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International contribution to development of Ukrainian game industry

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Abstract:

Aim: This paper is devoted to presentation of the international educational project's GameHub contribution to the development of highly-qualified workforce for Ukrainian gaming industry.

Design / Research methods: Gaming sector in Ukraine is briefly described in terms of its needs for employees. The idea and assumptions of the GameHub project are presented and hitherto achieved results in the project implementation are reported.

Conclusions / findings: Nowadays video game industry (gaming industry, game industry) is listed among sectors with the highest growth dynamics. The number of gamers all over the world is estimated to be to ca. 2.2 billion. Gamers are expected to generate USD 108.9 billion in game revenues in 2017. In Ukraine this sector is at the developmental stage, but it has huge potential manifested in promising projects. Ukraine attracts game industry with considerably low labor costs, but employees have high qualifications in mathematics and computer science as well as fluency in English and Russian.

Originality / value of the article: "GameHub – University–Enterprises Cooperation in Game Industry in Ukraine Project" was created to modernize the existing engineering education in Ukraine by providing universities with infrastructure and educational resources needed for enhancing students' knowledge and skills in creative game development sector.

Keywords: game industry, higher education, advanced technology, education, Ukraine GameHub.
JEL: I2, D2, J24, O3.

1. Introduction

Nowadays video game industry (gaming industry, game industry) is listed among sectors

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with the highest growth dynamics. The number of gamers all over the world is estimated to be to ca. 2.2 billion. Gamers are expected to generate USD 108.9 billion in game revenues in 2017. In comparison to 2016 the increase equals USD 7.8 billion, or 7.8%. In terms of the global market, digital game revenues will account for USD 94.4 billion or 87% of it. Due to the popularity of smartphones and tablets the most lucrative seems to be the mobile game segment which grows 19% year on year to USD 46.1 billion, claiming 42% of the market. By 2020, mobile games will probably dominate the total games market (Newzoo 2017a).

In Ukraine this sector is at the developmental stage, but it has huge potential manifested in promising gaming projects (Bogdanov 2014). This sector can also significantly contribute to Ukrainian labor market with many new workplaces. Ukraine attracts game industry with considerably low labor costs. Potential employees have high qualifications in mathematics and computer science as well as they are usually fluent in English and Russian. What is more, the mixture of these skills is important in terms of video games localization to specific character of former soviet countries. Many experts agrees that unique geographical location, the availability of extensive IT talent pool, strong scientific legacy, and cost benefits make Ukraine a natural choice for outsourcing (Symphony Solutions 2012, Gdowska and Gawel 2016a, 2016b).

Nowadays, many young people aspire to be gaming professionals. However, to be successful on this market it is needed a combination and cooperation of people highly-qualified in such areas as information technology, computer science, computer graphics, animation, storytelling etc. Moreover, creativity and entrepreneurship and project management are also indispensible in this sector. The modern career needs modern education approach with professional networking, internships, freelance, and career specific part-time work. This is why hundreds of collages, engineering schools, art schools and other higher and professional education institution worldwide offer programs geared towards game design and development. The situation in Ukraine is different – almost none is proposed by their national higher education institutions (GameHub Project 2015).

“GameHub – University–Enterprises Cooperation in Game Industry in Ukraine Project” was created to modernize the existing engineering education in Ukraine by providing universities with infrastructure and educational resources needed for enhancing students’ knowledge and skills in gaming sector. The 3-year project is being conducted in 2015–2018 and is co-financed by Erasmus+ programme, “Cooperation for Innovation and the Exchange of Good Practices key

action and Capacity Building in Higher Education action". The objective of GameHub project is to develop a support system for Ukrainians who would like to work in game industry. The main innovative component of this project is to design learning modules on computer game design and development that can be incorporated into existing university curricula and in long-term perspective offered to students on the daily basis (Dziabenko et al. 2017).

This paper is devoted to the presentation of the international educational project GameHub and its contribution to development of highly-qualified workforce for Ukrainian gaming industry. Gaming sector in Ukraine is briefly described in terms of its needs for employees. The idea and assumptions of the GameHub project are presented and hitherto achieved results are reported.

2. Game industry sector in Ukraine

Condition and importance of gaming industry for Ukrainian economy can be understood only when compared to other countries. Wide perspective of global game industry can be provided according to rankings of top countries by game revenues (Table 1), top countries by smartphone users and penetration (Table 2), and top companies by game revenue (Table 3).

The top 100 countries by game revenue ranking (Table 1) was based on the combination of primary consumer research, transactional data, quarterly company reports, and census data. The revenues are based on consumer revenues generated by companies in the global games industry from which hardware sales, tax, business-to-business services, and online gambling and betting revenues are excluded (Newzoo 2017d). Note that there is no Central and Easter European country in the top 10 countries by game revenue (Table 1), and Ukraine was placed in 43rd position, 20 ranks below Poland. Poland – placed in 23rd position – has the highest game revenue amongst Central and Easter European countries and can be considered as unquestionable local leader in this sector.

Table 1. Top countries by game revenue, June 2017

Rank	Country	Population	Internet population	Total revenues [USD]
1	China	1,388,232,693	801,642,507	27,547,038,245
2	United States of America	326,474,013	261,176,568	25,059,882,690
3	Japan	126,045,211	119,828,554	12,545,658,648
4	Germany	80,636,124	73,097,802	4,378,065,542

5	United Kingdom	65,511,098	61,619,475	4,217,714,650
6	Republic of Korea	50,704,971	46,874,568	4,187,710,343
7	France	64,938,716	57,380,790	2,967,051,801
8	Canada	36,626,083	33,454,004	1,947,370,765
9	Spain	46,070,146	38,457,540	1,913,049,387
10	Italy	59,797,978	43,140,153	1,874,607,316
11	Russia	143,375,006	113,303,242	1,485,204,562
…				
23	**Poland**	**38,563,573**	**28,656,048**	**489,207,838**
…				
43	**Ukraine**	**44,405,055**	**25,184,677**	**187,916,391**
…				
47	Romania	19,237,513	12,129,290	151,992,107
48	Czech Republic	10,555,130	9,037,451	146,862,832
…				
64	Slovakia	5,432,157	4,814,011	75,197,990
…				
69	Belarus	9,458,535	6,536,478	69,075,288
…				
78	Lithuania	2,830,582	2,187,291	40,143,076
…				
85	Slovenia	2,071,252	1,631,293	30,912,982
…				
93	Latvia	1,944,565	1,631,471	26,979,134
…				
97	Estonia	1,305,755	1,192,022	21,465,981

Source: Newzoo 2017d.

The top 50 countries in terms of smartphone users in 2017 (Table 2) is based on an understanding of a smartphone user as a person who uses a smartphone at least once a month. Numbers presented in the ranking come from annual Global Mobile Market Report by Newzoo.com and are based on a model which takes into account a country's economic progression, demography, online population, and inequality (Newzoo 2017c). As far as the total number of smartphone users is concerned, Ukraine in placed in 38th position with 10,448,000 devices (Table 2). As smartphone penetration in Ukraine is to 23.5%, this sector has big potential to grow what may also result in increase in mobile games sector.

Table 2. Top 50 countries by smartphone users and penetration, April 2017

Rank	Country	Total population	Smartphone penetration	Smartphone users
1	China	1,388,233,000	51.7%	717,310,000
2	India	1,342,513,000	22.4%	300,124,000
3	United States of America	326,474,000	69.3%	226,289,000
4	Brazil	211,243,000	37.7%	79,578,000
5	Russia	143,375,000	54.7%	78,364,000
6	Japan	126,045,000	50.1%	63,089,000
7	Germany	80,636,000	68.8%	55,492,000

8	Indonesia	263,510,000	20.7%	54,494,000
9	Mexico	130,223,000	40.7%	52,993,000
10	United Kingdom	65,511,000	68.6%	44,953,000
…				
22	**Poland**	**38,564,000**	**63.4%**	**24,431,000**
…				
37	Romania	19,238,000	56.0%	10,772,000
38	**Ukraine**	**44,405,000**	**23.5%**	**10,448,000**
…				
46	Czech Republic	10,555,000	64.8%	6,835,000

Source: Newzoo 2017c.

Another important ranking is the top 25 companies by game revenue (Table 3). The ranking is based on analysis of annual and quarterly financial reports published by a number of relevant publicly listed game companies. Revenues exclude hardware sales and other non-game sales to the extent publicly available. Note that Microsoft and Sony estimates represent all Xbox and Playstation non-hardware platform revenues, including Xbox Live and PSN revenues respectively (Newzoo 2017b).

Table 3. Top 25 companies by game revenue, April 2017

Rank	Company	Revenue [millions USD]	Change [%]
1	Tencent	10201.00	+17.00
2	Sony	7837.00	+33.00
3	Activision Blizzard	6607.00	+42.00
4	Microsoft	6477.00	+9.00
5	Apple	5864.00	+32.00
6	EA	4626.00	+8.00
7	NetEase	4177.00	+50.00
8	Google	4065.00	+37.00
9	Bandai Namco	1991.00	+19.00
10	Nintendo	1831.00	-6.00
11	Square Enix	1666.00	+37.00
12	Warner Bros	1606.00	-27.00
13	Ubisoft	1602.00	+57.00
14	TakeTwo Interactive	1586.00	+19.00
15	Nexon	1564.00	-1.00
16	Mixi	1197.00	+5.00
17	Konami	965.00	-5.00
18	GungHo Entertainment	960.00	-25.00
19	Disney	908.00	-23.00
20	DeNA	859.00	-8.00
21	Sega	857.00	+9.00
22	NCSoft	817.00	+15.00
23	Facebook	753.00	-11.00
24	Zynga	741.00	-3.00
25	COLOPL	647.00	-2.00

Source: Newzoo 2017b.

No Polish and Ukrainian company is included in the top 25 companies by game revenue (Table 3). But it must be emphasized that both Polish and Ukrainian labor forces have contributed to the success of companies included in the ranking. Both Poland's and Ukraine's IT outsourcing service industry and outsourcing companies were recognized many times by global research organizations, national industry associations in their reports, listings, and rankings, as well as awarded in different nominations. There are achievements that should be mentioned and acknowledged inthe image of Ukraine as a one of the best locations for outsourcing (Symphony Solutions 2012).

Job offers in game industry in Ukraine active in June 2017 (Glassdoor.com 2017) show that gaming companies not only need IT specialists but also people with managerial skills, analysts or artists. Amongst positions listed in Table 4 all of them were available in Ukraine (Kyiv and Lviv mostly), only one position required moving to another country. Those positions were offered by companies with their headquarters in Ukraine (16), the USA (7), Germany (6), France (5), Cyprus (4), England (3) and Sweden (1).

Table 4. Job offers in game industry in Ukraine, June 2017

Position	Number of offers
Game Designer	4
Senior Game Designer	1
eCommerce UI / UX Designer	1
Ui-designer	2
UI/UX Designer for ReviMedia	1
Frontend Developer E-Commerce	1
PHP Developer (eCommerce dept)	1
C++ (multithreading) Developer	1
Senior C++ Developer	1
C++ Game Development Engineer	1
C/C++ Video Games Developer	1
Senior .NET Developer for SBTech Payments Unit	1
Senior .NET Developer for SBTech PaaS Team	
Senior .NET Developer for SBTech	1
Senior .NET developer	1
Python QA Automation Engineer	1
Platform Engineer	1
Middle QA Engineer	1
Associate/Lead Programmer	1
Senior Game Logic Programmer	1
Lead Game Programmer	1
Lead C++ Programmer	1
Database developer	1
Senior Server Programmer	1
Senior Manual QA for SBTech	1

Manual QA	1
Tech Lead/Dev Lead for SBTech Sport Unit	1
Middle QC Specialist	1
Product Owner for SBTech Online Unit	1
Product Owner for Platform Unit SBTech	1
Content Designer	1
Data Scientist	1
Weapon Artist	1
Community Administrator	1
Project Manager	1
R&D Manager for BEKEY (Dnipro)	1
Sales Representative (Outreach Expert)	1
Head of Mobile Technology for SBTech Mobile Unit	1

Source: Glassdoor.com 2017.

Although offered positions are located in Ukraine, employees are supposed to work on products which have global audience. To illustrate Ukrainian involvement in global video and computer games market, it is enough to mention five world famous games developed in Ukraine. Wargaming began cooperated with start-up Persha Studia from Kyiv on design of the French vehicles for the "World of Tanks". Then the same Ukrainian studio fully developed Wargaming's next big hit game – "War of Warplanes". Another example is hit game "Assassin's Creed" developed by Ubisoft Entertainment, but most of PC game versions were developed in Kyiv, Ukraine. The game has appeared on most of the consoles and OS including PlayStation 3, Xbox 360, Nintendo, MS Windows, Mac OS X, iOS, Android, and the Wii U. Even Sony Online Entertainment outsourced some elements of development of their blockbusting "Star Wars" series to the Ukrainian game studio Boston Animation. After Boston Animation closed down, developers and designers start working for leading games studios that outsource their games development to Ukraine. German games developer Crytek has its own development center in Kyiv that has been developing a legendary first-person shooter Warface since 2011. One of Ukraine's most popular shooters "Metro 2033" was developed by 4A Games founded by developers of "S.T.A.L.K.E.R.: Shadow of Chernobyl". After some time 4A Games sold game copyrights to Koch Media for USD 5.8 million (Bogdanov 2014).

3. GameHub – idea and development

"GameHub – University–Enterprises Cooperation in Game Industry in Ukraine Project" co-financed by Erasmus+ was developed by an international consortium of thirteen institutions.

The objective is to create in 2015–2018 in six Ukrainian universities so-called GameHub centers equipped with infrastructure, hardware, software and educational tools to provide complete support to students and unemployed people who are willing to start their careers in gaming industry. Erasmus+ KA2: "Capacity-building projects in the field of higher education" is a successor of the Tempus Programme. In general Erasmus+ is the European Union Programme for 2014–2020 to support projects, partnerships, events and mobility in the areas of education, training, youth and sport (National Erasmus+ Office – Ukraine, 2017).

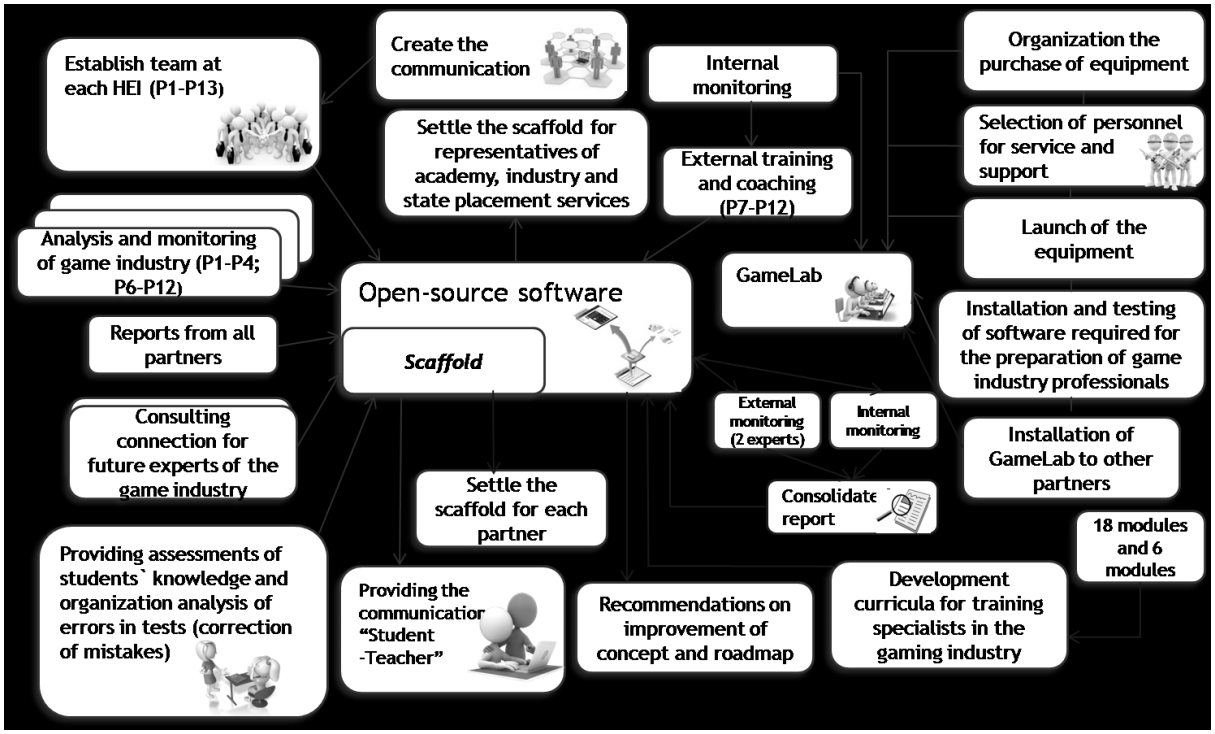
Nowadays, GameHub consortium consists of twelve partners – four from the European Union (EU partners) and seven from Ukraine (UA partners). The team demonstrates a dynamic and strong fusion of nine higher education institutions – three from the European Union (University of Deusto in Bilbao, Spain; FH Joanneum Gesellschaft M.B.H. in Graz, Austria; AGH University of Science and Technology in Krakow, Poland) and six from Ukraine (Donetsk National Technical University, Kherson National Technical University, Kyiv National University of Construction And Architecture, National Technical University "Kharkiv Polytechnical Institute", Odessa National Polytechnic University and Vasyl Stefanyk Precarpathian National University in Ivano Frankivsk), one foundation providing training/research in development of serious games and gamification fields (Virtualware Labs Foundation in Bilbao, Spain), an expert institution in certification, validation products and training – Quality Austria – Trainings, Zertifizierungs und Begutachtungs GmbH in Vienna, Austria, and Ukrainian Association of IT Professionals (GameHub Project 2015, Gdowska and Gawel 2016a, 2016b).

Partners were selected according to their knowledge, experience and competence. The field of expertise of the EU partners cover entire range of required knowledge and skills in the field – from programming (e.g. Python, Java), through implementation (gamification approach) to digital startups and product marketing. The participation of six Ukrainian universities is significant to integrate new methodologies, educational courses, to define requirements and improve the results with different perspectives and realities in different Ukrainian regions. Ukrainian universities have been selected using three criteria: (1) capability to establish the university-enterprises cooperation in gaming industry in their regions, (2) diversity of the target geographical area (south-east, south, south-west, central, north and northwest), and (3) involvement in European projects, e.g., Tempus action, during past several years (GameHub Project 2015).

As it was already mentioned GameHub project aims to ensure employability and self-sustainability in game industry of students, alumni, unemployed engineers as well as veterans of anti-terrorist operation in Ukraine. The first activity undertaken by the GameHub consortium was establishing competence profiles and training necessary for employment in information and communication technology market in Ukraine including international networking and business opportunities. To accomplish these aims, the following objectives were reached by elaborating needs analysis report: job and task analysis, and determination of competence scheme for successful employees and entrepreneurs in the information and communication technology and game industry in three European Union member countries and Ukraine. The analysis of training programs and curricula available at European partner organizations, and knowledge and skills gaps in the curricula at the field of interest at Ukrainian universities were performed. Such extensive analysis allowed deploying monitoring instrument of knowledge and skills necessary on the job market, and preparing recommendations for demanded education contents, and techno-pedagogical game lab design. This goal has been already completed and the results are provided by Dziabenko et al. (2017). In long-term perspective achieved results should lead to establishing monitoring of competence profiles needed on digital labor market in Ukraine, with reference to international networking and business opportunities.

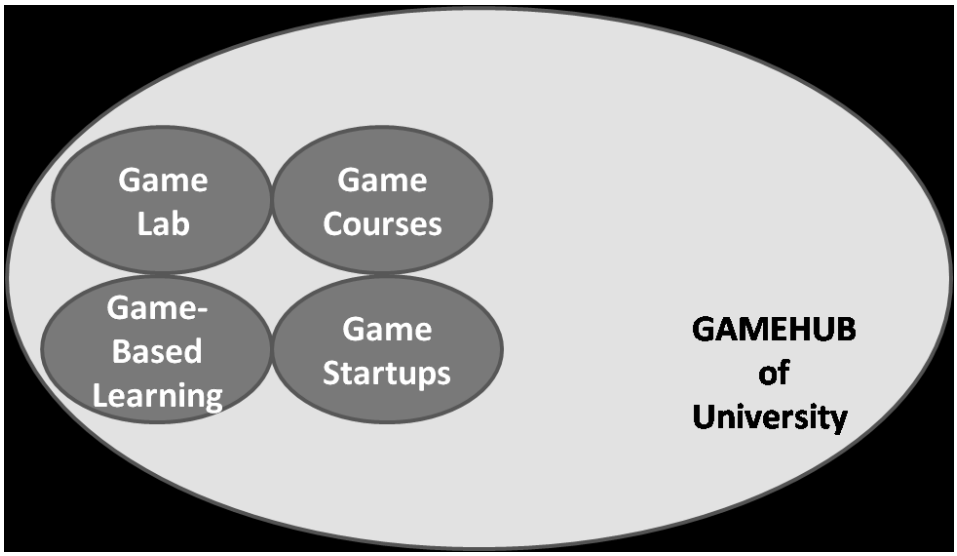
The second goal of the project is to build six GameHub centers – one in each of Ukrainian higher education institution involved in the project. Each university is to develop physical space for their GameHub (computer laboratories, game development laboratories, conference rooms for business negotiations, co-working rooms) equipped with professional computer hardware and software for game development and testing. GameHubs infrastructure will contribute to knowledge and competences for digital game production and entrepreneurship by developing and offering education resources, coaching and consulting of university faculties and unemployment centers; and realize elaborated over GameHub game laboratories and education outcomes and tools, employing cooperation between academia and ICT and game development enterprises (Figures 1–3).

Figure 1. The concept of a GameHub



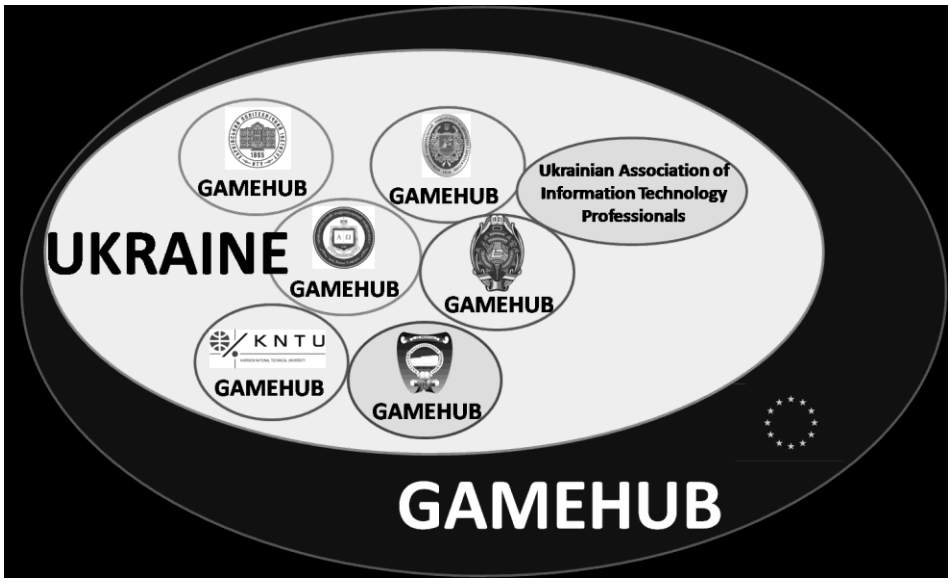
Source: Gdowska and Gawel 2016b; Білощицький et al. 2016.

Figure 2. Structure of GameHub I (general) which is to be copied and adjusted every Ukrainian university involved in the project as GameHub II (specific)



Source: Gdowska and Gawel 2016b; Білощицький et al. 2016.

Figure 3. Structure of GameHub III – inter-university network in Ukraine developed in association with institutions from Spain, Austria and Poland.



Source: Gdowska and Gawel 2016b; Білощицький et al. 2016.

This phase of the project is now in progress: building concept, structure, and facilities of a GameHub as a basis for developing and offering education resources in computer game development; for the practice-oriented or project-oriented approaches the game laboratories with set of necessary software and test equipment are installed. In parallel 18 learning modules are developed: modules contain practical tasks and final projects using facilities the university's GameHub. The learning modules will be incorporated into Ukrainian universities' curricula. Moreover, 6 modular designed training programs for the unemployment centers and anti-terrorist operation veterans are being developed (GameHub Project 2015).

Learning modules are prepared by employees of Ukrainian universities assisted and guided by European partners. In order to support Ukrainians in pedagogical work three study visits were organized at universities in Spain, Poland and Austria in 2016. University teachers from Ukraine had opportunity to get familiarized with infrastructure, good practices and teaching methods used for education is game development (Spain), gamification (Austria) and entrepreneurship and creativity (Poland). Moreover, a series of "teach the teachers" trainings were conducted in Ukraine in autumn 2016: "Creativity" and "Entrepreneurship in digital business sector" delivered by AGH University of Science and Technology in Krakow, Poland; "User interface (UI) design and game design", "From Competence to intended Learning

Outcomes", "Evaluation of UI: Usability Test", "Life cycle of the game design" and "Assessment of intended Learning Outcomes" delivered by University of Deusto in Bilbao, Spain; "Working with Unity3D" and "Learning theories and their application in digital games" delivered by Virtualware Labs Foundation in Bilbao, Spain; "Learning outcomes of game play and the role of the teacher", "The Balanced Design approach of learning game design", "Integration of games in education and barriers of adoption", and "Development of a logical scheme video game" delivered by FH Joanneum Gesellschaft M.B.H. in Graz, Austria. Substantial knowledge and skills developing techniques presented during these workshops were adapted for pilot edition of trainings offered to Ukrainian students; in long-term perspective these modules are to integrated with university curricula (Gdowska et al 2016, 2017).

Long-term goal of the GameHub project is establishing mutually beneficial and viable cooperation between academia, game industry and society – employment agencies and veterans associations. Measurable effect of the project should be improving competence in game design field and entrepreneurship for project target groups: approximately 180 university teachers, 500 students and 150 unemployed including ATO veterans will be trained during project pilot. GameHub centers are to be platforms for the cooperation and communication between university, game industry enterprises, and other stakeholders. Ukrainian universities together with involved in scaffold enterprises should be able to organize annually one job fair, round table and three info days for the university students and wide society. During the project tools for studying project impact on end-user satisfaction with the GameHub products should be developed, validated and implemented for the long-time perspective.

4. Conclusive remarks

In the paper the general description of game industry sector in Ukraine as a background for presentation GameHub project was presented. Hitherto obtained results shows that it is possible to create a network of specialized centers where common and specific (professionally-oriented) competencies can be developed. Development of didactic base is indispensable for improving the engineering curricula in Ukrainian technical schools and universities. Results of the competence analysis of employers' requirements in digital game industry made it possible to establish a structure GameHub laboratory.

Main objective of the GameHub project is to maintain – after the project ends – long-term mutually beneficial and sustainable university-enterprises cooperation, so that it is possible to achieve better match between competence profile of university graduates and those required by industry and, thus, strengthen students professional development, employability and quality of life in general. However, it will be possible to review all the long-term results only several years after the project ends in 2018.

5. Acknowledgements

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