Electronic Commerce Entrepreneurship Education using Virtual Laboratory

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Abstract - The information and communication technologies (ICT) allow educators to transform education still more and more. Education in the area of entrepreneurship might be supported by the usage of a virtual laboratory of electronic entrepreneurship as in the case of our faculty. Future entrepreneurs get the opportunity to try out the establishment and operation of their own businesses in the form of virtual companies as part of their studies. The aim of this paper is to present how the virtual lab of electronic entrepreneurship might serve for educational purposes. Entrepreneurship education is supported by the virtual laboratory of electronic entrepreneurship at our faculty for several years already and our students gain practical experience of establishing and managing a small virtual business. These students’ businesses operate in the field of e-commerce and their functioning is supported by the virtual bank, electronic registry, virtual certification authority, virtual e-shops and learning management system. The experience from each year is further incorporated into the educational process of the subject and our results show that virtual lab of electronic entrepreneurship is a useful tool for entrepreneurial skills development.

Keywords – eCommerce; virtual laboratory; entrepreneurship education.

I. INTRODUCTION

Information and communication technologies (ICT) changed the economic activity in many ways. Entrepreneurs often use ICT to set up businesses, to promote and distribute their products, to make use of banking services or to communicate with authorities. ICT enabled the emergence of electronic commerce (e-commerce) as a still growing distribution and marketing channel. Electronic commerce represents the provision of services or products using ICT resources and is often interconnected with e-marketing, electronic payment systems, electronic data interchange or business intelligence systems. E-commerce activities might be oriented as business-to-customer, business-to-businesses or customer-to-customer relations [1].

Entrepreneurs in the field of electronic commerce (as all businesses) have to communicate with the authorities of public administration to meet legal obligations (e.g. business registration, applications for licenses, tax registrations and declarations, etc.). This communication is often provided using digital channels and represents the government-to-business layer of e-government [2].

E-commerce primarily supports also electronic payments or various forms of electronic banking services. The main advantage of electronic banking is continual access to the payment services for both customers and businesses. It allows making transactions almost anytime from anywhere in the world with the use of electronic data interchange. This fact allows e-commerce retailers to ensure cash flow without need of brick-and-mortar shops and thus gain the cost- and time-saving benefits. It is therefore desirable, to take into account these aspects of e-commerce so that students can gain experience with the operating of this type of entrepreneurship in the education process of future e-commerce entrepreneurs. The educational process at our faculty is intensively supported by information and communication technologies. ICTs help to develop knowledge and skills of students not only in computer science (or informatics) but also in many other subjects [3]. For example, e-learning as a very frequent distant learning form of education emerges thanks to information technologies [4]. ICT within the context of e-commerce entrepreneurship education have dominant role based on the very principle of e-commerce [5].

II. VIRTUAL LABORATORY

Information and communication technologies might be integrated into the education process in various ranges, extent, and forms. The mastery and utilization of ICT are now one of the decisive factors of success for an entrepreneur in electronic commerce. It lies in the ability of entrepreneurs to orient themselves in a variety of information in their business area. This fact suggests the usage of ICT in the education process of future electronic commerce entrepreneurs. At our faculty, the education form of the virtual laboratory of electronic entrepreneurship was selected to provide training to potential entrepreneurs in e-commerce. A virtual laboratory is one of the possibilities of intensive ICT involvement in teaching. The concept of a virtual laboratory is an environment of multiple ICT systems that enables simulation of some kind of activity. Klamma et al. (2015) suggested the use of virtual laboratories for the purposes of entrepreneurial education [6]. Our virtual lab includes an electronic registry, certification authority, virtual bank, and virtual e-shops.
Figure 1 schematically illustrates parts of the virtual laboratory of electronic entrepreneurship. Operations of our virtual laboratory are supported also by learning management system (LMS) Moodle.

E-commerce entrepreneurial education at our faculty using Virtual laboratory of electronic entrepreneurship is provided in the course named Economic Information Systems (EIS). Any perfectly prepared discourse, video lectures or multimedia textbook will not replace the personal experience of participants. Therefore, in the EIS course, the methods of problem-oriented learning, learning by doing and e-learning are used. This course aims to teach course participants to operate a small virtual business from its establishment to first annual closure of accounts using information and communication technologies. The participants should build on knowledge of accounting, marketing, law and tax systems, basic computer skills, website creation and its publication on the Internet.

The subject of study named Economic Information Systems (EIS) is provided as an e-learning course based on the platform of LMS Moodle [7]. This learning management system is used standardly for e-learning of the majority of study subjects at our faculty. LMS Moodle also supports basic communication with the course participants. All study materials for a given subject of study are published in Moodle. All tasks within the course and its schedule are posted there, so participants have the overview if they meet deadlines. Multiple tasks (e.g. strategic plan, business plan, accounting reports) are uploaded into the LMS Moodle by participants and evaluated by lecturers.

The EIS course is provided in the form of distant learning. The advantage of the distant form of learning is that the trainees are not strictly bound to the exact time of the lesson or lecture. They can consult the lecturer at any time via emails, live chat and via the learning management system. Their tasks can be elaborated flexibly at work, at home or virtually at any place with internet connection.

The course is supported by components of our virtual laboratory of electronic entrepreneurship:

- virtual wholesale e-shop operated by lecturers,
- virtual business registration authorities (licensing register, tax office, business register, social insurance, and health insurance),
- virtual electronic bank,
- e-shops and other entities necessary for the implementation of assigned tasks.

The course also provides a web domain, which contains links to web presentations of the participants’ firms stored on a server. The course is oriented on the conditions of e-commerce in the Slovak economy. Course participants are engaged in the retail sector (purchase and sale of goods). They establish their firms according to legislation conditions of Slovak Republic. Virtual electronic registry operated by lecturers is used to emulate public authorities (business register, tax office, licensing register, social insurance office, healthcare insurance authority). During the preparation of the establishment of
the company business plan is developed and all the necessary documents (deed of foundation, registrations, licenses, etc.) are completed.

After all legislative conditions for the founding of the company have been met, participants prepare their websites as a presentation of their e-commerce firms. Furthermore, provided e-shop solutions are integrated into their websites. The source of their products is central wholesale e-shop operated by lecturers, through which they buy goods for further trading. Their clients are simulated by other students, who are buying goods sold in other students’ e-shops. In this case, they act as private persons to generate some demand for goods. Lecturers also generate another portion of demand by buying in students’ e-shops. All payments in e-shops are transferred using the virtual bank, which also provides starting loans to all students’ businesses.

All participants’ firms have to keep their accounting of the current business period in electronic form. After the simulated end of the first business period, participants prepare the financial statements and evaluate their business within a strategic study. This study contains intentions for the future development of their business. At the end of the course, students also analyze some of the information systems used during the course and also give feedback regarding the course.

The EIS course uses a virtual laboratory of electronic entrepreneurship to support the operation of students’ virtual firms. The laboratory contains the following electronic systems:

A. Electronic registry

Electronic registry serves as a virtual representation of public administration authorities within the EIS course. While setting up their virtual businesses, participants have to communicate with these virtual public administration authorities using electronic communication. This communication is adapted according to the valid Slovak legislation. Participants are obliged to register their businesses with the Trade Licensing Register and Business Register. Furthermore, they have to register their newly created firms at virtual Tax Office, Social Security Office and Healthcare Insurance Company. All necessary forms are available in electronic form. After filling those forms, the pdf files are generated to be sent through the electronic registry. The application forms have to be signed using a digital signature.

Electronic communication using digital signature is an important part of the EIS course and deals with the following terms and principles:

- digital signature and electronic signature,
- symmetric and asymmetric encryption,
- electronic signature legislation,
- Public Key Infrastructure (PKI),
- certification and registration authority,
- electronic data interchange.

Guidelines on the usage of a digital signature for communication are available on the web site of the faculty’s certification authority. This certification authority allows the course participants to get private certificates of digital signatures for the purposes of the EIS course. It is based on open source PKI certification authority – EJBCA [8].

The digital signing of prepared pdf files is performed in Adobe Acrobat Reader DC. Website of the certification authority contains also information on the usage of a digital signature in communication and authentication in general. Possible usage of a digital signature in the whole field of e-government is described. The term of Public Key Infrastructure (PKI) is introduced to course participants [2]. They also gain some practical experience with PKI in the process of generating their digital signature certificates at the faculty’s certification authority. Digitally signing all necessary documents in electronic form (and sending them to corresponding virtual authorities) allows participants of EIS course to gain practical experience with a digital signature. The content of the EIS course reflects the real options of communication with public administration authorities in Slovakia at a basic level [8].

B. E-shop

E-shop solution is another key part of the virtual laboratory of electronic entrepreneurship. The main e-commerce activity of students in the EIS course is establishing and managing e-shop linked to their website. All goods of participants’ virtual firms are merchandised here, but the source of the goods is in the central wholesale e-shop of faculty managed by lecturers. The goods are of a virtual character and are inserted into the inventory of wholesale e-shop with no production costs.

Participants may buy goods from central wholesale e-shop (for further trading in their e-shops) from the product group (computer equipment, office equipment or office furniture) of their interest. Lecturers create some demand by purchasing in students’ e-shops. Participants should buy goods from the e-shops of other participants (selling products from two other groups of goods) with the aim to simulate demand in participants e-shops. The course participants also represent their businesses by a website. It is the main tool of the firm’s marketing activities and it should attract potential customers to buy goods from the firm’s e-shop. The registration in e-shop is needed to buy some product from a given firm. Participants in this part of the course have the opportunity to experience both sides of the purchase process in an e-shop using the virtual laboratory. [4].

C. Electronic payments

The virtual laboratory of electronic entrepreneurship contains also virtual bank supporting electronic payments. The purchases in e-shops invoke necessity to administer electronic payments for the goods purchased. Those payments are conducted via internet banking system of faculty’s virtual bank. This virtual bank is called Electronic Online Bank (or EOB) and was provided to faculty for free as outdated banking software by its developing company UNICOM. The electronic payment
functionalities of EOB are satisfactory for the educational purposes of the EIS course. Participants get virtual euros at their newly generated bank accounts in the form of a loan to support the payment processes within the course. Any electronic payment in e-shop will redirect a buyer to the virtual bank’s internet banking form pre-filled with the parameters of this particular payment. A digital signature is used as the authorization element in EOB. Furthermore, the identification process of bank users is realized using digital signature [9].

All participants get practical and theoretical knowledge about the security of the payment process during electronic purchase. Most often, the security of electronic payments usage is a question of users’ safety behavior. The participants of our course will learn safety rules while using online payments and try to follow them in praxis. Various methods for authentication and authorization of electronic payments are available in EOB (One-Time Password generator, SMS code, and digital signature), but for the EIS course, only the most secure one – the digital signature is supported [10]. The biggest technological challenge when building the virtual laboratory of electronic entrepreneurship was an interconnection of e-shop with the payment system of the virtual bank to allow automatic transfer of payment data.

### III. Survey Results

During recent years, surveys on participants’ experience with e-commerce, electronic payments, and electronic communication were conducted to gather feedback on Electronic Information Systems course. Each year, the survey is performed before and after the course completion. Participants’ experience and knowledge about electronic business, electronic commerce, electronic payments and electronic communication with public administration were examined in the survey. The results bring also relevant suggestions for improvement of the education process within the EIS course. The respondents of the survey were all participants of EIS course in the year 2018 (last finished course to date) and they were addressed by a link in LMS Moodle. Participation in the survey was mandatory for all course participants. Following table contains demographic data of the EIS course survey.

#### TABLE I. DEMOGRAPHIC DATA OF EIS COURSE PARTICIPANTS

<table>
<thead>
<tr>
<th>Age</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 – 24</td>
<td>94</td>
<td>80.34</td>
</tr>
<tr>
<td>25 – 29</td>
<td>18</td>
<td>15.38</td>
</tr>
<tr>
<td>30 and over</td>
<td>5</td>
<td>4.28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>44</td>
<td>37.61</td>
</tr>
<tr>
<td>Women</td>
<td>73</td>
<td>62.39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Residence</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-sized city (over 100 000 citizens)</td>
<td>68</td>
<td>58.12</td>
</tr>
<tr>
<td>Medium-sized city (40 000 to 100 000 citizens)</td>
<td>13</td>
<td>11.11</td>
</tr>
<tr>
<td>Small town (5 000 to 40 000 citizens)</td>
<td>7</td>
<td>5.98</td>
</tr>
<tr>
<td>Village (under 5 000 citizens)</td>
<td>29</td>
<td>24.79</td>
</tr>
</tbody>
</table>

The survey was executed in digital form using the web questionnaire. It was gathered 117 completed questionnaires (in both times: pre- and post-course). Most of the respondents (94 representing above 80 percent of participants) were in the age range between 19 and 24 years as it is the usual age of the most students of the internal form of study. Between 25 and 29 years of age were 18 respondents (15 percent of students) and 30 and more years had only 5 respondents (slightly above 4 percent of participants) of the survey. Participants of 25 and more years of age were mostly the students of the external form of study mostly studying part-time alongside their jobs.

The majority of course participants (over 62 percent) were women, which reflects also the gender composition of students at our faculty. The rest of the survey sample (almost 38 percent) created male respondents. The area of residence in Slovak conditions may affect the availability of high-speed broadband internet services. In larger cities in average higher speeds of connections are available. The most of respondents (over 58 percent) are residing in large-sized cities (above 100 000 citizens) and 13 respondents (11 percent) were from medium-sized cities, where the availability of high-speed internet is good. The rest of the respondents were from towns with less than 40 000 citizens or villages, where the availability of high-speed broadband internet is lower.

Survey data were gathered before the course and after its completion. Following results were gathered before the start of EIS course.

Theoretical experience with the establishment of the company and with business legislation, in general, had all participants thanks to the fact, that they already attended the courses of business legislation in previous years of study. Only 3 percent of participants added some practical experience with the establishing or managing firm, while the rest of the respondents did not indicate any experience with entrepreneurship at all. All students indicated experience with preparing the business plan, what was caused by the content of their previous studies at our faculty. Just 4 percent of respondents added some experience with using a digital signature in e-government applications. Compared to the past, this is a tiny shift in the area of the digital signature usage, but it is still low. Almost 22 percent of respondents indicated some experience with electronic communication with public administration authorities, but only as individuals and not as entrepreneurs or company representatives. This result suggests a low level of e-government usage in Slovakia [11].

The majority of respondents (94 percent) had experience with creation of the simple website, again mostly because of their previous studies at our faculty. None of the participants had experience with establishing and managing an e-shop or linking it with a website. Over 80 percent of respondents added experience with purchases in real e-shops. Even 96 percent of them indicated some practical experience with the electronic payments on the web, but only at the buyer’s side.

Again, all of the respondents noted some theoretical experience with accounting, though just 7 percent of them...
had some practical experience with accounting in an actual business. Approximately 35 percent added some previous experience with creation of a business strategic plan as a part of a company's future development strategy.

These survey results indicate relatively wide knowledge and experience of students before the start of the EIS course acquired in their studies in initial years of their studies at our faculty. The second survey was carried out after the students’ participation and completion of Economic Information Systems course. Its results are presented further.

Almost 95 percent of respondents reported, that during the EIS course they gained notable experience in establishing or managing company. Over 85 percent of course participants indicated obtaining some new information on the business establishing process within the framework of valid Slovak legislation. Above 42 percent of respondents adduced that the practical preparation of the business plan of their virtual firm was beneficial for them even though they already had some experience with business plan preparation. Over 98 percent of course participants indicated that acquiring practical experience with electronic communication with public administration authorities using virtual lab’s electronic registry was beneficial for them. The use of the digital signature within the framework of this communication was also highlighted by students.

More than 29 percent of respondents reported that creating a website of their company brought them some new experience, even if they had previously created a website during their studies. Establishing and managing e-shop of their firm was a valuable experience for around 78 percent of students. Mainly, the possibility to experience the operation of an e-shop from the side of its administrator was appreciated by students.

Almost 63 percent of EIS course participants found the possibility to practically try out to keep an accounting of their training firms as beneficial. Especially, the experience with the first accounting period was highlighted by them. Around 65 percent of students also appreciated the task of strategic plan preparation for their virtual businesses into the following years (although beyond the horizon of ongoing course). The large majority of participants (93 percent) rated the course of Electronic Information Systems very positively and they welcomed the opportunity to practically experience entrepreneurship with the support of the virtual laboratory of electronic entrepreneurship.

In general feedback part of the survey, students provided suggestions for improvement of the course. One of the suggestions that are to be implemented was the possibility to train entrepreneurial soft skills in the form of e-learning besides the use of the virtual laboratory. This was one of the reasons for joining the RECREATE project team.

IV. RECREATE PROJECT

It is necessary for us to continually develop the EIS course and to improve entrepreneurship education at our faculty. Also, the surveys’ results showed that students would like to have the opportunity to improve their skills and knowledge during the course in the form of e-learning. Therefore, our faculty joined the RECREATE project.

The RECREATE project (Recovery the Crisis through Entrepreneurial Attitude – Erasmus + Strategic Partnership – 2017-1-PL01-KA203-038438) is Erasmus+ program project, in which the partner subjects cooperate to provide students in higher education more innovative learning environments and curricula that stimulate independence, creativity and an entrepreneurial approach to harnessing knowledge [12].

Europe’s future economic growth and jobs will increasingly have to come from innovation in products, services, and business models. Therefore, universities need to create structured partnerships with the business community and increase the relevance of education and training programs by adding entrepreneurial skills to scientific expertise and so to improve the career prospects of researchers and students [12].

A structured and better implementation of entrepreneurial learning aimed for the creation of links between universities and business will strongly support mutual exchange between universities, industries, the business community, and the wider society. The main innovation of the RECREATE project focuses on boosting the knowledge triangle. The training proposed focuses on the development of the entrepreneurial skills and to ease the employability of researchers and young graduates and boost the innovation potential of the territories involved [12].

Therefore, the training in RECREATE project will include enterprise creation and management, development of transversal and soft skills and a specific module on the creation of links with business. The aim is to favor the creation of structured partnerships with the business community (including SMEs), which can bring opportunities for universities to improve the sharing of research results, intellectual property rights, patents, and licenses (for example through innovation clusters, fablab, business incubators, etc.). Thanks to these links, universities can also increase the relevance of education and training programs through placements of students and researchers in business [12].

The main objectives of the RECREATE project are the following:

- develop tools such as platform (for sharing material), games (to better understand business rules), etc.
- provide workshops for students with mentors which describe and presents the issues about entrepreneurship
- to create links between high educational and business partners especially at the regional level
- the acquisition of entrepreneurial attitude among young researchers and students.

The investigation in the project will focus on the concrete obstacles and skill gaps that make the
collaboration between universities and business difficult. The scorecard tool is being developed to assess:

- the attitude and perception of knowledge-based entrepreneurship;
- the extent to which academic research can produce marketable products and services and have market knowledge;
- the barriers experienced in the creation of links with the business community;
- specific needs at a local/national level;
- attitudes towards risk-taking; and lack/needs of transversal skills [12].

The RECREATE project further aims to develop training materials and develop new content to enhance transversal competencies for entrepreneurship. Each module of training materials will be developed for a workshop focused on one specific theme. The final outcome will be a modular training course to be implemented with a set of workshops with the following topics:

- soft skills: leadership, risk-taking, communication, creativity (based on practical exercises);
- hard skills related to business creation: business idea formulation, market identification, a route to market, business plan, legal and fiscal issues (country-specific information);
- social media and marketing;
- making the knowledge triangle work: linking higher education, research, and business for excellence and regional development [12].

The education process in these modules will be supported by an innovative e-learning space created within the RECREATE project. The creation of the learning environment will ensure the development of the knowledge base allowing fast and easy access to materials and contents; a self-diagnostic tool that will guide the users to proper materials (e.g., educational games, simulations of the business creation process, forums, FAQs, manuals, etc.). The newly developed learning environment and its tools will be based on the methodology of mixing traditional training approach with informal learning (e.g., simulations, educational games) meant to favor the acquisition of key competencies through non-traditional methods. After its finishing, the RECREATE platform will be available for students of EIS course and it will complement the use of virtual laboratory of electronic entrepreneurship during the provision of the course [12].

V. CONCLUSION

The course of Economic Information Systems gives students the opportunity to acquire practical experience with entrepreneurship in the area of e-commerce with the support of the virtual laboratory of electronic entrepreneurship. Course participants gain practical experience with establishing a firm according to the legislative conditions of Slovakia. Furthermore, they try out the usage of electronic registry and digital signature in electronic communication, preparation of a business plan, the creation of the firm’s website with e-shop implementation, management, and operation. Finally, students keep accounting and prepare a strategic plan for the of their virtual businesses. The feedback on the EIS course gathered by survey contained suggestions to provide a possibility to train entrepreneurial soft skills in e-learning form as support of their study in the course. This is planned to be implemented by using the platform developed within the RECREATE project.

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