created their own games on the platform developed in Poland and tested it with their students. Estonian colleagues were responsible for collecting feedback on the testing. The same questionnaire was used to collect feedback from students in Estonia. The writers of this chapter have not been informed if the students in Estonia played the game individually or in teams, whether they completed the whole game during one session and if and to what extent they received instruction and technical support from teachers. Due to these facts, we were not able to produce a very reliable comparison between Finnish and Estonian students’ feedback. We would, however, like to briefly present the differences detected in the responses. The differences were quite noticeable, and we can presume that the students’ field of study and sex, among other things, contributed to their experiences of the game.

The number of students in Estonia was 33, of whom 26 were female and 7 male. Most of them (17) were students of business and administration or tourism (14). Two were students of social work. Compared to Finnish students, Estonian students found playing the game more agreeable (Table 2). Over 43% of the Estonian students felt cheerful when playing. On the other hand, over 36%

Table 2. Students’ experiences of playing the game

	Nationality			
	Estonian		Finnish	
	Count	Column N%	Count	Column N%
Cheerful and in good spirits	14	42.4%	2	5.3%
Irritated, because things did not go as I wanted	1	3.0%	12	31.6%
Neutral	4	12.1%	15	39.5%
Cannot tell	1	3.0%	2	5.3%
Amused	0	0.0%	0	0.0%
Bored	0	0.0%	3	7.9%
Disoriented	12	36.4%	1	2.6%
Self-confident and challenged	0	0.0%	0	0.0%
Other	1	3.0%	3	7.9%

reported feeling disorientated during the game session. Comparing the two sets of feedback, we can say that clearly a larger proportion of Estonian students felt that playing was fun. Only two Finnish students felt this way. Instead, almost one third of Finnish students felt irritated during the game, for reasons explained above, compared to a single student feeling irritation in Estonia. Three Finnish students also felt bored during the game session. Despite this, nearly 40% of Finnish students rated playing as neutral. In Estonia, only 4 students found playing the game neutral. One student in Estonia and three in Finland chose the option "other", but did not explain why, although given a chance to elaborate.

Over 36% of Estonian students were eager to participate in similar classes in future and circa 34% were prepared to recommend the game to others. Over 40% agreed that the game scenario captured important issues and over 43% regarded the way of dealing with market dilemmas as interesting. Like Finnish students, part of the Estonian students were critical about the story provided in this game scenario; only 14% of the Estonian students found the game scenario coherent and clear. Over 28% of them answered that the problems provided in the game were diversified. In other words, the students in Estonia were generally less critical about the game compared to Finnish students. A considerably larger proportion of Estonian students were ready to participate in similar classes in future and to recommend the game to other students.

Rather similar answers were given by both Finnish and Estonian students to the question "Which skills are necessary to successful progress with the game?" (Tables 3 and 4). According to the Finnish students, problem solving skills, decision making skills, flexibility and communication skills were the most important skills. Computer skills, analytical skills, time management and independence and team work skills were not regarded as equally important. All Estonian students answered that the most important skills required in playing the game successfully were problem solving skills, decision making skills and communication skills. Nearly 100% of them also mentioned team work skills, flexibility and analytical skills as necessary in playing the game. Time management and independence were not considered so important.

As regards this question, the main difference between the students in the two countries lied in the fact that Estonian students appreciated the importance of almost all the skills much more than Finnish students.

The students had been classified into groups based on the combination of the following features: extravert, introvert, sensor, intuitive, thinker, feeler, judger and perceiver. The writers are not informed of the exact basis of the classification, but it showed that Finnish students were mostly extraverts, intuitive and feelers. The next most common groups were perceivers and judgers. Few Finnish students were classified as introverts and thinkers. As for Estonian students, most of them belonged to the category intuitive and judgers, whereas the next group were classified as thinkers, perceivers and extraverts and a minority as introverts, sensors and feelers. The greatest difference was that there was a notably larger number feelers among Finnish students compared to Estonian students. There was also a greater number of extroverts among Finns, although the dif-

Table 3. Skills required in playing the game according to Estonian students

Skill	ESTONIA									
	Totally disagree		Disagree		Neither		Agree		Totally agree	
	Count	Row N%	Count	Row N%	Count	Row N%	Count	Row N%	Count	Row N%
Communication skills	0	0.0%	0	0.0%	1	3.0%	12	36.4%	20	60.6%
Decision making skills	0	0.0%	0	0.0%	0	0.0%	3	9.1%	30	90.9%
Team work skills	0	0.0%	0	0.0%	1	3.0%	4	12.1%	28	84.8%
Flexibility	0	0.0%	0	0.0%	1	3.0%	12	36.4%	20	60.6%
Analytical skills	0	0.0%	0	0.0%	1	3.0%	7	21.2%	25	75.8%
Independence	0	0.0%	2	6.1%	15	45.5%	9	27.3%	7	21.2%
Problem solving skills	0	0.0%	0	0.0%	0	0.0%	10	30.3%	23	69.7%
Time management skills	0	0.0%	2	6.1%	6	18.2%	10	30.3%	15	45.5%
Computer skills	2	6.1%	6	18.2%	8	24.2%	10	30.3%	7	21.2%
Other	11	34.4%	2	6.1%	15	46.9%	0	0.0%	4	12.5%

ference was not pronounced. Even though the justification of the classification remains unknown to us, it would seem, also based on the students' feedback for the game, that Finnish students expressed more emotions associated with the game than Estonian students. This finding may be related to the students' field

Table 4. Skills required in playing the game according to Finnish students

Skill	FINLAND									
	Totally disagree		Disagree		Neither		Agree		Totally agree	
	Count	Row N%	Count	Row N%	Count	Row N%	Count	Row N%	Count	Row N%
Communication skills	1	2.6%	2	5.3%	5	13.2%	21	55.3%	9	23.7%
Decision making skills	1	2.6%	0	0.0%	4	10.5%	16	42.1%	17	44.7%
Team work skills	0	0.0%	1	2.6%	3	7.9%	19	50.0%	15	39.5%
Flexibility	0	0.0%	1	2.6%	6	15.8%	21	55.3%	10	26.3%
Analytical skills	0	0.0%	1	2.6%	11	28.9%	20	52.6%	6	15.8%
Independence	0	0.0%	8	21.1%	13	34.2%	13	34.2%	4	10.5%
Problem solving skills	0	0.0%	0	0.0%	4	10.5%	24	63.2%	10	26.3%
Time management skills	0	0.0%	4	10.5%	10	26.3%	16	42.1%	8	21.1%
Computer skills	0	0.0%	2	5.3%	10	26.3%	15	39.5%	11	28.9%
Other	6	15.8%	2	5.3%	26	68.4%	3	7.9%	1	2.6%

of study; in social work studies, interaction skills are emphasised, along with handling and expression of emotions.

There were few responses to the open questions of the questionnaire. This may be partly due to students thinking that they should reply in English, which may have seemed difficult for some of them. For example, there were 14 responses to the question “Would you like to change some elements in this game?”, discussed earlier in this chapter. Only three students replied the question “How did you feel while playing this game?” One of them described the experience using the words “excited, irritated, bored”, whereas another chose the words “stressed, happy, bored, angry”. Both answers describe the fluctuations in emotions aroused by successes and failures and are compatible with the teachers’ classroom observations during the game session. The third response to the open question reflects the person’s frustration with the technical problems: “The game requires the development. The result should be visible without logging off”. It was a major problem that the changes made by players were not always saved for the next round.

When analysing and comparing the answers in Finland and Estonia, we must remember the differences between students. Nearly all Estonians were students of business and administration or tourism, and their game was connected with hotel business. The subject was familiar to them, which probably influenced their motivation to play. The Finns, in contrast, were social work students, whose studies only include 5 credits of business and entrepreneurship. Secondly, the game played in Finland was connected with the care of elderly people, a subject rather unfamiliar to most social work students. Elderly care was selected as a focus, as it is the strongest growing area in the private health and social care sector in Finland. The Polish colleagues from Poznań University of Economics and Business, who planned the game platform, originally meant it to represent manufacturing business; it was planned as a digital game on starting a chocolate factory. The Polish partners were also responsible for the technical execution of the game during our project. Some problems emerged when bringing the Finnish game onto the platform, because enterprises in the health and social sector are quite different in comparison to manufacturing companies. Despite this, an effort was made to create a game which would realistically represent the social and health care context.

Finally, the participating students’ age and sex may also have influenced their attitudes and motivation. In Estonia, the students’ mean age was 20 years, whereas in Finland it was 25 years. All Finnish students were women, while in Estonia, seven students were men. Statistics have shown that young men are more active players, so in this context, too, playing may have been a more natural and interesting way of learning for men than for women.

To sum up, the Finnish students had a rather critical attitude towards playing, especially as regards technical problems, instructions provided and the game’s incompatibility with reality. It was not possible, for example, for the imaginary enterprise to hire employees beyond a single occupational group. The students found it frustrating that, especially early on in the game, it was only possible to make a few decisions and changes during one round. Players had to wait for all

teams to make their decisions before they could move to the following round. The students' critical attitudes may partly be explained by the fact that time did not allow them to complete the game. In this respect, we cannot compare the situation with Estonian students, whose testing conditions are not known to us. One can only presume that their field of study (business and tourism), combined with the contents of their game (hotel business) had an effect on the feedback. The Estonian students experienced the game as more fun and agreeable and they were more prepared to participate in similar classes and to recommend the game to others than the Finnish students. The technical problems experienced in Finland were connected with the fact that the game dealt with health and social sector enterprises and was quite different in comparison to other partners' games. It is also possible that the game was tested too early, before it was technically fully functional.

## **Evaluation of the virtual business game and game-based learning**

Based on our experiences, we might recommend that the game on home help services should provide a more versatile approach to learning. For example, the use of several sensory channels could be integrated into the game. As the visual environment of games strongly affects players, the role of visual graphics, characters and environments could be promoted. The auditory environment could also be developed by including music, which communicates emotions and thus facilitates learning. Music may help the player understand the emotional level of learning (Lu, 2014: 56).

Secondly, it would be helpful if the game included basic information about entrepreneurship. Social and health care students have few courses on entrepreneurship. The students were, for example, not familiar with the roles and job descriptions they had to choose from in the virtual enterprise: CEO (Chief Executive Officer), CFO (Chief Financial Officer), COO (Chief Operating Officer), CMO (Chief Marketing Officer) and CTO (Chief Technology Officer). Another important improvement would be to include information about the Finnish permissions and regulations related to setting up an enterprise in the social and health sector.

The third suggestion for improvement concerns assessment. The purpose of the virtual game was to motivate students to learn contents and skills related to setting up a business. All studies completed must also be assessed. It would be very difficult to assess the students' contributions, especially if the game were not part of a regular course, with other assessment methods and targets available. The question is: what did students learn with help of the game, and how to assess the level of their competence? As mentioned above, the social work students at Seinäjoki University of Applied Science gave feedback electronically on how they experienced the game.

There are several potential approaches to assess students' learning. They could be asked to write a learning journal, in which they describe the role of game-based learning as part of their entrepreneurship studies. Secondly, students could be requested to draw up a plan for setting up a home help enterprise before

playing the game. The same assignment could be used after the game, and a comparison between before and after would give the teacher an idea of the students' learning process and level of competence. Thirdly, students could be asked to evaluate their own learning. Another option would be to compare the results of separate game sessions during one course.

Finally, we feel that even when playing a game, all teams should experience success, at least in some areas of the game. In this game, only one team could win. Even though just testing the game, the students' attitudes to winning and losing were quite visible. The members of the winning team were happy, expressing their feelings by shrieks of joy, arm lifting and "high-fives". Members of the losing teams, in contrast, sighed annoyed and talked about their minus points. The main purpose of the game, however, should not be one or a few team members feeling like winners and the rest of the students like losers.

## **Discussion**

Games provide students an opportunity to experience something they might not otherwise experience. Not all students will start an enterprise, but games can show them what kind of factors need to be considered when planning a company offering home help services. Games can promote problem-solving skills, as students need to draw conclusions on why certain solutions do not work. Games can also be useful in learning interaction skills, information technology and language skills, provided that they are technically adept and suitable for the overall learning contents. Games can provide a different learning experience; they can be happy and exciting occasions, if students are motivated to play. When planning and designing games it is essential that they suit the contents and requirement levels of the course. In the best case, games are an interesting and motivating method for the teachers' tool kit. Teachers must know the game well, to be able to assist students with technical problems, but also with finding solutions. Just organizing game sessions as part of a course is not adequate; as mentioned above, it is advisable to combine games with reflective assignments. After the game session, it is a good idea to discuss the decisions made and their consequences, and to ponder how the game process and things learnt reflect real life. Unfortunately, in this case in Finland the students' schedule was so tight that there was no time for discussion after the game. The version of the game used was not technically developed enough at the time of testing, which is the biggest reason why gaming was not satisfying.

Gamification and game-based learning are one way to integrate elements of working life into studies, which is one of the goals emphasized in Finnish universities of applied sciences. This way, students of social work and health care can gain an understanding of the conditions of business operations and an idea of how to succeed in the game of entrepreneurship. Simultaneously, however, there may be a risk of forgetting the fact that work in the social and health sector often involves slow processes, where the logic of game playing does not fit. Challenges of social life and health issues may be a far cry from game-like situations. Some



games have been developed with this difficulty in mind, with game contents and rhythm matching the problems of social life. As an example, a game designed to help depressed and socially excluded young people uses virtual novels, whose purpose is to facilitate choices and decision-making (Ravelin, Korhonen, 2015: 120). Socially withdrawn young individuals may find in the visual novel a source of belonging (Lu, 2014: 55).

In future, games should be designed for the study and practice of client work. In other words, games should be created for real client work in the social and health sector, not only for studying client work. One example could be a game used by clients to practise life coping skills. It would be advisable to involve patients and clients in the game planning and implementation process (Ravelin, Korhonen, 2015: 117). Future clients and patients will be critical about their care and assume more responsibility for their health and rehabilitation (Raitio, Hopia, 2015: 111). Games can help clients make choices and decisions related to their welfare.

The identities of social and healthcare workers are bound to change in one way or other due to digitization, and work culture is likely to change with the technological development and gamification. Social and healthcare professionals will increasingly find themselves in a counselling instead of an expert role, while clients are expected to assume more responsibility for their health, welfare and care (Jauhiainen, Sihvo, 2015: 126). Digitization requires that workers adopt new attitudes and knowledge about how to work and support clients (Tiilikka, 2011: 36).

From the perspective of future social and health services, games and gamification can be important in helping students' familiarization with digitization and in creating tools for the promotion of clients' participation and social functioning. Games can be meaningful in the social sector, if they help motivate clients to engage in welfare-promoting activities. Students, who learn to use games during their studies, can apply their skills to promote their future clients' welfare.

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## Scenarios for Virtual Management Games

The chapter presents the approach to creating and managing scenarios for virtual management games in the Business Arena platform. This task is performed by users called Game Masters; typically these users are teachers who employ the Business Arena in the didactic processes of their courses. The tool used to managing scenarios names the Administration Panel and enables performing the following tasks:

- Creating game scenarios.
- Creating games based on a selected scenario.
- Monitoring and managing games in progress.

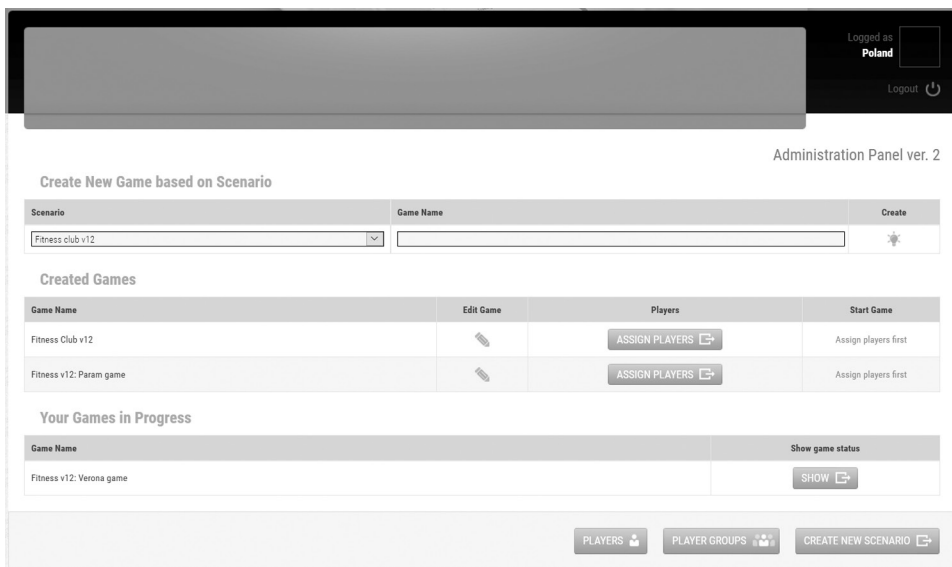


Fig. 1. Administration Panel for Business Arena

## **Virtual Management Game Scenario**

A scenario for a virtual management game (game scenario in short) is a set of parameters and their values which define a business environment for running games. Based on one scenario, multiple games can be run. A single game is played by several players, who can be grouped into teams. The purpose of the game is to establish and run a service company which develops and offers services at various market locations. Companies of different players compete against each other for a scarce demand generated by customers' groups. Each customer group has its own, unique profile. Players must try to adjust the profile of their offer to the profiles of customer groups. The more accurate the adjustment, the larger the sales that can be made. Of course, larger sales do not instantly mean higher profit; players must balance income with expenses necessary to run a company: human resources expenses (salaries, benefits, training sessions), research and development expense, premises expenses, etc.

Creating a game scenario involves 12 steps and consists of defining values for the parameters of specific areas constituting a business environment for running games. The values should be selected with great care to imitate all the nuances of a real business world and to make relations among its elements as close to the reality as possible.

The details of the particular steps are presented in subsequent sections.

### **Step 1: Initial Assumptions**

Step 1 defines the initial assumptions of a scenario:

- Scenario name
- Summary – provides the general description of a business environment and the main goal players should try to achieve.
- Basic language for user's interface. This is the default language for a game to interact with players; however, the game is not limited to one language only. It is possible to define many languages and players are able to switch between them dynamically during the game.
- Currency used in a game. All amounts (prices, salaries, etc.) defined within the scenario should be adjusted to the currency defined here and the locations of scenario's markets (see Step 3).
- Organisational parameters: number of rounds, number of teams, max number of teams, max number of players per team.
- Financial parameters: the initial amount of money and max emergency loan. Both amounts should be carefully adjusted to the scenario's business environment. Due to the investments players have to realize during initial rounds, too low an amount of initial money makes them go immediately into huge debts, which are impossible to pay off with future earnings.
- Service attributes and their max values. Players use these attributes to develop services with different characteristics to meet the expectations of different customer groups. Careful selection of these attributes is vital to make game reception natural and conform to the business environment a scenario is based on.

The screenshot shows a web-based interface for creating a scenario. The title is 'Step 1: Initial Assumptions' and the subtitle is 'Create New Scenario'. The scenario name is 'Fitness Club v12'. The summary text describes the game's premise: players establish a virtual company in a sports center market, competing in different markets (Poznan, Gdansk, Cracow, Warsaw) to open fitness clubs. The goal is to create tailored sports services for target groups. Parameters include: Basic language (English), Currency (Polish Zloty (zł)), Number of Rounds (10), Maximum Number of Teams (5), Maximum Players per Team (5), Initial Money (100000), Maximum emergency loan (per game) (100000), Service Attribute 1 (IND), Service Attribute 2 (EQ), Service Attribute 3 (F/M), and Initial Maximum Values (10 for IND, EQ, and F/M). Navigation buttons for 'NEXT' and 'GO BACK TO MAIN MENU' are at the bottom.

Fig. 2. Scenario initial assumptions

For example, in the *Fitness club* scenario, the service attributes are as follows: IND – individual index, indicates if a specific fitness service is more an individual or more a group one; F/M – fat burning/muscle building index, indicates the intensity of a workout; EQ – equipment index indicates if a specific fitness service requires state-of-the-art equipment.

## Step 2: General Parameters

Step 2 defines the general parameters of a scenario:

- Consumer Group Changeability – specifies the extent of a customer group’s change (increase or decrease) when a specific level of a demand generated by this group is satisfied. The extent of 0% means no change at all.
- Prediction Bonus. During a game, within the strategic management decision area, players can specify their predictions about sales, profit, and market share. If the predictions prove accurate, the players can be rewarded with a financial bonus.
- Service Point Capacities. Service points established by players during a game have one of a predefined size: small, medium, or large. For each size, the parameter defines the max number of services a service point can provide, and the max number of employees who can be hired at that point.
- Standard service provision per employee – defines the number of services an employee is able to provide if working with 100% effectiveness. The employee’s actual effectiveness during a specific round results from various factors: salary, average salary at a given market location, non-financial benefits and training sessions, and changes on a round-based basis.



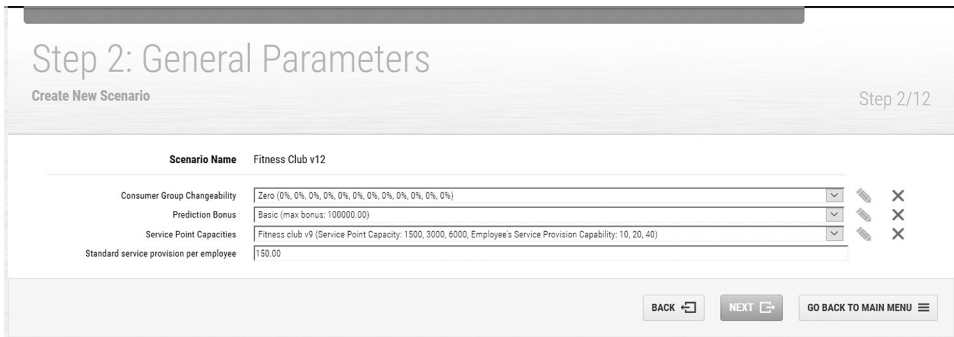


Fig. 3. General parameters

### Step 3: Game Locations

Step 3 involves defining market locations; i.e., locations where players can establish their service points. Each location is described by the following parameters:

- Name: typically, this is a name of a city; however it can be the name of any geographical place like region, country, or even a continent.
- Initial customer demand – specifies the aggregated level of a demand generated by all customer groups at a specific location (customer groups are defined in Step 4). Players compete against each other for this demand by offering services characterized by the different values of attributes defined in Step 1.
- Service offering cost – specifies the unit fixed cost associated with offering a service; it covers all fixed elements associated with provision of a service; e.g., electricity, running water, etc.
- Service Point upkeep cost – specifies the fixed cost associated with running a service point; e.g., maintenance cost, property taxes, etc.
- Service Point setup cost – specifies the cost of establishing a service point of a specific size (small, medium, large – different cost values for each size). These

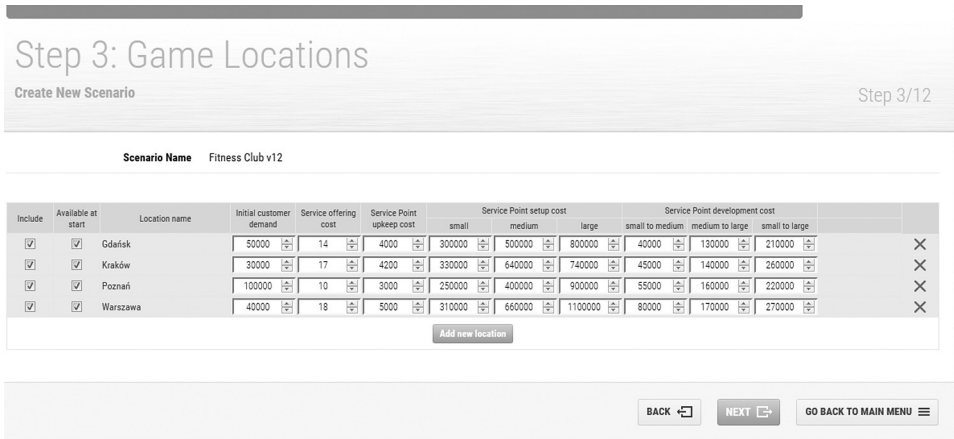


Fig. 4. Game locations

costs should be carefully balanced with the Service Point Capacities defined in Step 2 – larger service point involves higher setup cost, but also brings perspectives for higher sales.

- Service Point development cost – specifies the cost of increasing the size of a service point.

#### Step 4: Headquarters

In Step 4, one of the locations created in Step 3 is selected to serve as the headquarters for a player’s company.

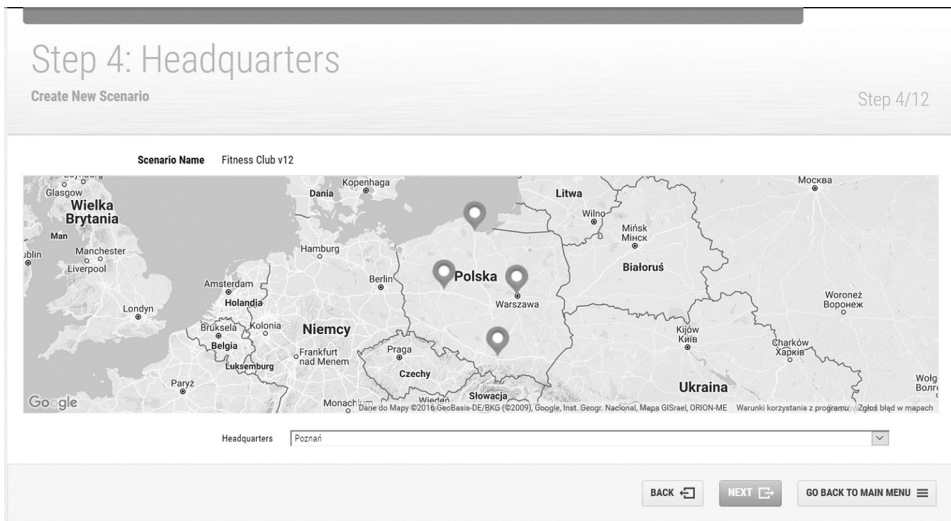


Fig. 5. Headquarters

#### Step 5: Customer Groups & Employee Segments

In Step 5, customer groups and employee segments are defined.

##### Customer groups

Customers are divided into groups with different preferences according to service characteristics. A scenario can define any number of customer groups; however, the majority of scenarios are based on four groups. During the game, players are supposed to develop and offer a set of services with characteristics that meet the expectations of particular groups.

The customer group is described by the following parameters:

- Group name and Group description. The parameters should reflect the business profile of a specific customer group; e.g., fitness freaks – a group of customers who are very keen on all fitness activities and demand sophisticated fitness services, but are also ready to spend a significant amount of money for them.

## Step 5: Consumer Groups & Employee Segments

Create New Scenario

Step 5/12

---

**Scenario Name**    Fitness Club v12

Consumer groups & Employee segments in locations

**Gdańsk**

Include	Group name	Initial %
<input checked="" type="checkbox"/>	Celebrities (ND: 3/5, EQ: 2/4, F/M: 2/7, Price: 50.00/80.00, marketing: 80/90)	35
<input checked="" type="checkbox"/>	Convalescents (ND: 2/5, EQ: 1/3, F/M: 2/10, Price: 100.00/140.00, marketing: 20/80)	30
<input checked="" type="checkbox"/>	Fitness freaks (ND: 8/9, EQ: 2/4, F/M: 3/5, Price: 90.00/120.00, marketing: 60/70)	15
<input checked="" type="checkbox"/>	Sociable fitness amateurs (ND: 6/8, EQ: 5/7, F/M: 1/8, Price: 20.00/40.00, marketing: 50/60)	20

Include	Employee segment name	Number of employees
<input checked="" type="checkbox"/>	Fitness instructors (ND: 5, EQ: 9, F/M: 1, Min salary: 1000.00)	300
<input checked="" type="checkbox"/>	General personnel (ND: 1, EQ: 3, F/M: 8, Min salary: 4000.00)	10
<input checked="" type="checkbox"/>	Personal trainers (ND: 4, EQ: 2, F/M: 8, Min salary: 5600.00)	80

Fig. 6. Customer Groups and Employee Segments

- Minimum and preferred values for each service attribute created in Step 1. Min value means the floor limit below which the customer group does not accept a service. Preferred value means the optimal level being the most favourable for the customer group.
- Maximum and preferred price for a service the customer group is willing to pay. If the price established by a player for a specific service is significantly below the preferred one, such a service seems to be “suspicious” for customers of that group and makes them reluctant in their purchase decisions, resulting in lower demand and lower sales.
- Minimum and preferred marketing point values. Minimum value means the floor limit for the intensity of marketing activities, below which there is no influence for the customer group. Preferred value means optimal intensity of marketing activities. Any intensity above the preferred value is recognized as too intrusive and develops an antipathy to a service resulting in lower demand and lower sales.

Each location has its own, unique structure of customer groups, defined as a percentage of the market share particular groups cover at that location.

### Employee segments

To provide and sell services, players have to hire employees. Employees are divided into segments; each employee segment has its specific profile described by the following parameters:

- Name and description: as above, the name and description should reflect the business profile of a specific employee segment; e.g., fitness instructors, personal trainers, etc.
- Level of skills for each service attribute defined in Step 1. Employees of a specific segment have skills to provide a service with the values of service attributes equal or lower to the values specified by this parameter.

- Min salary – specifies the lowest level of remuneration required by the employees of the segment. If a player offers a salary below the min value, employees of the segment do not accept the offer.

Each location has its own, unique structure of employee segments, defined as a number of employees of each segment available at that location.

Because employees are necessary to provide and sell services, and their number is limited, players have to compete for employees – it is assumed that employees can freely move between players on a round-based basis. While allocating employees to players, the labour supply function takes into account three factors: salary, benefits, and the training sessions offered by each player.

### Step 6: Advertising

The main purpose of advertising is to increase the level of sales. There are two types of advertising: ad channels and global ads. Advertising based on ad channels is applied independently to each service offered by a player and influences sales of that service only. Advertising based on global ads is meant to increase general awareness of a player’s company, and thus influences sales of all services.

An ad channel is described by the following parameters:

- Name; e.g., newspaper, radio, television.
- Cost – specifies the price per turn for a single usage. Each turn, a player can purchase a different number of ads within a specific ad channel.

## Step 6: Advertisement

Create New Scenario Step 6/12

**Scenario Name** Fitness Club v12

Ad. Channels

Include	Ad. channel name	Cost	Cancel cost	
<input type="checkbox"/>	Newspaper	400	85	X
	Consumer Group	Influence	Influence duration	
<input checked="" type="checkbox"/>	Celebrities (Gdańsk, Kraków, Poznań, Warszawa)	1	2	
<input checked="" type="checkbox"/>	Convalescents (Gdańsk, Kraków, Poznań, Warszawa)	2	1	
<input checked="" type="checkbox"/>	Fitness freaks (Gdańsk, Kraków, Poznań, Warszawa)	3	2	
<input checked="" type="checkbox"/>	Sociable fitness amateurs (Gdańsk, Kraków, Poznań, Warszawa)	4	1	
<input type="checkbox"/>	Radio	800	50	X
	Consumer Group	Influence	Influence duration	
<input checked="" type="checkbox"/>	Celebrities (Gdańsk, Kraków, Poznań, Warszawa)	4	2	
<input checked="" type="checkbox"/>	Convalescents (Gdańsk, Kraków, Poznań, Warszawa)	3	3	
<input checked="" type="checkbox"/>	Fitness freaks (Gdańsk, Kraków, Poznań, Warszawa)	2	1	
<input checked="" type="checkbox"/>	Sociable fitness amateurs (Gdańsk, Kraków, Poznań, Warszawa)	1	2	
<input type="checkbox"/>	TV	2000	100	X
	Consumer Group	Influence	Influence duration	
<input checked="" type="checkbox"/>	Celebrities (Gdańsk, Kraków, Poznań, Warszawa)	4	1	
<input checked="" type="checkbox"/>	Convalescents (Gdańsk, Kraków, Poznań, Warszawa)	2	3	
<input checked="" type="checkbox"/>	Fitness freaks (Gdańsk, Kraków, Poznań, Warszawa)	3	1	
<input checked="" type="checkbox"/>	Sociable fitness amateurs (Gdańsk, Kraków, Poznań, Warszawa)	5	2	

[ADD NEW AD. CHANNEL +](#)

Fig. 7. Advertising

- Cancel cost: players can purchase ads within the ad channel for several turns in advance. If they decide to terminate the contract earlier, there is a cancel fee for that.
  - Influence for each customer group – specifies the impact of the ad channel for a customer group; defined independently for each customer group.
  - Influence duration for each customer group – specifies the number of turns a single usage of the ad channel influences a specific customer group; defined independently for each group.
- An global ad is described by the following parameters:
- Name and description; e.g., website, football club.
  - Initial cost – specifies the price for initiating the global ad.
  - Cost per turn – specifies the price paid each turn for the global ad.
  - Influence for each customer group – specifies the impact of the global ad for a customer group; defined independently for each group.

### Step 7: Suppliers, Employee Benefits & Training Sessions

Suppliers deliver the resources necessary to offer services. A supplier is defined by the following parameters:

- Name
- Point cost for each service attribute – specifies the cost of resources necessary to construct a single point of service attributes for services offered by a player.
- Availability: the supplier can be available from the first round or can appear in the middle of a game.

Employee benefits are meant to increase the employee's effectiveness. A benefit is described by the following parameters:

- Name
- Cost per employee per round
- Productivity increase – represented in units of 10%; i.e., the parameter value equal 1 results in the productivity growth by 10%.
- Availability: the benefit can be available from the first round or can appear during the game in one of the later rounds.

Training sessions are meant to play a dual role: to increase professional competencies of employees, and to increase their productivity. A training session is defined by the following parameters:

- Name
- Type – currently one possible value: training session for sales / service provision.
- Cost – the round cost per employee.
- Cancel cost: a training session can be set up for up to three rounds. If a player decides to terminate it earlier, there is a cancel fee per employee.
- Productivity increase – represented in units of 10%; i.e., the parameter value equal 1 results in the productivity growth by 10%.
- Cost of a skill's unit increase – specifies the cost of increasing employee's skills by one unit for a specific service attribute; defined independently for each service attribute.

## Step 7: Suppliers, Employee Benefits & Training Sessions

Step 7/12

Create New Scenario

**Scenario Name** Fitness Club v12

### Suppliers

include	Available from the beginning	selected	Supplier name	Point Costs			
				IND	EQ	F/M	
		<input checked="" type="radio"/>	none				
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	Fitness Supplies and More Ltd.	0.30	0.05	0.30	✕
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	RAW Fitness Equipment Inc.	0.15	0.15	0.25	✕

[ADD NEW SUPPLIER +](#)

### Employee Benefits

include	Available from the beginning	Employee benefits name	Cost	Productivity increase	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Hot meals for lunch	140	1	✕
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Multisport card	150	1	✕
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sandwich bar	100	1	✕

[ADD NEW EMPLOYEE BENEFIT +](#)

### Employees Training

include	Available from the beginning	Training course	Training for	Cost	Cancel Cost	Productivity increase	IND unit cost	EQ unit cost	F/M unit cost	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Personal sessions with clients	Sales / Service	200	2	1	30	40	20	✕
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	General fitness	Sales / Service	200	4	1	25	35	30	✕
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fast fat burning	Sales / Service	300	6	1	20	20	50	✕

[ADD NEW TRAINING COURSE +](#)

Fig. 8. Suppliers, employee benefits, and training sessions

- Employees of each segment have a basic level of skills for each service attribute (see Step 5), which results in the competence to provide services having values of attributes at those levels or lower. To be able to provide services with attributes above that basic level, employees must be trained to increase their competence.

For example, a player developed a service named ‘Cycling,’ with attributes of the following values: 5 (attribute IND), 4 (attribute EQ), and 7 (attribute F/M). Employees of a segment named ‘General personnel’ have basic skills for all attributes at the level of 4. To be able to provide the ‘Cycling’ service, the employees of that segment must receive a training session increasing the IND attribute by 1 unit and the F/M attribute by 2 units.

- Availability: the training can be available from the first round or can appear during a game in a later one.

## Step 8: Development Costs

Step 8 enables to define development costs for services and service points.

For services:

- Base creation cost – specifies the fixed cost of creating a new service.
- Base development cost – specifies the fixed cost of developing a service; i.e., increasing values of its attributes.



Fig. 9. Development costs

- Point cost for service attribute – specifies the unit cost of a specific attribute while creating or developing a service; defined independently for each service attribute.

The total cost of creating or developing a service is therefore the sum of the appropriate base cost and costs of all service attributes according to their values.

For service points:

- Point cost for service attribute – specifies the unit cost of a specific attribute while creating or developing a service point; defined independently for each attribute. A service point is characterized by two service attributes, which means that at a specific service point, it is possible to provide services having values of attributes less or equal to values possessed by this service point.

Example:

A player established a point of fitness services which has the following values of attributes: 5 for IND and 7 for EQ.

The business meaning of these values is as follows: The arrangement of space at the service point allows providing fitness services aimed at independent training sessions at the level of 5 or lower (IND attribute). The service point's equipment is at the level of 7 – the point is able to provide services which require equipment at the level of 7 or lower. These two requirements (5 for IND and 7 for EQ) must be satisfied together; i.e., the service point can provide services having IND at 5 or lower, and simultaneously EQ at 7 or lower.

## Step 9: Initial Service Points

To boost a game, it is possible to equip players with initial service points ready to operate from the very first round.

Initial service points are described by the following parameters:

- Name
- Size: small, medium, or large. The size determines the max number of employees to hire and the max number of services to provide (for details see Step 2).
- Location: one of the possible locations defined in Step 3.
- Service attributes: values of service attributes determining service point's capabilities to provide services at a certain level.

Step 9: Initial Service Points

Create New Scenario Step 9/12

Scenario Name Fitness Club v12

Service Points

Service point name	Size	Location	INO	EQ
24-Hour Fitness	small	Poznan	2	3

ADD NEW SERVICE POINT +

BACK NEXT GO BACK TO MAIN MENU

Fig. 10. Initial service points

### Step 10: Turn Events

Step 10 enables the definition of “unexpected” events for players – business situations appearing unexpectedly during a game and influencing its course in order to check players’ skills to adjust their gaming strategy to new business conditions. There are the following types of events:

- Financial bonus: players are granted extra money.
- Change in available attribute points: max values of service attributes are limited to lower levels. In consequence, profiles of services developed and offered by players change, which forces them to rethink their sales and marketing strategies applied prior to the event.
- New supplier: a new supplier with different prices for service attributes appears.
- Supplier unavailable: one of the suppliers is gone.
- New location: an opportunity to increase sales by entering into a new territory.
- Location unavailable: one of the locations is gone. The total number of available locations decreases; when trying to retain sales at an unchanged level,

Step 10: Turn Events

Create New Scenario Step 10/12

Scenario Name Fitness Club v12

Turn Events

include	after round	description	type	details
<input checked="" type="checkbox"/>	not predetermined		Financial bonus	amount: 100000.00
<input checked="" type="checkbox"/>	0		Location unavailable	Warszawa

ADD NEW TURN EVENT +

Fig. 11. Turn events



players must open new service points at the remaining locations, which results in tougher competition.

- New benefit: a new non-financial benefit for employees becomes available.
- Benefit unavailable: one of the benefits for employees becomes unavailable.
- New training session: a new training session becomes available.
- Training session unavailable: one of the training sessions becomes unavailable.

It is possible to define any number of turn events. Each event is described by the following parameters:

- After round: the round after which the event is triggered. If “not predetermined”, game masters are able to manually trigger the event during a round of their choice.
- Description: short description of the event, which may include guidelines for players on actions they should take due to the event and its consequences.
- Type: type of the event.
- Details: event’s parameters, accordingly to the event type.

### Step 11: Evaluation Algorithm Parameters

Step 11 enables the specification of parameters for the algorithm used to evaluate players’ performance during a game. The evaluation mechanism is based on five main sections referring to the five areas of managerial decision players are supposed to take during the game. Within each section, there are specific factors referring to specific subdomains of the main section:

- Marketing and Sales
  - Price Index – evaluates if prices for services specified by a player meets the expectations of customer groups.
  - Sales Channels Effectiveness – evaluates sales efficiency of service points: the actual sales level compared to the sales capacities of the service points and demand generated by customer groups.
  - Sales Index – represents the market share: the percentage of customers purchasing services offered by a player.

Step 11: Evaluation Algorithm Parameters

Create New Scenario Step 11/12

Scenario Name: Fitness Club v12

Optimization Parameters Set

Fitness Delete ✕

Global function type		linear - f(x)=x		Parameters	
Section		weight	function	name	weight
Marketing and Sales		0.30	linear	Sales Index	0.30
Operations		0.20	linear	Service Shortage	0.20
Human Resources		0.10	linear	Employee Satisfaction	0.10
Finance		0.40	linear	Debt Index	0.40

Fig. 12. Evaluation algorithm parameters

- Operations
  - Service Shortage – evaluates the amount of unsatisfied demand due to the lack of resources in service points preventing to provide the number of services possible to be sold.
- Human Resources
  - Employee Satisfaction – evaluates the level of employees’ job satisfaction based on their earnings, non-financial benefits, and training sessions.
- Finance
  - Debt index – the ratio of money borrowed from financial institution during a game to outstanding debt at the end of the game.
- Strategic Management
  - Plan Fulfillment Index – evaluates accuracy of player’s planning in terms of actual sales, profit, and market share.

Within each evaluation section, it is possible to specify the weight of each factor and the type of function (linear, exponential, or logarithmic).

## Step 12: Save Scenario

Step 12 enables permanently saving a newly-created scenario in a database.

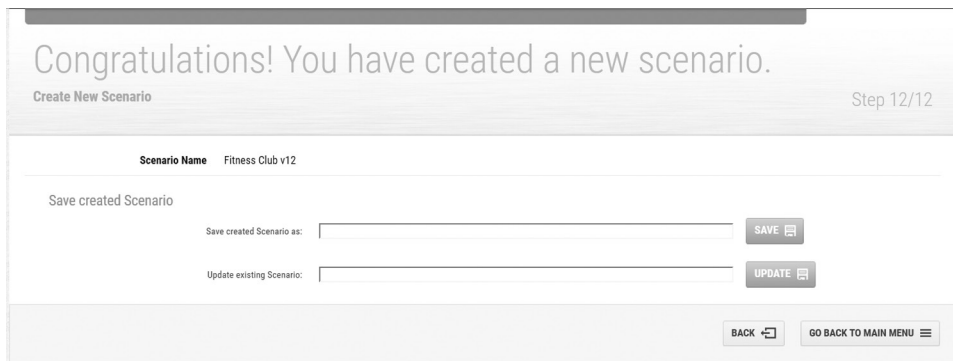


Fig. 13. The end of scenario creating process

## Scenario vs. Games

While using the virtual game method in a didactic process, it is significantly important to understand the difference between a scenario and a game. A scenario is a set of parameters which, together with their values, defines a selected business environment. A game is an instance of the scenario – an entity based on the scenario – running within conditions of the business environment defined in the scenario. A scenario may be thus seen as a template for creating games. Based on a single scenario, any number of games can be created, the same as in a manufacturing process where a ready-made shape is used to create numbers of ultimate products. Because all games created in the same scenario are independent entities, they can have completely different courses.



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## The Management of Virtual Games During the Education Process

When virtual games are applied as teaching tools, the role and tasks of a university teacher change in comparison to the traditional *ex cathedra* model. It might be assumed that the teaching process may be divided into three stages: the planning and implementation of classes and the assessment of students' activity. In such a model, the application of games means that the preparation phase requires a lot more time and effort on the teacher's part than in the case of frontal instruction, while his or her activity becomes more passive in the implementation stage.

### Preparing for classes using the virtual game method

At the preparation stage, it is necessary to make a number of decisions and do preparatory work in order to design and launch classes with the application of virtual games. At the implementation phase, the main focus of activity moves towards students as it is them who make strategic decisions while playing and the teacher's role is to support their decision-making process.

The teaching process in which virtual strategic games are applied begins with the determination of educational goals. These goals should be consistent with the whole teaching process and take into account the educational experiences that students have had so far. They should indicate skills and competences developed during education (for example team work, decision making skills, analytic skills and the knowledge that students will acquire).

One of the first decisions which must be made at the planning stage is the choice of the game scenario. Teachers may choose between two kinds of scenarios. The first is a pre-defined scenario when the teacher uses a scenario developed and prepared by other authors. The second kind is an original scenario prepared by teachers who then use it during the classes they teach.

Each of these options has its advantages and limitations. Pre-defined scenarios are ready-made games which can be used by many teachers. Such scenarios

Table 1. A comparison of the features of pre-defined and original scenarios from the perspective of the university teacher

Feature	Pre-defined scenarios	Original scenarios
Nature of scenario	General	Customised
Game parameters	Repeatedly tested, hence close to optimum values	Individually determined, hence possible errors
Time investment	None for the teacher, all preparation is done by the supplier	Very time-consuming for the teacher
Cost of preparation	None for the teacher, all costs lie with the supplier	Very high cost for the teacher
Cost of playing a game	Licence fees for the supplier	None for the teacher

Source: own compilation.

have been repeatedly tested, the game parameters have been optimised, and any glitches have been eliminated. On the other hand, if teachers prepare their own scenarios, they are able to adjust them to the needs of particular groups of students and to the set the objectives. However, the smaller scale of own-scenario games may mean that not all the parameters will be optimal. The risk of incorrect results, i.e. the ones that do not comply with market rules, is greater in the case of original scenarios.

A comparison of the features of pre-defined and original scenarios is presented in Table 1. Original scenarios developed by teachers are individualised, customisable, and they do not entail licence fees. However, they involve a considerable amount of work connected with preparing and refining a scenario to make it playable.

The decision concerning the type of scenario to be used must involve the level of education of those to whom the game is addressed, the type of course, the level of game difficulty, the number of students in one team, the number of teams in a single game, the number of decision rounds, time for making a decision for a single decision round, rules for collaboration within each team, rules for collaboration between the team and the teacher, rules for making decisions, and the assessment of students' activities.

It is also crucial to determine whether the game will be used as a part of a traditional face-to-face course or an e-learning course. Another choice that must be made is whether to conduct the game as a part of a course dedicated to a given topic or whether it should be the separate course.

Last but not least, the chosen scenario should be easy for students to imagine and understand. The game scenario contains all the basic assumptions of the game; in particular, the market in which virtual companies operate and the initial conditions for starting and running virtual enterprises.

## Arranging the work of students

The application of strategic games may serve various educational goals, thus the formation of students' groups must be correlated with them. The maximum

number of students in one team is pre-defined in the game scenario, but can be adapted by the teacher.

When deciding on the size of teams, we should pay attention to the problem of effective team work. When a team has too many members, the problem of *free riders* might occur. It means that some students only take advantage of other people's work and remain passive themselves. At the same time, if a team is too small, students may find it difficult to take part in the game and they will have a negative attitude caused by work overload. Hence, the ultimate number of people in a group should be tailored individually and result from a compromise between the level of difficulty of the game and the students' skills. The adoption of the criteria of the division of students into groups may be based on their competence or experience which can be defined on the basis of their previous experience or education, or the results of personality tests and the analysis of the roles they play in the group. When we have a more homogeneous group of students, we can decide on how they're going to be divided into teams in a haphazard way or let them form teams on their own.

Another issue that must be dealt with when planning students' groups is to determine the number of teams in a single game. On one hand, this number is pre-defined in the game scenario based on the experience of scenario authors, but can be adapted by a teacher. As the teams of students create the market in the virtual game, the number of teams influences the competition in the market. If there are too many virtual companies, the competition becomes too strong. If there are too few companies, the game is too easy.

Another issue that must be planned at this stage involves determining the framework of cooperation among students in a group as well as between groups and the teacher. As far as group cooperation is concerned, the teacher may impose a certain set of solutions establishing the rules of teamwork or he or she may allow students to establish such principles on their own. In order to reduce the risk of misunderstanding between team members during the game, however, it is recommended that students write down the adopted rules of cooperation so that they could refer to them in case a conflict occurs.

At the stage of planning the game, the rules of cooperation between groups and the teacher should be also laid down. In the teaching process with the application of virtual games, the role of the teacher shifts from passing and evaluating knowledge to the role of the moderator of the process of teaching students. Therefore, it is important to find the right balance in the teacher's involvement in the process of making decisions by students during the game between giving clues to students and encouraging them to seek solution on their own and providing explicit answers them.

While planning classes with the application of virtual games it is important to establish the rules of student assessment. It is possible to evaluate them exclusively on the basis of the results they obtain during the game. Such a solution best motivates students to compete with one another, but it may raise doubts when a given group of students underperforms despite their high engagement.

Thus, it is worth considering some other elements of the evaluation of students' work. Such elements may include tasks assessed in particular decision rounds, which makes the educational game similar to the entertainment game, in which players are systematically awarded by reaching higher levels of the game or gaining bonus points for completing tasks. Moreover, some more traditional assessment measures may be incorporated in the evaluation system, like, for example, the preparation of a presentation on the course of the game or of an essay with initial assumptions.

When arranging teamwork, it is also worth dealing with the issue of the amount and detail of the information on the mechanics of a game given to students. It must be remembered that the more information students get, the easier the game is and less involved the students are. Information overload creates the risk of "clicking" based on the instruction instead of playing by students. On the other hand, too little information entails the risk of misunderstanding the game rules. The balance should be found.

It is always worth creating a learning agreement with students, which makes all these assumptions clear for players. Students should be aware of the goals of the gaming and should accept rules of gaming and of its assessment.

## Starting the game

As students are assigned to groups and ready to begin the game, all players should be registered. Students may register on their own or be registered by the instructor. To do so, they must enter the website <http://bizarena.ue.poznan.pl/> and create a new account (at the bottom of the page).

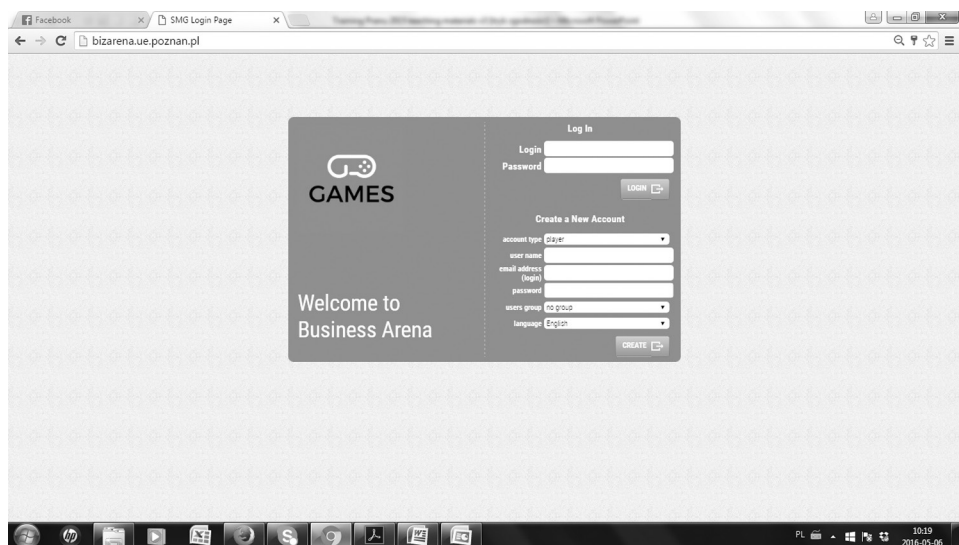


Fig. 1. Creating the user's account

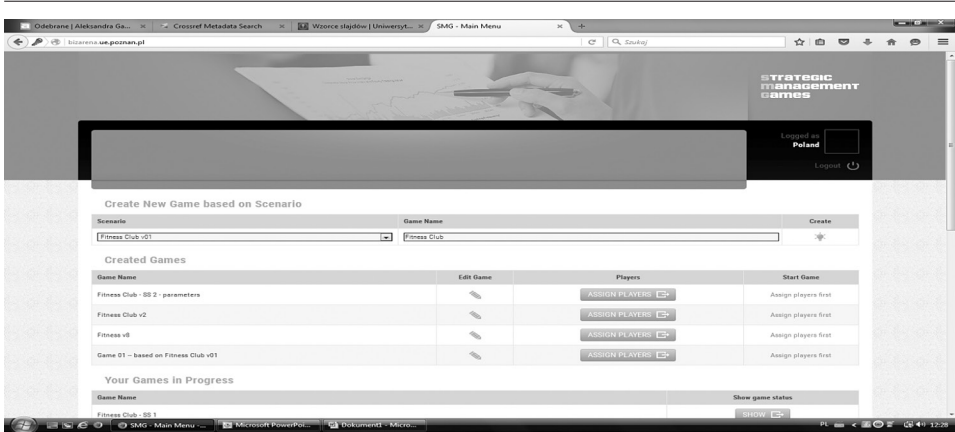


Fig. 2. Creating a new game

When you enter the player’s account, you should indicate this type of account, and then enter your own username, login and password. It is possible to join specific groups of players if such were created by the instructor before.

Finally, you should choose the language of the game. It should be noted, however, that the initial choice of the language does not mean that it must be used throughout the game. The language of the player’s panel can be changed during the game as well.

When all players are registered, the new game should be initiated. First, the existing game scenario must be chosen. The instructor had two options: he or

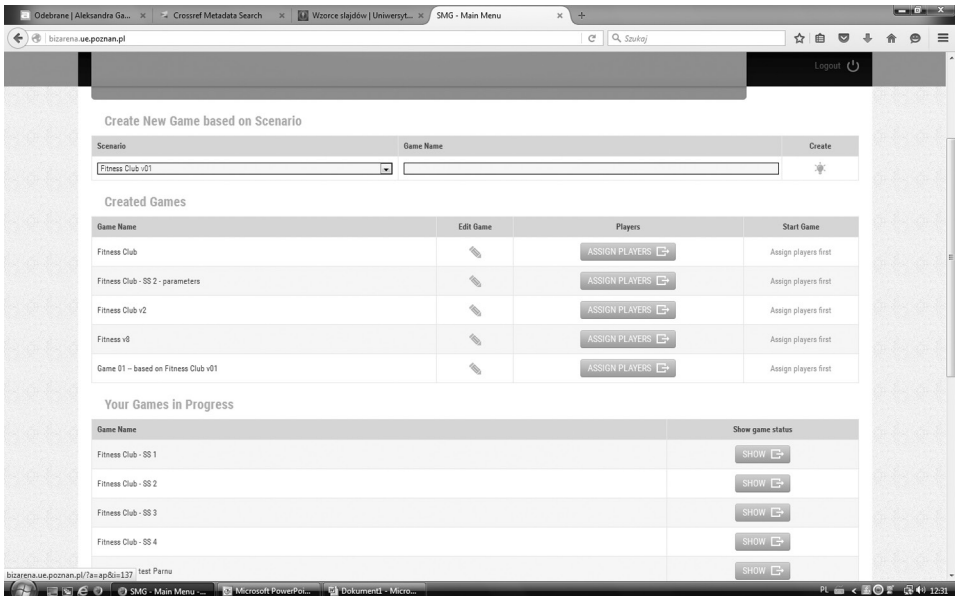


Fig. 3. Assigning players to the game (1)



she may choose the existing scenario in its current form or may change the game parameters by editing it (option: Edit game). Changes in the scenario may be minor, such as, for example, changes in the number of decision rounds or with the number of game participants. They do not basically alter the mechanism of the game. The instructor may also interfere with all parameters of the scenario, but it must be remembered that changes in the value of parameters may lead to the loss of the optimum level.

After creating a new game, you should assign players to it (option: assign players). When assigning players to particular teams, you should take into account whether they registered when joining a particular group or whether they did not choose any particular group (then their user name and login are displayed in the group “players not assigned to a group”).

When assigning players to the game, you should create teams of players by clicking the option “add team”. When creating a new team, it is possible to giving a name to it. It may be done by the instructor straight away or, if he or she does not do it, players will be able to give a name to their virtual company at the beginning of the game.

The number of teams in each game is determined by the scenario parameters, but it is possible to have fewer teams than the scenario includes. The same situation applies when it comes to the size of teams. The maximum number of players is also predetermined in the scenario parameters, but a lower number of players in a given game is also allowed.

After players are assigned to teams, changes must be saved and you should return to the instructor’s panel. The field which initiates the game becomes active

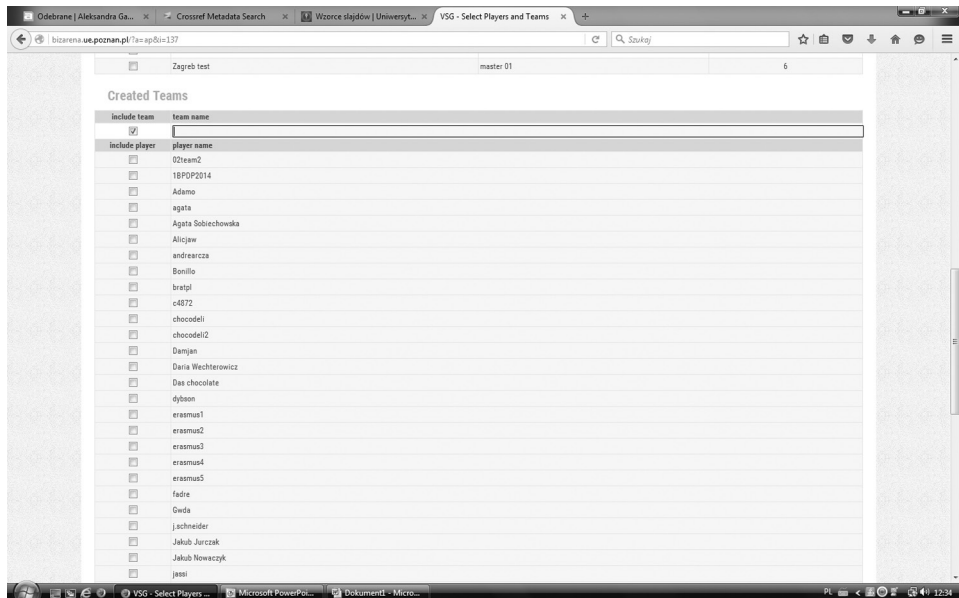


Fig. 4. Assigning players to the game (2)

then. Before starting the game, however, you should make sure that all players are assigned to appropriate teams and that none of the students has been left out. When the game has already started, no changes concerning the players assigned to the game and to particular teams are possible.

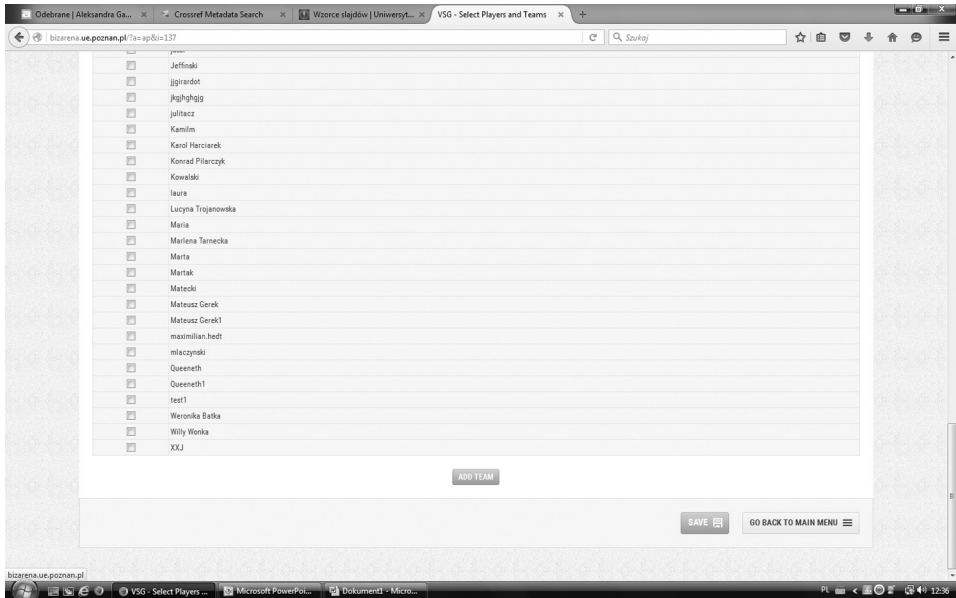


Fig. 5. Adding teams of players

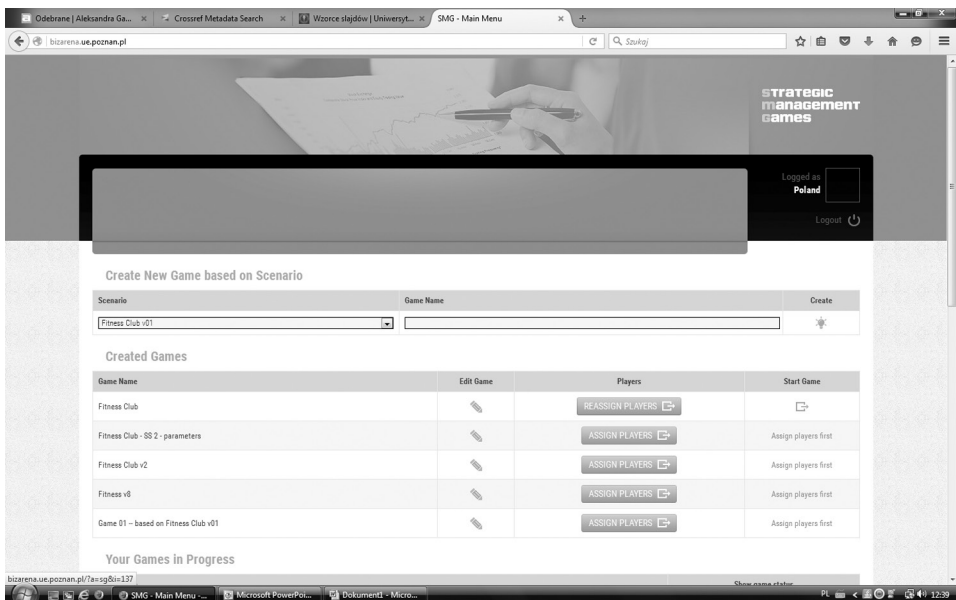


Fig. 6. Starting the game

## Progressing the game

After initiating the game, its dynamics depends on the educational goals of classes and agreements made with students prior to the game. The learning agreement should take into account the frequency of closing decision rounds, the depth of the analysis of results, or additional tasks for students. All elements of the agreement should be implemented throughout the course of the game.

To close the decision round, you should choose the proper game from the list of “Your Games in the Progress” in the instructor’s panel and enter a chosen game.

To end a given decision round, you should click the button “End turn”. Instructor may choose between two solutions concerning the end of the turn. The first of them consists in waiting for the moment when each player declares that he or she is ready to close the round. Thus, the instructor ends the turn as soon as all teams are ready. This solution seems to be better suited to the pace at which particular groups make decisions. On the other hand, it involves the risk of delays as there might be teams that defer their decisions. The other solution consists in the establishment of the fixed deadline rigid deadline of closing the round. All students are expected to complete their tasks by a specific time. This solution seems to be less friendly to players, but it definitely makes students more disciplined by imposing the time framework on them.

It must be remembered, however, that after closing each round it is not possible to cancel it. Thus, if any team does not make a decision in time, it actually loses the results it could achieve.

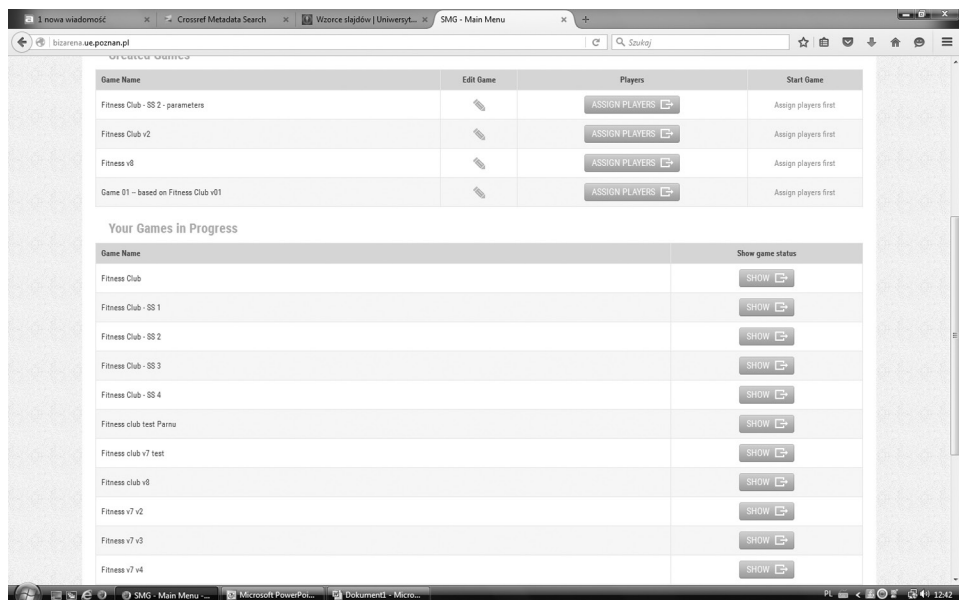


Fig. 7. Entering a selected game

During the game, although the instructor has a passive role as regards students' activity, he or she may be asked to clarify students' doubts or to solve problems that might arise in the course of the game. Three types of problems may occur during the game:

- Technical problems,
- Content-related problems connected with the participants' inadequate understanding of the results of the game,
- Problems with playing the game resulting from the participants' inadequate knowledge of the rules and principles of the game.

The first group of problems includes technical ones, connected with players' problems or game suppliers' problems. As virtual games use software which is installed on the supplier's servers and players take part in the game by connecting to the servers from their own computers, there might be some intermittent difficulties in accessing the games as well as in processing decisions and generating results which are the fault of the supplier of the game or of the server operator.

The next group of problems is related to the content of games. Such problems usually arise when students are not able to understand the results achieved by their virtual enterprises or to identify the causes of the mistakes in their strategies. The instructor ought to monitor the actions of all teams so as to be able to assist players in finding mistakes. The teacher, however, should only provide hints so that players can identify the mistakes themselves rather than having them pointed out directly.

The final group of problems which may arise is connected with the inadequate knowledge or lack of understanding of the rules of the game on the part of the

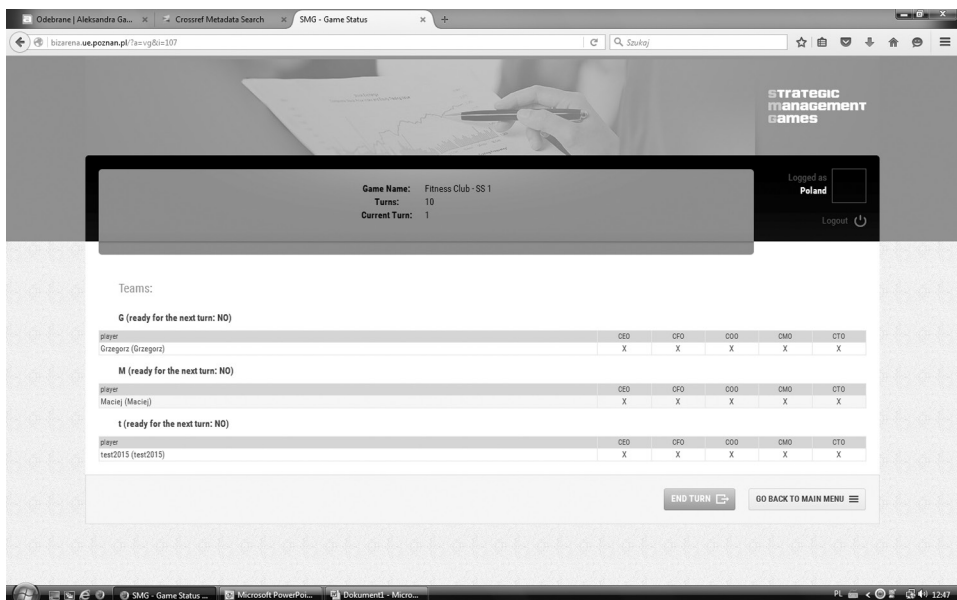


Fig. 8. Closing a decision round

players. For example, players may find it difficult to start the offering services because their service points are too low quality comparing to the quality of services or their skills are not sufficient to provide a given service. In fact, however, these are not real problems, but they result from the lack of understanding of the rules of the game.

## Evaluating game results

The final stage of the learning process is the assessment of students' activity. The rules of this assessment should be well thought out and agreed with students before starting the game as part of a learning agreement. The teacher is independent in adopting the criteria for the evaluation of students as it is not an element of the game scenario. At least three groups of student assessment criteria are possible:

- Based on the game results – competition among students, although the teacher may choose the type or types of results that will be taken into consideration. It is usually the financial result obtained by students during the game, but, depending on teaching goals, other parameters may be established – for example, the efficiency of employees, the quality of services provided, expenditure on research and development;
- Based on students' involvement – it is possible to assess the involvement of particular students. They are evaluated directly by the instructor on the basis of their participation in the discussion or by their teammates;

Game Name: Fitness club v7 test  
Turns: 50  
Current Turn: 9

Teams:

**G (ready for the next turn: NO)**

player	CEO	CFO	COO	CMO	CTO
Gregorz (Gregorz)	X	X	X	X	X

**M (ready for the next turn: NO)**

player	CEO	CFO	COO	CMO	CTO
Maciej (Maciej)	X	X	X	X	X

**I (ready for the next turn: NO)**

player	CEO	CFO	COO	CMO	CTO
test2015 (test2015)	X	X	X	X	X

REPORTS    END TURN    GO BACK TO MAIN MENU

Fig. 9. Players' progress reports (1)

- Additional assessment criteria – it is possible to establish additional criteria for the assessment of students' work, for example, the need for the formulation of an initial strategy of a virtual company or for the presentation of the summary of actions. It is also possible to additionally evaluate each of decision rounds depending on extra tasks given to students.

In order to be able to assess students' games, the instructor has access to game reports. In the instructor's panel, you need to select the appropriate game from the list of "Your Games in Progress", enter it, and then move to the section "Reports". After opening this bookmark, you should choose the kind of report that is interesting for the instructor.

The game makes it possible to analyse the activity of players in the decision areas related to sales, products/services offered by them, service outlets, human resources, finances, suppliers, and marketing. As – while creating a game scenario – it is possible to determine the optimisation of algorithm, which enables the evaluation of a few aspects of students' work, we may analyse its results.

From the perspective of the overall situation of students, it is the report on finance that is characterised by the biggest condensation of information, because it reflects all decision areas that students are active in.

The screenshot shows a web interface for 'STRATEGIC management games'. The page title is 'Game Name: Fitness club v7 test'. The user is logged in as 'Poland'. The navigation menu includes: Sales (main), Sales (general), Products, Production Lines, Sales Offices, HR, Finance, Suppliers, Marketing, Opt. Algorithm. Below the menu, there are buttons for 'PREVIOUS', 'TURN 8', and 'generate CSV report'. A table displays sales data for various companies across different locations and consumer groups.

Company	Product	Location	Consumer Group	offered	sold	price
1	FFF	Odańsk	Celebrities	200	40	50.00 zł
1	FFF	Odańsk	Connoisseurs	200	27	50.00 zł
1	FFF	Odańsk	Fitness freaks	200	75	50.00 zł
1	FFF	Odańsk	Sociable fitness amateurs	200	56	50.00 zł
1	FFF	Poznań	Celebrities	200	38	50.00 zł
1	FFF	Poznań	Connoisseurs	200	18	50.00 zł
1	FFF	Poznań	Fitness freaks	200	49	50.00 zł
1	FFF	Poznań	Sociable fitness amateurs	200	88	50.00 zł
1	FFF	Warszawa	Celebrities	200	63	50.00 zł
1	FFF	Warszawa	Connoisseurs	200	36	50.00 zł
1	FFF	Warszawa	Fitness freaks	200	19	50.00 zł
1	FFF	Warszawa	Sociable fitness amateurs	200	73	50.00 zł
1	000	Poznań	Celebrities	200	47	50.00 zł
1	000	Poznań	Connoisseurs	200	14	50.00 zł
1	000	Poznań	Fitness freaks	200	38	50.00 zł
1	000	Poznań	Sociable fitness amateurs	200	65	50.00 zł
1	000	Warszawa	Celebrities	200	64	50.00 zł
1	000	Warszawa	Connoisseurs	200	41	50.00 zł

Fig. 10. Players' progress reports (2)



Gaming has a long history in education. It is a history of pedagogical and theoretical conflicts. These conflicts have centred not on gaming itself but on the nature of education, knowledge identification and transmission, evaluation, methodology and power. I have included the notion of power because all educational matters may be reduced to conflicts based upon power and control. Control over the learner, the teacher, and the curriculum: its delivery and its evaluation. Conflicts, ideological in nature, may be traced back to Dewey and his student centred learning environment that was in opposition to the Thorndike behaviourist (connectivism) system centred approach. Vygotsky and Montessori, as well as others have entered in the discussion on rational instrumentality and cognitive development in relationship to a process that is structured upon system design and a system of control.

Serious models of gaming in education (and here we would include simulations), whether it is in early education or higher education demand upon the institutional system a shift from an instructional framework to a learning one. Instructional frameworks and designs focus on a means-end out come (instrumental rationality) where as a learning paradigm considers process and experience as the key elements.

The use of computer and Internet based learning environments present a number of learning opportunities and models for pedagogical and institutional change. This collection of essays and reports included in “Perspectives on Computer Gaming in Higher Education” provides a platform for further research, development, and inquiries into the nature of gaming and learning.

From Introduction

