

# FIT FOR THE FUTURE - MODERNISATION OF MASTER CURRICULUM IN ICT FOR ENHANCING STUDENT EMPLOYABILITY IN BELARUS<sup>1</sup>

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## Abstract

The Belarusian ICT industry grows fast, but the full potential has not been reached yet. To increase the ICT industry's position as a central soil for the Belarusian economy, factors that hinder further growth, need to be identified and improved. Two of such factors are the inefficient dialogue between the ICT industry and higher education and a rather passive role of universities in framing trends on the market. This paper describes the concept and the implementation plan of the Erasmus+-project "Modernisation of Master Curriculum in ICT for Enhancing Student Employability in Belarus" (MaCICT). MaCICT is aimed to enhance the employability of ICT master students, foster entrepreneurship and establishment of SMEs in the ICT industry, and to upscale the position of higher education. For this, MaCICT updates the ICT study programmes to become more labor market and society oriented, practice-based, and student-centered. This forces universities to combine the traditional professional skills and competencies with soft and transferable skills and to focus more on multidisciplinary studies and internationalization of the study environment.

Keywords: ICT curricula modernization, ICT market needs, didactic method, teaching soft skills for ICT graduates

## 1 INTRODUCTION

The ongoing digitalization of societies impacts and changes them in multiple levels opening several novel opportunities and creating simultaneously new challenges that did not exist before and that need to be solved. This applies especially to the labour market. For example, more than 10 percent of jobs in Germany have a high probability of being automated in the next few years and in the United States, almost half of employees are likely to be replaced by machines in the next 10 to 20 years with a probability of more than 70%. Digital skills of employees are becoming increasingly important to accommodate in almost all labour market sectors and thus the transfer of digital skills is becoming increasingly important [11].

For emerging economies, the digitalization offers novel opportunities and chances [13]. However, in order to seize the opportunities, they must be prepared. The preparation is not about digital skills alone, it presupposes formation of other competencies that are needed in a society, which is driven by global trends. This makes digitalization go hand in hand with internationalization. Successful internationalization requires not only language, intercultural communication and other soft skills, but also knowledge in the field of economics and entrepreneurship [7]. However, such skills and knowledge are not built up overnight: they require a careful preparation.

This paper describes the concept of the Erasmus+-project "Modernisation of Master Curriculum in ICT for Enhancing Student Employability in Belarus" (MaCICT) as well as its implementation plan, developing the basic concept proposed previously by [11]. The remain of this paper is structured as follows: in the "Methodology" section the initial state is presented and the project goals are described; the "Results" section is dedicated to the description of the approach to reach the project goals; and in the "Conclusion" part the paper is summarized and the outlook is provided.

## 2 METHODOLOGY

MaCICT is aimed to enhance employability of Information and Communication Technology (ICT) master students, foster entrepreneurship and establishment of SMEs in the ICT sector, and to upscale the position of higher education in the sector on the market. All these aspects lead to human capital development and support socio-economic growth of Belarus as a transition economy [12]. To achieve these goals, the consortium plans to undertake the following activities. First, before the curricula are modernized, the main weaknesses of ICT employees and ICT university graduates will be identified.

### 2.1 The starting point

Currently, the Belarusian society is actively opening towards western economies. As a traditional high-tech country, Belarus particularly welcomes international ICT companies. At the same time, Belarus strongly supports its own ICT industry with the goal to export ICT services. These are prioritized goals framed in a series of strategies at the national level in the country.

Thus, openness to the global world and building the knowledge economy [6], defined by the Program of Social and Economic Development of the Republic of Belarus for 2016–2020 as some of the priorities in the development of the national economy, “are the key to increasing the competitiveness of the country, strengthening the position of the Republic of Belarus in modern civilization” (Chapter 3 “Global Trends: Challenges and Opportunities for Belarus”) [1]. The country has set a course for improving the efficiency of traditional sectors of the economy “through accelerated informatization, mastering the best achievements in the global community and [...] the ability to change quickly on demand of time” (Chapter 3) [1]. The program identifies information and communication technologies as a tool that “will ensure the development of the high-tech sector of the economy, create the conditions for the transition to a digital economy, improve the institutional and create a favorable business environment (Chapter 3) [1]. Training specialists in improved ICT educational programs will optimize graduates’ entry into the national and global labor market represented in Belarus, which will greatly enhance the process of expanding the domestic market of information and communication technology services and greatly optimize the growth of competitive exports, which fully corresponds to the goals and objectives of the Program. As a result, advanced formation specialists will create an even greater potential for using information and communication technologies in various sectors of the economy, provide a significant contribution to economic growth [10], increase the competitiveness of basic industries and new sectors of the economy, quality of life of the population, as well as achieve high positions of Belarus in world rankings.

The training of specialists of the new type planned in the project fully complies with the goals and objectives of the National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus for the period up to 2020, developed in accordance with the Law of the Republic of Belarus “On State Forecasting and Programs of Social and Economic Development of the Republic of Belarus”. Such specialists will make a significant contribution to the effectively developing information and communication infrastructure in the country, designed to create the conditions for improving the efficiency of the economy (Section 3.5 “Information and Communication Technologies” Chapter 3 “National resources and socio-economic potential of sustainable development of the country”). This will eventually accomplish the tasks set in the chapter, namely:

- ICT development and the formation of an export-oriented industry of information technology (IT industry);
- development of advanced information technologies in the framework of the relevant state scientific and technical programs;
- the creation of unified principles of automated information systems in various sectors of the economy;
- development of the system of training and retraining of specialists in information and telecommunication technologies and qualified users;
- the formation of professional educational programs, the creation for their implementation of hardware and software, including distance learning systems [2].

The improvement of the existing ICT educational programs within the project through the introduction and use of EU best practices in the formation of competencies of master-level students in accordance with the requirements of the modern market and national economy development strategies in Belarus

fully complies with the goals and objectives set forth in Subprogramme 5 "Development of the higher education system" of the State program "Education and youth policy" for 2016 - 2020.

In particular, the development of skills required for the intensively developing ICT sector of the national economy, as well as close cooperation with the ICT industry enterprises for use in the educational process of updated information and real-world problems, will significantly improve the quality of training, and the advanced educational methods, methods and training technologies will ensure the effectiveness of practice-oriented training and the deepening of relations with the labour market. The creation within the framework of the project of network interaction of partner universities to ensure academic mobility of teachers and students will contribute to the implementation of the tasks defined by the Program. Improving the quality of teaching and learning, which is the core of the project, is consistent with the objectives of the Program, which states that the main factors affecting the quality of education are: "scientific and methodological support, which form the basis for the implementation of the educational process; changing the content of education to meet the requirements of the real sector of the economy and services; the quality of teaching, which depends on the professionalism of the university staff" [3]. Project activities will contribute to improving the quality of teaching and learning, taking into account all the factors identified above. Chapter 11 of the Program "General Characteristics and Directions for the Implementation of Subprogramme 5" Development of the Higher Education System "describes the state policy for the development of the national higher education system" taking into account global trends in the field of higher education" [3], and asserts that in order to "improve the competitiveness of the higher education system of the country in the world, a significant amount of work is underway to implement international and mainly EU approaches in higher education in Belarus" [3], which is the focus of the project.

The planned networking of partner universities from Belarus, Germany, Denmark and Poland will be implemented in accordance with the priority areas of innovations (Chapter 6 of the State Innovative Development Program of the Republic of Belarus for 2016–2020), one of which is information and communication technologies. Their development, as noted in the Program, is closely related to improving the competitiveness of higher education in the global educational space, which will be carried out at the expense of, inter alia, "the development of cooperation between higher education institutions of Belarus and higher education institutions from abroad in the implementation of educational programs, promoting exchanges of students and staff" [4].

According to "2017 Global Outsourcing 100 Ranking", six Belarusian branch ICT companies are within the 100 best global outsourcers of 2017 [5]. Large international ICT service providers – EPAM Systems, Itransition, IBA Group, Bell Integrator, Ciklum, Intetics, Colliers International, Teleperformance – have offices in Belarus with around 1700 Belarusian staff. Since 2005 the share of ICT services in the structure of Belarusian exports increased more than sevenfold – from 1.27 to 9.4 % in 2017. ICT services have been listed 2nd in the total exports of services, following transport [5]. This situation has created a gap between the challenges of the global market and skills/competences Belarusian ICT graduates have at entering the profession. ICT companies bear economic losses by providing additional training to their new staff. The companies state the high level of professional knowledge of university graduates but low level of soft/transferable skills necessary to work in international teams. EPAM Systems and CISCO listed in 2017 skills they need to have in new staff that are almost absent in university graduates at present: (1) efficient interpersonal communication; (2) critical thinking; (3) flexibility; (4) intercultural communication; (5) team-building and team-working, (6) negotiation, collaboration, (7) valorization, (8) project management.

At the International Science Conference "Informational technologies and systems ITS-2017" (<https://science.bsuir.by/en/news/100306-conference-its-2017-takes-place-at-bsuir>) held in BSUIR (Belarus) in October 2017 the five Belarusian partner universities made up a list of their needs. The common needs are:

- the existing Master study programmes (MSc) in ICT are mono-subject and they do not provide graduates with soft skills required by labour market.
- insufficient pedagogical skills and outdated approaches and teaching methods used by Belarusian teachers;
- little orientation of methods to the labour market;
- lack of labour market participation in curriculum updates;
- not involving students in curricular changes;
- no students' work in groups for conducting projects; and
- no special classrooms for group work or tele-networking with similar groups outside.

Besides the common needs, the Belarusian partners report individual needs that can be grouped into five groups: (1) insufficient or scanty quality assurance (QA) procedures, (2) low-level pedagogical and methodological work on the existing MSc; (3) no networking and active involvement of students; (4) theory- or research-oriented rather than practice-based education; (5) lacking pedagogical skills among MSc teachers.

The project will meet the needs with relevant activities that correspond to the recent strategies in the higher education (HE) reforms in the European Higher Education Area (EHEA), of which BY has been part since 2015. The Yerevan Ministerial Communiqué lays down a renewed vision of the EHEA and sets one of its priorities “ensuring educational opportunities to provide the competences and skills required for innovation and employment” [6]. To achieve this enhancing quality and relevance of learning and teaching becomes the main mission any university in the EHEA by “promoting pedagogical innovation in student-centered learning environments and a stronger link between teaching, learning and research at all study levels” [6].

The motivation to undertake activities related to the project results from the following. The ICT sector is an essential element in Belarus’ economy and the ICT development is defined as a priority task in the national strategies. Due to its strong ICT education and competitive salaries, the Belarusian ICT industry is export-oriented. During the Soviet time, the ICT industry of the USSR was heavily concentrated in Belarus. The ICT tradition from those days has been kept upright - today's ICT industry in Belarus offers various types of ICT services for foreign clients. Although the growth of ICT services has been fast (more sevenfold from 2005 to 2015) and has reached more than 15 % of total export in 2017, the full potential has not been reached yet. To increase the ICT sector’s position as a central soil for the Belarusian economy, factors that hinder further growth, need to be identified and improved. Two of such factors are the inefficient dialogue between the ICT sector and higher education and a rather passive role of universities in framing trends on the market.

The novelty of our study is the new attempt of the MaCICT to respond to these challenges. To enhance the mentioned skills, the novel didactic method T-CHAT (cf. [8], [9], and [11]) will be applied. The focus will be on interdisciplinary study programme to equip graduates with competitive skills and competencies demanded by the regional, national, and global market to optimize their employability. The role of the university is seen as an education service provider and as an active participant of the market rather than a knowledge-generating authority only. Consequently, the offered study programs need to become more labor market and society oriented, practice-based, and student-centered. The perceived role as a service provider commits the universities to combine the traditional professional skills and competencies with soft and transferable skills and to focus more on multidisciplinary studies and internationalization of the study environment.

## **2.2 The Project Goals**

The overall goal of the project is to modernise the existing ICT curriculum in order to 1) enhance employability of ICT master students and 2) to foster entrepreneurship and establishment of SMEs in the ICT sector.

This overall goal will be reached by pursuing the following specific objectives:

1. To modernise the existing curriculum on the MSc study programme in ICT
  - a. by updating the existing professional study courses through incorporating the EU partners’ best practices – strategies, pedagogical approaches and methods of education to back up professional knowledge and hard skills demanded by the labour market.
  - b. by incorporating new interdisciplinary courses to equip students with competitive knowledge, soft and transferable skills necessary for entering the labour market, pursuing successful career at the existing companies or starting their own business.
2. To accredit the programme.
3. To develop and to apply the strategy, guidelines, and principles of QA to enhance the modernised MSc study programme in ICT by attracting master students and the labour market to the evaluation and further enhancement of the MSc.
4. To run the modernised MSc study programme at the pilot stage.
5. To promote EU and Belarusian students' cooperation by conducting real-life problems solving projects by international student groups.

6. To assure the quality of the programme and make necessary improvements at the follow-up stage.

The fulfilment of the first two objectives (1a and 1b) will ask for a change

- in pedagogical attitudes, approaches and methods of education in Belorussian teachers,
- in students' mindsets and their adaptability to society and market, and
- on the labour market where graduates from the modernised interdisciplinary MSc study programme in ICT will get better possibilities of employment.

As a further result of the project will be that some of the graduates will be able to start their own business.

The 3rd and 4th objectives will enhance the quality of the programme and bring it closer to the demands of the labour market and society.

The last 3 objectives will allow implementation of the modernised MSc study programme and its quality control, improvements and optimization of the programme, and enhance the international dimension of the programme. We assume global evaluation of proposed methods depicted on the scheme depicted in Fig. 1, according to [11].

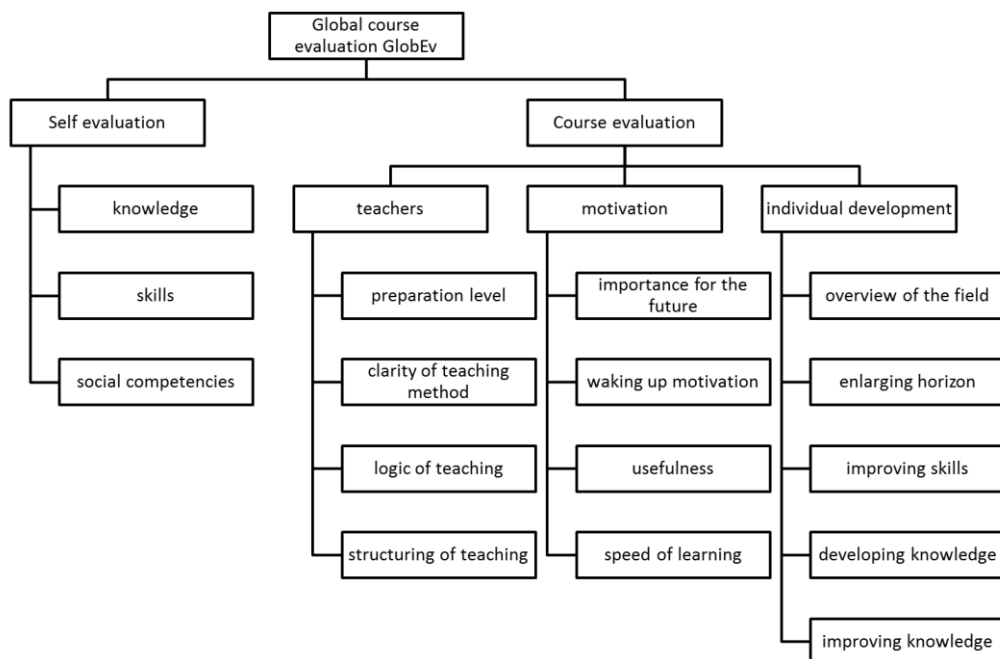


Figure 1. Scheme of course evaluation

### 3 RESULTS

The modernised curriculum is new in the Belarussian Higher Education, as it combines interdisciplinary society-oriented professional courses with soft/transferrable skills development courses at the master level, which is a novel practice for Belarus.

University lecturers will be trained to use modern teaching methods and to use advanced pedagogical approaches. Currently, pedagogy and methodology are almost neglected in teaching at Belarussian universities.

As an answer to the growing demands of the industry to use the ICT staff in international projects with an international workforce and English as the project language, all courses are offered in English. Currently, teaching in English is hardly practiced by the ICT faculties in Belarus.

One reason for the high liquidation trend of Belarussian SMEs in ICT field is the lack of soft skills among their managers. Fostering soft skills will be in the centre of attention of the programme to enhance ICT master graduates' performance. This is a new practice for Belarus.

Arranging and holding international students' groups to conduct joint projects for solving international enterprises' real-life problems is new not only for Belarus but also for EU. International student short-term mobility will be organised for this purpose.

Project-based learning as a teaching method is not used at the ICT study programmes in the Belorussian partner institutions. The use of this method for international students' projects will also be a new practice in Belarus.

## 4 CONCLUSIONS

This paper reports about the ongoing Erasmus+-project MaCICT. The goal of the project is to modernize the ICT master level education at five Belarusian universities. The Belarusian universities are supported by three partner universities from the European Union. The modernization includes the training of lecturers in modern didactic and educational approaches, redesign of some courses as well as the introduction of international student projects into education.

The main reasons for the project are the steadily growing importance of ICT for the economic growth in Belarus and that the existing master study programs do not prepare the students according to the market's demands. Thus, this project aims to eliminate the main shortcomings of graduates in respect of their employability such as: (1) lack of team-building skills, (2) lack of entrepreneurial skills, (3) low communication and socialization skills, (4) lack of knowledge in the fields of management and business.

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