

ENTREPRENEURSHIP COMPETENCES FOR ICT STUDENTS: LATVIAN AND KAZAKH CASE STUDIES

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Abstract. There is an evidence that students, especially non-business students, lack of entrepreneurial skills. The importance of entrepreneurship education has been frequently debated in the academic environment. However, the question is about competences that should be developed and their relevance to the market demand. The current research was conducted within the framework of the international project “Accelerating ICT students’ start-up development competence via interdisciplinary modular courses in the HEI curricula” supported by the Erasmus+ programme “Capacity Building for Higher Education”. The goal of the research is to evaluate the perceived importance of entrepreneurship competences for the future career of students of ICT-related study programmes in Latvia and Kazakhstan. 119 students and 31 staff members participated in the survey. List of competences offered for evaluation was created based on the EU Entrepreneurship Competence Framework, as well as on the learning outcomes defined in the Master’s study programmes in Entrepreneurship at Cambridge University and Amsterdam Business School. Data was processed by means of frequency analysis and ranking. The difference between respondent groups was tested by Mann-Whitney U test. The internal consistency of the scale was analysed by calculating Cronbach alpha. The most important entrepreneurship competences on the viewpoint of ICT students are “Seeing opportunities”, “Real life problem solving based thinking” and “Research skills”. Staff members have the priority to “Generation of creative ideas”, “Self-awareness and self-efficacy”, “Motivation and perseverance”, and “Thinking based on real-life problems solving based thinking problems”.

Keywords: entrepreneurship education, higher education, ICT, survey.

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Introduction

Entrepreneurial activities are among critical indicators of economic development (Cui & Bell, 2022), innovation and societal change, economic recovery (Global Entrepreneurship Monitor [GEM], 2022), market stabilization and resilience of markets to the impact of external factors (Finn, 2021). Therefore, national authorities have been designing public policies to boost entrepreneurial intention and activities among various groups of the population, including youth (Ho et al., 2018), who might be interested in starting own ventures (GEM, 2022). However, there are factors impeding such initiatives, such as the fear of failure (GEM, 2022), lack of resources and contacts (Finn, 2021), financial anxiety (Gignac et al.,

2023), and insufficient knowledge of how to overcome entrepreneurship barriers.

One area of social activity that can help people overcome their concerns and develop essential knowledge, including those related to entrepreneurship, is education. In fact, the Entrepreneurship 2020 Action Plan of the European Commission mentions entrepreneurial education and training as one of the pillars of the expansion of entrepreneurial activities (European Commission, 2013), which ultimately resulted in the development of the European Entrepreneurship Competence Framework (henceforth – EntreComp) (Bacigalupo et al., 2016), which was hoped to provide workforce with strategies and tools for the survival on volatile markets, to drive innovation by enabling

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the transformation of ideas into common values (European Commission, 2018), and to increase competitiveness of European markets and economies (European Commission, 2016). By proposing 3 competence areas, 15 specific competences and 8 levels of performance (Bacigalupo et al., 2016), EntreComp provides practical guidelines for the development of measurable entrepreneurship knowledge and skills that are applicable to individual and collective professional growth and start-up initiatives. Therefore, within the EntreComp framework, entrepreneurship competences might be defined as the abilities to identify opportunities and transform ideas into actions and products by finding and allocating various resources through own initiative for the purposes of own and corporate growth.

However, EntreComp competences might merely remain recommendations unless they are perceived as valuable tools not only among entrepreneurs and politicians but across various social groups. One such group, capable of creating and promoting services and products, are the students of information and communication technologies (henceforth – ICT), computer and computing sciences. Although the volume of studies of entrepreneurial competences of such students has recently been increasing (Nugraha et al., 2023), their number continues to be relatively low.

The goal of the research is to evaluate the perceived importance of entrepreneurship competences for the future career of students of ICT-related study programmes in Latvia and Kazakhstan.

The countries were selected because the research was conducted within the framework of the international project “Accelerating ICT students’ start-up development competence via interdisciplinary modular courses in the HEI curricula” supported by the Erasmus+ programme “Capacity Building for Higher Education”. Project consortium involves EU partner universities (Germany, Latvia, and Estonia) and partner universities from the Republic of Kazakhstan. The participants of the research included staff and students from ICT-related study programmes of the EKA University of Applied Sciences (Latvia), the Alberta College (Latvia) and the A. Baitursynov Kostanay Regional University (Republic of Kazakhstan).

This research yields contributions to both entrepreneurship and ICT education by indicating the value assigned to entrepreneurship competences by both ICT students and academic staff, and thus, supporting earlier examples of the inclusion of entrepreneurial track into computer science training in other countries. This research also yields longer-term socioeconomic contributions to market development because it points to the interest of ICT professionals in entrepreneurial actions. Consequently, if given proper entrepreneurial training, today’s ICT students might establish their own start-ups in the future. As previous research outcomes suggest, there is a relationship between competences and subsequent entrepreneurial actions (Alakaleek et al., 2023).

1. Literature review

In scientific literature, universities are treated as essential vehicles of the development of entrepreneurial intention in society and the transition platforms from students’ entrepreneurial intention to students’ entrepreneurial behavior (Lyu et al., 2023).

Universities might be viewed as hubs for the development of entrepreneurial mindsets across various disciplines due to their capacity and resources that can stir and maintain students’ interest in entrepreneurial activities throughout their studies. This can be attained by increasing students’ entrepreneurial motivation. Entrepreneurial motivation can be developed through the development of positive attitudes to entrepreneurial actions (Chang et al., 2020; Perez-Perez et al., 2021). By helping students practice behavioral control, withstand pressure of subjective evaluations and social norms and by engaging students in experiential learning, games and simulations (Kaltenecker et al., 2013; Perez-Perez et al., 2021), universities can help students construe various attainable models of entrepreneurial actions and competences. Because entrepreneurship can be regarded as a cognitive concept and process (Chang et al., 2020), which is hard for individuals to define (Salas, 2017), the immersion in various cognitive models of entrepreneurship might help students bring down the mental barriers of the lack of power associated with entering the entrepreneurship market (Doboli et al., 2010; Finn, 2021).

One area of studies that seem particularly important for the creation of new business initiatives in the current era of Industry 4.0, characterized by digitalization of economies and creation of artificial cognitive minds, is computer science, including information and communication technologies (henceforth – ICT). In fact, ICT sectors have been found to positively contribute and support the GDP growth (Fernandez-Portillo et al., 2020). The graduates of these programs will co-create new types and markets of economy, as they have already done with the Gig economy. In fact, such specialists have already produced new forms of entrepreneurship – cyber-entrepreneurship (Chang et al., 2020) and digital entrepreneurship (Fernandes et al., 2022). More and more businesses are transferring their processes and services to the digital reality, and they require the vision and consultation from specialists knowledgeable in the areas of economic, entrepreneurial and cyber space activities. However, not all computer scientists receive proper training in entrepreneurial competences or their subset – soft-skills, which is why there is a need for their development (Lamine et al., 2021).

2021 research explored the employers’ perceptions of the most essential soft skills needed and missing among recently hired STEM undergraduates. The result indicates that the soft skill gap in current STEM undergraduates is not only evident, but it is steadily increasing (Karimi & Pina, 2021).

Potential employees should have the balanced set of hard and soft skills, complementing one another. Various

researchers in (Lazear, 2005; Stuetzer et al., 2013; Tulgan, 2016) specify that diversity is necessary in the development of students' skills and competencies. Already in 2014, Myers et al. (2014) insisted on the inclusion of soft-skills in the learning outcomes of an ICT graduate.

In earlier attempts to integrate entrepreneurial skills into computer science curricula, Salas (2017) limited entrepreneurship education for computer science students to the activities leading to the invention, design and production of abstract ideas transformed into computer science products and services. Consistent with this vision of entrepreneurship training, some universities have introduced entrepreneurship modules in the (1) Data Structures and Algorithms, (2) Software Engineering and (3) Computing, Ethics and Society courses (Doboli et al., 2010; Salas, 2017). Another approach is to integrate the entrepreneurship modules and programs that are delivered to the students of business and management programs by business and management departments (Doboli et al., 2010). However, both approaches might have limitations due to their focused scope on specific contexts of economic activities.

A more sustainable approach to the development of the entrepreneurial mindset in computer science students might be rooted in entrepreneurship competences because they focus on the development of both the entrepreneurial mindset (personality) and entrepreneurial business ideas. In fact, Lopatka (2021) suggests that the success of an enterprise, including an ICT start-up, is linked to the entrepreneurial competences of its owner. Entrepreneurial competency models can be adapted from Mitchelmore and Rowley (2010) and Bacigalupo et al. (2016). The former framework distinguishes 4 areas of competences, all of which converge on the knowledge and skills of launching and managing business enterprises, proper market analysis and data analysis, human capital management and communication, whereas the latter one, EntreComp, emphasizes three areas of action – into action (implementation of ideas into business actions), ideas & opportunities, and resources (Bacigalupo et al., 2016). Both frameworks promote skills essential for the establishment and management of business operations and human resources. EntreComp also emphasizes the skills of identification, deployment and creation of re-sources for the purposes of filling-in the market gaps with new savvy business ideas. Because the EntreComp is up-to-dated to the current challenges of the market development across the entire European space, its competences might be more suitable for the inclusion into the ICT programs not only in the short-term but also long-term perspective.

If such competences were to be found important, they could be integrated into current ICT curricula with a relative ease because the formulation of these competences allows for their adaptation to a myriad of contexts.

2. Methodology and hypothesis

To achieve the research goal, the authors of the paper developed a questionnaire for staff members and students. The research instrument was identical for both sample groups except for slight differences in Respondent profile part. The structure of the questionnaire is presented in Table 1.

Table 1. Structure of the questionnaire (source: the authors' developed)

Part	Question	Type of the question; responses
A	Respondent profile	For staff: Gender, age, type of the position in the HEI, taught study courses For students: Gender, age, HEI represented, study programme
B	Entrepreneurship competences	19 competences. Evaluation scale: level of perceived importance (1 – absolutely unessential; 5 – absolutely essential)
C	Entrepreneurship competences	Open question to name additional competences that were not mentioned in the B part

The list of competences offered for evaluation was created based on the EU Entrepreneurship Competence Framework (Bacigalupo et al., 2016), as well as on the learning outcomes defined in the Master's study programmes in Entrepreneurship at Cambridge University (The Cambridge University Judge Business School, n.d.) and Vrije Amsterdam University (Vrije Amsterdam University, 2023).

The scale of the B part was tested for internal consistency, using the reliability analysis in SPSS. The total alpha for scale was 0.982 pointing to the excellent internal consistency. Based on the values of alpha for individual scale items, the conclusion was to use the instrument in its initial form with no changes (Table 2).

Table 2. List of the entrepreneurship competences used for the research; item-total statistics: Cronbach's alpha if item deleted (source: the authors' contribution)

α	Competence	α	Competence
0.981	Ethical and sustainable thinking	0.981	Research skills
0.981	Generation of creative ideas	0.981	Real-life thinking and solving real-life problems
0.982	Vision	0.981	Taking the initiative, displaying entrepreneurial behavior
0.981	Seeing opportunities	0.981	Planning and managing general business processes, displaying the knowledge of organizational and entrepreneurial behavior
0.981	Valuing / assessing / analyzing ideas	0.982	Planning and managing human resources, displaying the knowledge of organizational and entrepreneurial behavior

End of Table 2

α	Competence	α	Competence
0.982	Conducting market research	0.981	Copying with business ambiguity, uncertainty, and risk, applying systems thinking
0.981	Self-awareness and self-efficacy	0.981	Learning through experience
0.981	Motivation and perseverance	0.982	Planning and managing financial resources, displaying the knowledge of entrepreneurial financial management
0.981	Mobilization of resources (including others)	0.982	Using marketing instruments for the promotion of entrepreneurial ideas
0.982	Financial and economic literacy		

The first hypothesis has been stated to test the consistency between the vision of OECD about entrepreneurship competences and opinion of our sample groups.

H1: The most important entrepreneurship competences are “creativity, a sense of initiative, problem-solving, the ability to marshal resources, and financial and technological knowledge” (OECD, 2018).

The list of competences developed of the authors is not 100% consistent with the competences mentioned by OECD. The authors assume the following links (Table 3).

Table 3. Formulation of entrepreneurship competences: OECD vs. the authors

OECD	Authors
Creativity	Generation of creative ideas
A sense of initiative	Taking the initiative, displaying entrepreneurial behavior
Problem solving	Thinking based on real-life problems solving based thinking problems
The ability to marshal resources	– Planning and managing financial resources, displaying the knowledge of entrepreneurial financial management – Planning and managing human resources, displaying the knowledge of organizational and entrepreneurial behavior
Financial knowledge	Financial and economic literacy
Technological knowledge	–

The second research hypothesis was stated based on the assumption about the differences in attitudes of students and educators towards different issues, such as online education (Drasler et al., 2021), constructive feedback (Al-Hattami, 2019), organizational effectiveness (Akomolafe & Ibijola, 2014) and others.

H2: There is a difference in perceived importance of entrepreneurship competences between students and staff of the ICT-related study programmes.

The survey was conducted among 119 students and 31 staff members represented two Latvian and one Kazakh higher education institutions.

Student sample group included 82% of men and 18% of women; staff group included 50% and 50%, respectively.

40% students represented Latvian HEIs, 60% were from Kazakh HEI. For staff group the distribution was approximately the same.

It was not possible to test the hypothesis about the difference in opinions of academic and administrative staff members, because 24 of 31 respondents represented the first group.

3. Results

Initial data processing was made to evaluate perceived importance of all suggested entrepreneurship competences. For this purpose, frequency analysis and the following ranking procedure were applied.

Ranking was performed based on the summative evaluation of each competence, taking into account only “4” (essential) and “5” (absolutely essential) assessments.

The ranked list, based on responses of students and staff members is represented in Table 4 and Table 5.

Table 4. Entrepreneurship competences evaluated by students ranked according to their perceived importance (source: the authors' contribution)

Rank	Competence	Respondents evaluated this competence with “4” or “5”
1	Seeing opportunities	73.11%
2	Thinking based on real-life problems solving based thinking problems	73.11%
3	Research skills	72.27%
4	Motivation and perseverance	71.43%
5	Valuing / assessing / analyzing ideas	70.59%
6	Self-awareness and self-efficacy	70.59%
7	Learning through experience	69.75%
8	Generation of creative ideas	68.07%
9	Financial and economic literacy	64.71%
10	Conducting market research	61.34%
11	Planning and managing financial resources, displaying the knowledge of entrepreneurial financial management	61.34%
12	Mobilization of resources (including staff)	60.50%
13	Coping with business ambiguity, uncertainty, and risk, applying systems thinking	60.50%

End of Table 4

Rank	Competence	Respondents evaluated this competence with "4" or "5"
14	Ethical and sustainable thinking	59.66%
15	Taking the initiative, displaying entrepreneurial behavior	59.66%
16	Using marketing instruments for the promotion of entrepreneurial ideas	59.66%
17	Planning and managing general business processes, displaying the knowledge of organizational and entrepreneurial behavior]	58.82%
18	Planning and managing human resources, displaying the knowledge of organizational and entrepreneurial behavior	56.30%
19	Vision	52.10%

Based on Table 4, we can conclude that the only problem-solving skill is highly evaluated by students. All other OECD mentioned competences are in the middle or bottom of the list.

Table 5. Entrepreneurship competences evaluated by staff members ranked according to their perceived importance (source: the authors' contribution)

Rank	Competence	Respondents evaluated this competence with "4" or "5"
1	Generation of creative ideas	80.65%
2	Self-awareness and self-efficacy	80.65%
3	Motivation and perseverance	80.65%
4	Thinking based on real-life problems solving	80.65%
5	Seeing opportunities	77.42%
6	Valuing / assessing / analyzing ideas	77.42%
7	Learning through experience	77.42%
8	Ethical and sustainable thinking	74.19%
9	Taking the initiative, displaying entrepreneurial behavior	74.19%
10	Mobilization of resources (including staff)	70.97%
11	Coping with business ambiguity, uncertainty, and risk, applying systems thinking	70.97%
12	Vision	67.74%
13	Using marketing instruments for the promotion of entrepreneurial ideas	67.74%
14	Research skills	64.52%
15	Planning and managing general business processes, displaying the knowledge of organizational and entrepreneurial behavior	64.52%

End of Table 5

Rank	Competence	Respondents evaluated this competence with "4" or "5"
16	Conducting market research	61.29%
17	Financial and economic literacy	61.29%
18	Planning and managing financial resources, displaying the knowledge of entrepreneurial financial management	58.06%
19	Planning and managing human resources, displaying the knowledge of organizational and entrepreneurial behavior	51.61%

Staff members gave the priority to two competences mentioned by OECD – “creativity” and “problem solving”. Thus,

H1: The most important entrepreneurship competences are “creativity, a sense of initiative, problem-solving, the ability to marshal resources, and financial and technological knowledge” – was rejected.

Most of OECD mentioned competences were not highly evaluated by respondents within this research.

As for the difference in opinions of students and staff members, there is no unambiguous conclusion. Treating the competences on first six places as the most important ones, half of them have been prioritized by both groups of respondents- students and staff: “Thinking based on real-life problems solving” (2nd and 4th place), “Valuing / assessing / analyzing ideas” (5th and 6th place), “Self-awareness and self-efficacy” (6th and 2nd place).

Despite the limited number of respondents in the groups and different size, the authors evaluated the difference in results generated by two groups, using Mann-Whitney U Test. The results are presented in Table 6.

Table 6. Mann-Whitney test results (source: the authors' contribution, based on SPSS analysis)

Competence	Asymp. Sig.	Difference: YES / NO
Ethical and sustainable thinking	0.003	YES
Generation of creative ideas	0.008	YES
Vision	0.098	NO
Seeing opportunities	0.159	NO
Valuing / assessing / analyzing ideas	0.070	NO
Conducting market research	0.467	NO
Self-awareness and self-efficacy	0.520	NO
Motivation and perseverance	0.129	NO
Mobilization of resources (including others)	0.124	NO
Financial and economic literacy	0.783	NO
Research skills	0.715	NO
Real-life thinking and solving real-life problems	0.154	NO

End of Table 6

Competence	Asymp. Sig.	Difference: YES / NO
Taking the initiative, displaying entrepreneurial behavior	0.167	NO
Planning and managing general business processes, displaying the knowledge of organizational and entrepreneurial behavior	0.221	NO
Planning and managing human resources, displaying the knowledge of organizational and entrepreneurial behavior	0.582	NO
Copying with business ambiguity, uncertainty, and risk, applying systems thinking	0.051	YES
Learning through experience	0.199	NO
Planning and managing financial resources, displaying the knowledge of entrepreneurial financial management	0.585	NO
Using marketing instruments for the promotion of entrepreneurial ideas	0.379	NO

The results of the analysis revealed a statistically significant differences in opinions of students and staff members only regarding the evaluation of competences “Ethical and sustainable thinking”, “generation of creative ideas” and “Copying with business ambiguity, uncertainty, and risk, applying systems thinking”.

H2: There is a difference in perceived importance of entrepreneurship competences between students and staff of the ICT-related study programmes. – was rejected.

Conclusions

The current research was aimed at evaluating entrepreneurship competences by students and staff of higher education institutions in regards to their importance for future career of students from ICT-related study programmes.

The research was made within the framework of international project run by European (including Latvia) and Kazakh partners within the Erasmus+ programme “Capacity Building for Higher Education”. That is why the respondents participated in the survey were representatives of Latvian and Kazakh HEIs.

To conduct the research, the authors developed a list of entrepreneurship competences, derived from EntreComp, which was offered to respondents for evaluation.

The most important competences on the viewpoint of students (first six places in the list) were “Seeing opportunities”, “Thinking based on real-life problems solving”, “Research skills”, “Motivation and perseverance”, “Valuing / assessing / analyzing ideas”, and “Self-awareness and self-efficacy”. In turn, staff members assigned the highest priority to such competences, as “Generation of creative ideas”, “Self-awareness and self-efficacy”, “Motivation and

perseverance”, “Thinking based on real-life problems solving”, “Seeing opportunities”, and “Valuing / assessing / analyzing ideas”. Thus, the opinions of respondent groups partly crossed. The statistical analysis revealed the difference in opinions regarding the only three competences from the list. However, to make a reliable conclusion the research sample should be significantly extended. The number of respondents was the main limitation of this research. In case, the project partners agree on joint participation in this research, the sample can be enlarged by participants from Estonian and German partner institutions, as well as additionally from two Kazakh universities.

The research contributes to the main technical task of the project – incorporation of the entrepreneurship module in ICT study programmes.

The research outcomes indicate that both students and academic staff assign values to the development of entrepreneurship competences because such competences help spot opportunities, increase own effectiveness and perseverance, which are the preconditions of successful career development. Thus, universities should allocate more resources to the integration of entrepreneurial education into ICT training. The best option is to create an additional module and to offer students at least as an optional credit points.

The merge of ICT and EntreComp competences, for example, in the format of learning outcomes in university programs, would yield benefits for the entire ecosystem of universities – students, universities and societies. First, such competence set would expand the opportunities of career growth for the graduates of such programs. Second, such programs would boost competitiveness of ICT programs and universities because such programs would train professionals capable of satisfying and creating market demands, which is particularly important in the context of development of new forms of education ecosystems, such as Massive Open Online Courses (MOOCs). Finally, societies need to expand their markets and increase economic growth to ensure their sustainability. These two goals can be achieved by new entrepreneurial actions that can be created by ICT professionals equipped with entrepreneurial competences, the rudiments of which could be developed at universities, which possess sufficient intellectual resources for training of such professionals.

Disclosure statement

The authors do not have any competing financial, professional, or personal interests from other parties.

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