



Рамочная модель предпринимательских компетенций студентов в условиях цифровизации

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АННОТАЦИЯ

Введение. Предпринимательство является движущей силой экономического роста и создания рабочих мест, что, в свою очередь, способствует повышению конкурентоспособности. Однако остается открытым вопрос о том, как стимулировать предпринимательскую активность, особенно среди молодежи. Решение заключается в том, чтобы вооружить молодых людей необходимыми предпринимательскими компетенциями, которые можно развить с помощью специализированного образования.

Цель статьи заключалась в разработке и эмпирической валидации рамочной модели предпринимательских компетенций студентов в условиях цифровизации.

Материалы и методы. Для проверки предложенной модели было проведено эмпирическое исследование. В исследовании приняли участие 64 предпринимателя-эксперта (члены региональных общественных объединений предпринимателей) в возрасте от 31 до 70 лет ($M = 42$ года), занимающихся различными видами предпринимательской деятельности. Участники добровольно заполнили анкету, основанную на поведенческих индикаторах компетенций. Им были заданы следующие вопросы: 1) Как часто вы используете определенные компетенции в вашей профессиональной деятельности? 2) Насколько эти компетенции важны для предпринимателей?

Результаты. В ходе исследования была теоретически обоснована, эмпирически и статистически подтверждена рамочная модель предпринимательских компетенций студентов (StudEntrComp) для цифровой экономики, включающая 23 компетенции, относящихся к операционным/функциональным, личностным/сквозным и цифровым компетенциям. Наибольшее значение в структуре предпринимательских компетенций имеют такие компетенции, как "видение" ($M = 4,8$), "финансовая и экономическая грамотность" ($M = 4,7$), "мобилизация других" ($M = 4,7$), "работа с другими" ($M = 4,6$), "обучение через опыт" ($M = 4,6$) и "креативность" ($M = 4,6$). В отличие от существующих моделей, рамочная модель StudEntrComp включает дополнительный блок цифровых компетенций, важность которых для предпринимателей также была оценена высоко ($M = 4,3$). Корреляционный анализ показал, что частота использования 10 из 23 компетенций тесно связана с предпринимательским опытом: "переход к ориентированному на действие рекомендациям" ($r = 0,334$); "работа с другими" ($r = 0,548$); "мобилизация ресурсов" ($r = -0,260$); "оценка идей" ($r = -0,274$); "креативность" ($r = 0,250$); "управление целями" ($r = 0,255$); "самосознание и самоэффективность" ($r = -0,349$); "преобразование и интеграция данных" ($r = 0,264$); "представление данных и отчетность" ($r = 0,365$); "использование цифровых инструментов для маркетинга" ($r = 0,357$).

Заключение. В отличие от существующих моделей, рамочная модель предпринимательских компетенций студентов для цифровой экономики включает в себя дополнительный блок цифровых компетенций, важность которых для предпринимателей подчеркивается исследователями. Уровневая модель, включенная в рамку (начинающий, средний, продвинутый уровни), может быть использована для оценки развития предпринимательских компетенций студентов в процессе обучения. Предложенная модель может быть использована в качестве руководства для разработки программ обучения предпринимательству и отдельных учебных курсов, для оценки уровня предпринимательских компетенций студентов в любой области обучения.

КЛЮЧЕВЫЕ СЛОВА

предпринимательской обучение, предпринимательские компетенции, цифровые компетенции, модель предпринимательских компетенций студентов

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Students Entrepreneurial Competencies framework in a Digitalised World

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ABSTRACT

Introduction. Entrepreneurship is a driving force behind economic growth and job creation, which in turn contributes to competitiveness. However, the question remains of how to stimulate entrepreneurial activity, especially among youth. The solution lies in equipping young individuals with the necessary entrepreneurial competencies, which can be cultivated through specialized education. A review of the literature indicates a paucity of research on students entrepreneurial competencies need to be developed in higher education in digital age. To address this gap, the present study aims to propose and empirically validate an StudEntrComp (students' entrepreneurial competencies) framework model for the digital economy. A conceptual StudEntrComp framework model was developed based on: 1) the entrepreneurship competence framework (EntrComp framework); 2) the data management competency framework (Data Management Competency Framework); 3) and the activity drivers' model. An empirical study was conducted to validate the proposed model.

Materials and Methods. An empirical study was conducted to validate the proposed model. The study involved 64 entrepreneurs-experts (members of a regional public associations of entrepreneurs) ranging in age from 31 to 70 years ($M = 42$ years) engaged in various entrepreneurial activities. The participants voluntarily completed a questionnaire based on behavioral indicators of competencies. The following questions were posed to the participants: 1) How frequently do you engage in certain behaviors? 2) To what extent are these competencies important for entrepreneurs?

Results. The study has theoretically substantiated and empirically and statistically confirmed a StudEntrComp framework model for digital economy, which includes 23 competencies related to operational/functional, personal/cross-cutting, and digital competencies. The competencies with the highest importance in the structure of entrepreneurial competencies are vision ($M = 4.8$), financial and economic literacy ($M = 4.7$), mobilizing others ($M = 4.7$), working with others ($M = 4.6$), learning through experience ($M = 4.6$), and creativity ($M = 4.6$), the necessity of the data competencies and competency of leveraging digital tools for marketing was highly rated too (4.3).

Conclusion. In contrast to existing models, the StudEntrComp framework model incorporates an additional block of digital competencies, the importance of which for entrepreneurs has been highly rated too ($M = 4.3$). The correlation analysis has shown that the frequency of use of 10 competencies has moderate and strong correlations with entrepreneurial experience: "transfer to action oriented recommendation" ($r = 0.334$); "working with others" ($r = 0.548$); "mobilizing resources" ($r = -0.260$); "valuing ideas" ($r = -0.274$); "creativity" ($r = 0.250$); "goal management" ($r = 0.255$); "self-awareness and self-efficacy" ($r = -0.349$); "data transformation and integration" ($r = 0.264$); "data presentation and reporting" ($r = 0.365$); "leveraging digital tools for marketing" ($r = 0.357$). Conclusion. In contrast to existing models, the StudEntrComp framework model incorporates an additional block of technological competencies, the importance of which for entrepreneurs has been underscored by researchers. The progress model presented in proposed framework (beginner, intermediate, advanced) may be used to assess the level of entrepreneurial competencies of students during the education. The revised framework model can be utilized as a guideline for the development of entrepreneurship training programs and individual academic courses, to assess the level of entrepreneurial competencies of students in any field of study. It is important to note that the study's results are subject to several limitations, primarily related to the small size of the empirical sample and its imbalance concerning entrepreneurial experience and business sectors. Future research could focus on further verification of the proposed model of entrepreneurial competences and evaluation of methods for assessing the development of entrepreneurial competencies.

KEYWORDS

entrepreneurship education, entrepreneurial competencies, digital competencies, students' entrepreneurial competencies framework, progressed model of students' entrepreneurial competencies

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INTRODUCTION

The development of students' entrepreneurial competencies is crucial for fostering a sustainable and innovative society, as highlighted in documents and initiatives by leading international organizations. The United Nations (UN) places particular emphasis on the need to provide quality education and skills development that contribute to economic growth and job creation in the framework of the Sustainable Development Goals. UNESCO supports educational programs that promote creativity, critical thinking, and entrepreneurial skills, as reflected in its Education 2030 strategy. The International Labour Organization (ILO) underscores the significance of entrepreneurial competencies in addressing youth unemployment and fostering inclusive economic growth. Consequently, the integration of entrepreneurship education into curricula becomes an integral part of preparing students for the challenges of today's labor market. In the digital age, numerous countries are confronted with a pivotal inquiry: how might they effectively stimulate entrepreneurial activity within their populations, particularly among the youth? This issue is influenced by several factors, including: (a) the transition to a service-based economic structure, and (b) the ongoing technological revolution.

Researchers posit that a pivotal factor in the proliferation of entrepreneurial activity is the cultivation of entrepreneurial competencies, which are forged through educational endeavors [1].

According to Bacigalupo et al., entrepreneurial competencies are essential skills for a knowledge-based economy [2]. Entrepreneurial education has been shown to be closely related to the development of human capital, enabling individuals to increase the economic value of their own competencies [3; 4]. Furthermore, educated individuals have been found to be more likely to identify entrepreneurial opportunities [5]. Vasiliadis & Poullos demonstrated that entrepreneurship education in universities enhances its appeal, potentially influencing students to select this profession irrespective of their field of study [6].

Young people today are increasingly drawn to entrepreneurship, driven by a desire for independence, flexibility, and the pursuit of passion-driven careers. This interest is reflected in the growing number of young individuals expressing entrepreneurial aspirations and taking steps to establish their ventures.

The digital economy has reduced barriers to entry, enabling young entrepreneurs to launch tech-driven startups with relatively low initial capital. Sectors like e-commerce, app development, and digital marketing are particularly appealing to young entrepreneurs. Kraus et al. highlight the importance of digitalization in facilitating disruptive innovation, which is often embraced by young entrepreneurs [7].

The Concept of Technological Development of Russia until 2030 places particular emphasis on personnel provision for the national economy. Universities that combine a high-tech environment [8], human capital [9], and access to laboratories and technical infrastructure) are regarded as drivers of technological development and ideal platforms for business startups [10]. In Russia, there is a notable discrepancy between the high demand for technological entrepreneurship and the limited availability of educational programs that cater to this area of interest. While European universities are responsible for the emergence of 25% of all technological startups, this figure is a mere 3% in Russia.

According to experts in the field, there is a discrepancy between the level of development of entrepreneurial competencies among students and the requirements of the current situation. A survey administered among students at Vitebsk State University indicated that the predominant factors impeding youth from embarking on their own entrepreneurial ventures are inadequate personal resources (69.9%) and a paucity of experience (69.3%), followed by a deficiency in professional skills and knowledge (42.2%) and the absence of a business concept (39.9%) [11].

Radygina analyzes the experience of Udmurt State University in creating a university platform for technological entrepreneurship, noting a clear trend in Russia of an oversupply of expertise and mentorship for projects, contrasted with a significant shortage of innovative ideas among the student and entrepreneurial environment [12].

A study by Hart Research Associates revealed a considerable gaps between students' perceptions of their readiness for work and employers' assessments. While 59% of students expressed confidence in their ability to apply their knowledge and skills in real-life scenarios, only 23% of employers concurred with this sentiment. Moreover, a substantial proportion of students and employers diverge in their assessments of graduates' aptitude for analyzing and resolving business issues. Furthermore, 64% of students believe they possess excellent information management skills, whereas only 29% of employers concur with this perspective. Consistent with these findings, Medne et al.) reported that only 16% of students assessed their entrepreneurial competencies as low [13]. Brauer, S. also highlight a substantial discrepancy between the competencies sought by businesses and industries and the competencies cultivated during the educational process [14].

As such, higher education system aiming to prepare successful entrepreneurs must cultivate a comprehensive array of competencies that reflect nowadays business complexities. The competencies required for students to succeed as entrepreneurs in the digital age are shaped by the demands of a rapidly evolving global and digital economy. These competencies equip entrepreneurs to innovate, adapt, and succeed in a rapidly changing environment. According to Bachmann et al., digital competencies play a crucial role in fostering entrepreneurial intentions among youth, indicating a strong link between digital skills and entrepreneurial pursuits [15].

The issue lies in the incongruity between the extant models of entrepreneurial competences and the demands of the digital economy [16].

The purpose of this study is to propose and empirically validate a StudEntrComp framework model for digital economy. Achieving the objective necessitates the successful completion of the following tasks:

1. The range of entrepreneurial competencies required for the digital economy must be defined.
2. A framework model of students' entrepreneurial competencies must be developed based on that definition.
3. The validation and refinement of the proposed framework model will be based on expert analysis.

LITERATURE REVIEW

The question of defining the set of entrepreneurial competencies for students is extremely relevant, as it allows higher education to align with the real demands of the economy. At the same time, a significant body of research dedicated to entrepreneurial competencies is focused on business environment: it identifies the competencies necessary for business owners [17], analyzes their role in organizational development and enhancing competitiveness [18; 19], it studies the connection between entrepreneurial competencies and the development of small and medium enterprises, as well as innovative transformations within them [20]. Despite the recognition of a high role of education (including higher education) in the development of these competencies [1] the number of studies directly focused on creating a model of students' entrepreneurial competencies is quite limited [21; 22]. Students' entrepreneurial competencies in higher education institutions are viewed by some researchers as a combination of general (instrumental, interpersonal, and systemic) and specific competencies and skills [22]. Draksler and Širec, integrated three models of entrepreneurial competencies (Man et al. [23], Moberg et al. [24]; Kyndt and Baert [16]), and compiled a list of 17 competencies that can be developed in high school: 1) competencies for strategic planning for the future; 2) competencies of decisiveness and commitment; 3) conceptual competencies; 4) organizing competencies; 5) personal strength competencies; 6) learning competencies; 7) competencies of self-knowledge; 8) sustainable behavior competencies; 9) competencies for market insight; 10) competencies of recognizing opportunities; 11) competencies of building networks and relationships; 12) ability to persuade; 13) independence; 14) awareness of potential returns on investments; 15) perseverance; 16) entrepreneurial knowledge; 17) creativity [21].

Bashkin et al. confirmed the activity drivers' model that consist of three cross-cutting competencies: goal management, time management, relationship management. Their development

in students allows them to improve not only their academic but also professional achievements. The proposed competencies may play an important role in entrepreneurial success by ensuring the business effectiveness [25].

The framework for entrepreneurial competencies "EntreComp: The Entrepreneurship Competence Framework"^a developed by the Joint Research Centre (JRC), identifies three groups of competencies related to: ideas and opportunities (spotting opportunities, creativity, vision, valuing ideas, ethical and sustainable thinking); to resources (mobilizing others, financial and economic literacy, motivation and perseverance, self-awareness and self-efficacy, resource mobilization); to implementation and actions: into action (taking initiative, planning and management, coping with uncertainty, ambiguity and risks, collaboration, learning through experience) [2].

Lans et al. proposed a framework of seven competencies for sustainable entrepreneurship: 1) systems-thinking competence (the ability to identify and analyze all relevant (sub)systems across different domains (people, planet, profit) and disciplines, including their boundaries); 2) embracing diversity and interdisciplinarity (the ability to structure relations, spot issues and recognize the legitimacy of other viewpoints in business decision-making processes regarding environmental, social and economic issues, to involve all stakeholders and to maximize the idea exchange and learn across different groups and different disciplines); 3) vision (skills in creativity, opportunity recognition, innovation and balancing of local/global and the short-term/long-term perspectives); 4) normative competence (the ability to map, apply and reconcile sustainability values, principles and targets); 5) action competence (the ability to actively involve oneself in responsible actions to improve the sustainability of social-ecological systems) 6) interpersonal competence (the ability to motivate, enable, and facilitate collaborative and participatory sustainability activities and research: skills in communicating, collaborating, negotiating, empathy and compassion); 7) strategic management (the ability to collectively design projects, implement interventions, transitions, and strategies towards sustainable development practices: skills in planning (design and implement interventions, transitions, and transformative governance strategies towards sustainability), organizing (arranging tasks, people and other resources), leading (inspiring and motivating people) and controlling (measuring performance, evaluation of policies, programs and action plans, and taking action). Later, these competencies were grouped into four categories: functionally-oriented (5, 7), cognitively-oriented (1, 3), socially-oriented (4, 6), and meta-oriented competencies (2) [26].

One of the latest models of entrepreneurial competencies is presented in the work of Tittel and Terzidis, they identified the following groups of competencies: 1) personal (act ethically, act in a creative way, act with social responsibility, deal with complex information, create empathy, define your goals, develop a vision, learn to learn, make appropriate decisions, recognize your own limitations, seek and analyze unstructured information, solve problems, take actions to overcome risk; take initiative, take risks, think conceptually, think logically); 2) domain competence (scan the environment, generate ideas, identify opportunities (subgroup "opportunities"), acquire resources, coordinate, control, delegate tasks, develop a team, develop an organizational culture, organize processes (subgroup "organizational skills"), administrate, design products and services, develop a finance and budget plan, develop a marketing strategy, develop innovative products and services, develop strategies, implement ideas and tasks, manage human resources, navigate the industry, monitor the work of others, plan processes, prepare a business plan, prepare a competitive analysis, see the big picture, sell your products or services, set your business goals (subgroup "strategy and management")); 3) interpersonal competencies: ability to communicate, cooperate and collaborate, deal with social customs, exchange knowledge, lead your team, manage customers, motivate organization members, persuade, negotiate, pitch your ideas, train your team, use and develop networks, work in a team [27].

According to Jones et al., small and medium business owners want to hire employees who possess positive attitude, respect for others, reliability, initiative, responsibility, teamwork ability, communication skills, ambition, self-confidence, critical thinking, presentable appearance, leadership abilities, good sense of humor, strong writing skills, knowledge of the primary field, software skills, work experience, mathematical skills, high grades, experience in student professional organizations, and knowledge of global business [28].

^a https://joint-research-centre.ec.europa.eu/entrecomp-entrepreneurship-competence-framework_en

Holtzman and Kraft found that students themselves highlight critical/analytical thinking, the ability to find, organize, and process information, interpersonal interaction skills, time management, and public speaking skills among the basic competencies that ensure success in an entrepreneurial career [29].

The transition to digital economy necessitates a comprehensive rethinking of competencies that higher education should cultivate because it demands technical skills, digital literacy, and adaptability, with job roles focusing on IT, data analysis, and digital marketing [30]. Digital competencies are considered by contemporary researchers as essential "cross-cutting" competencies for successful entrepreneurs: they can assist in risk assessment, market analysis, understanding consumer preferences, decision-making, and innovation [31]. According to Kurmanov et al., digital competencies, along with entrepreneurial, communicative, interpersonal competencies, self-development skills ensure the sustainability of entrepreneurial activities [32]. Digital literacy and tech-savviness are crucial for identifying opportunities and integrating innovative solutions: entrepreneurs must be adept at navigating digital environments, which includes understanding emerging technologies such as artificial intelligence and blockchain [33]. The competitive advantage gained from mastering the new generation of AI and big data has led Brynjolfsson and McAfee to conclude that "over the next decade, AI will not replace managers, but managers who use AI will replace those who do not" [34].

Mamonov et al. pointed out that the modern economy needs people who can turn new data into business insights [35]. According to Kambatla et al., data analytics has become a critical IT competency due to the rapid emergence and large volume of business data [36]. Fernández-Manzano et al. view big data as one of the most significant intangible strategic resources for organizations, helping to uncover hidden patterns, create clearer insights about businesses, customers, markets, and environments, and make more informed decisions [37]. Hattingh et al.,) proposed a unified model of data competencies that affect organizational, technical, analytical, ethical, and regulatory aspects of organizational activities [38]. Since "working with big data" refers to extracting information to better support decision-making processes [39], Lull et al. believe that working with big data correctly requires the ability to use tools for visualization, aggregation, normalization and data storage, and an entrepreneur who has mastered the listed tools will be able to effectively use them to gain and maintain a competitive advantage in the entrepreneurial environment [40]. The most comprehensive framework for data competencies was developed by the World Health Organization^b. It is based on the four stages of the data management cycle: data generation, processing, analysis and usage. Within each of competency area are competency domains (17 domains in total), which are distinct sub-competencies. The model includes three dimensions of competencies (subject knowledge, practical skills, and personal attitudes) which, when combined, determine the overall competence level of an individual employee. The model encompasses competencies in (a) data generation: data management planning, data creation, data collection, data maintenance; (b) data processing: data entry, cleaning, validation, verification, transformation; (c) data analysis: descriptive, diagnostic, predictive, prescriptive analysis; and (d) data usage: data interpretation and conclusion, data integration, data presentation and reporting, transfer to action-oriented recommendations.

Entrepreneurial education provides students with the necessary tools and knowledge to navigate financial landscapes and leverage technology effectively [41]. This is supported by modern research indicating that digital competencies are integral to entrepreneurial success [42; 43]. Economists also emphasize the significant role of AI and big data in innovation and discoveries [44]. The quantity and quality of data available to entrepreneurs is considered by some researchers to be the most important asset [45], because the proper usage of methods for working with high-quality data can enhance productivity, reduce costs, increase operational efficiency, and foster innovation in workflows [46]. However, studies show that a large number of companies and entrepreneurs cannot fully leverage the advantages of these tools, which is attributed to both low data quality and a lack of sufficiently developed data competencies among staff [47]. In this context, the development of data competencies is an important task for modern education. Students need to be skilled in emerging technologies such as artificial intelligence and data analytics as these will be integral to future business models and innovation [7]. Moreover, data literacy is crucial [43]; the ability to analyze and interpret data supports informed decision-making and personalized customer experiences [48].

^b Data management competency framework. Manila. World Health Organization Regional Office for the Western Pacific. 2023. Licence: CC BY-NC-SA 3.0 IGO.

The conducted analysis has shown, that: 1) the perceptions of scholars, entrepreneurs, and students regarding the set of competencies necessary for a university graduate to successfully organize a business significantly differ; 2) the competencies themselves are weakly operationalized, which complicates the process of developing a valid and reliable tool for measuring them; 3) the listed studies are based on competency models that do not include the cross-cutting digital competencies that are important to the digital economy.

The development of a framework model of entrepreneurial competencies for the digital economy could facilitate the creation of relevant educational programs in entrepreneurship and assess their effectiveness by evaluating the level of formation of the declared entrepreneurial competencies.

MATERIALS AND METHODS

The research process was methodically executed in the following stages (Fig. 1):

The development of a competence model was informed by a comprehensive theoretical literature review.

A questionnaire was meticulously designed for experts in the field.

A survey was conducted among experts using the developed questionnaire.

The results were statistically processed and the model of entrepreneurial competences was refined.

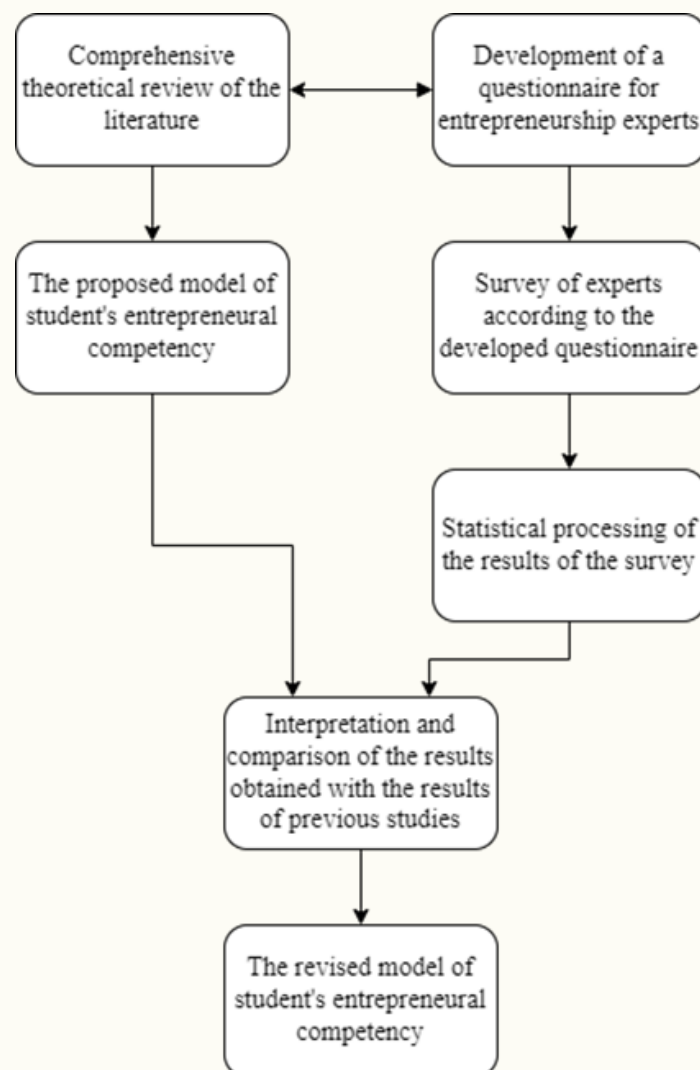


Figure 1 The research process

Empirical verification of proposed framework model was done through an expert analysis. The experts in the relevant field were asked to evaluate the importance of each competence for the modern entrepreneur. The questionnaire for experts was designed on the basis of the behavioral indicators of entrepreneurial activity, individuals were asked: 1) how often they carry out certain behaviors [16, p. 15]; 2) how important are these competencies for entrepreneurs in digital economy. Behavioral indicators were used because competencies can be shown only with an individual's behavior and actions [23, p. 133]. The evaluation was conducted using a five-point Likert scale, where 1 point meant "never use" / "the competency is not important" and 5 points meant "every time use" / "the competency is of the utmost importance."

In order to find experts, we contacted four regional professional associations of entrepreneurs and asked those willing to participate in the study. The link for online survey was distributed among entrepreneurs who are members of the regional public associations of entrepreneurs. 64 individuals aged between 31 and 70 years (average age – 42 years), voluntarily participated in the survey, they are engaged in various types of entrepreneurial activities: consulting, communications and marketing, educational services, healthcare, manufacturing and sales of equipment, and industrial safety. 36% of respondents have less than 5 years of experience in entrepreneurship.

The obtained data were processed using analysis of variance, Spearman's rank correlation coefficient, and factor analysis (the principal component method).

RESULTS

Following the theoretical investigation, a conceptual StudEntrComp framework model was developed based on: 1) the entrepreneurship competence framework (EntrComp framework); 2) the data management competency framework (Data Management Competency Framework); 3) and the activity drivers' model (Bashkin et al., 2023) [23].

The levels of formation for each competence (progress model) were described. In the proposed model, competencies are divided into three blocks: the operational competencies (OC) includes competencies directly related to the domain functions of an entrepreneur; the personal competencies (PC) include cross-cutting competencies that ensure the effectiveness of any activity; the third block consists of digital competencies (DC). Grouped together, these competencies provide solutions to professional tasks associated with different stages of entrepreneurial activity (formulating ideas and identifying opportunities; searching for and managing resources; transforming into action) (Fig. 2).

The average values for the use frequency and importance of entrepreneurial competencies are presented in table 1.

All competencies included in the framework model were recognized as important for an entrepreneur. The competencies with the highest importance in the structure of entrepreneurial competencies are vision (4.8), financial and economic literacy (4.7), mobilizing others (4.7), working with others (4.6), learning through experience (4.6), and creativity (4.6), the necessity of the data competencies and competency of leveraging digital tools for marketing was highly rated too (4.3).

The frequency of the entrepreneurial competencies usage among respondents was lower than the level of their importance. Some of the data competencies: "data verification" (2,3), "data maintenance" (2,5), "predictive analysis" (2,2) were marked as rarely used, therefore they were excluded from the proposed model. In addition, based on substantive analysis, the competencies "data transformation" and "data integration" were combined into one "data transformation and integration", as well as "relationship management" and "mobilizing others" were integrated into "relationship management". The listed competencies are of greater significance in cases where entrepreneurial activities are conducted in the IT sector; however, our model aims to identify competencies that may be necessary for students-entrepreneurs engaged in various types of entrepreneurial activities.

The updated framework model of entrepreneurial competencies is presented in Figure 3. Proposed model contains a description of the levels of proficiency for each competency (beginner, intermediate, advanced), which can be used to assess the educational results in forming entrepreneurial competencies (Table 2).

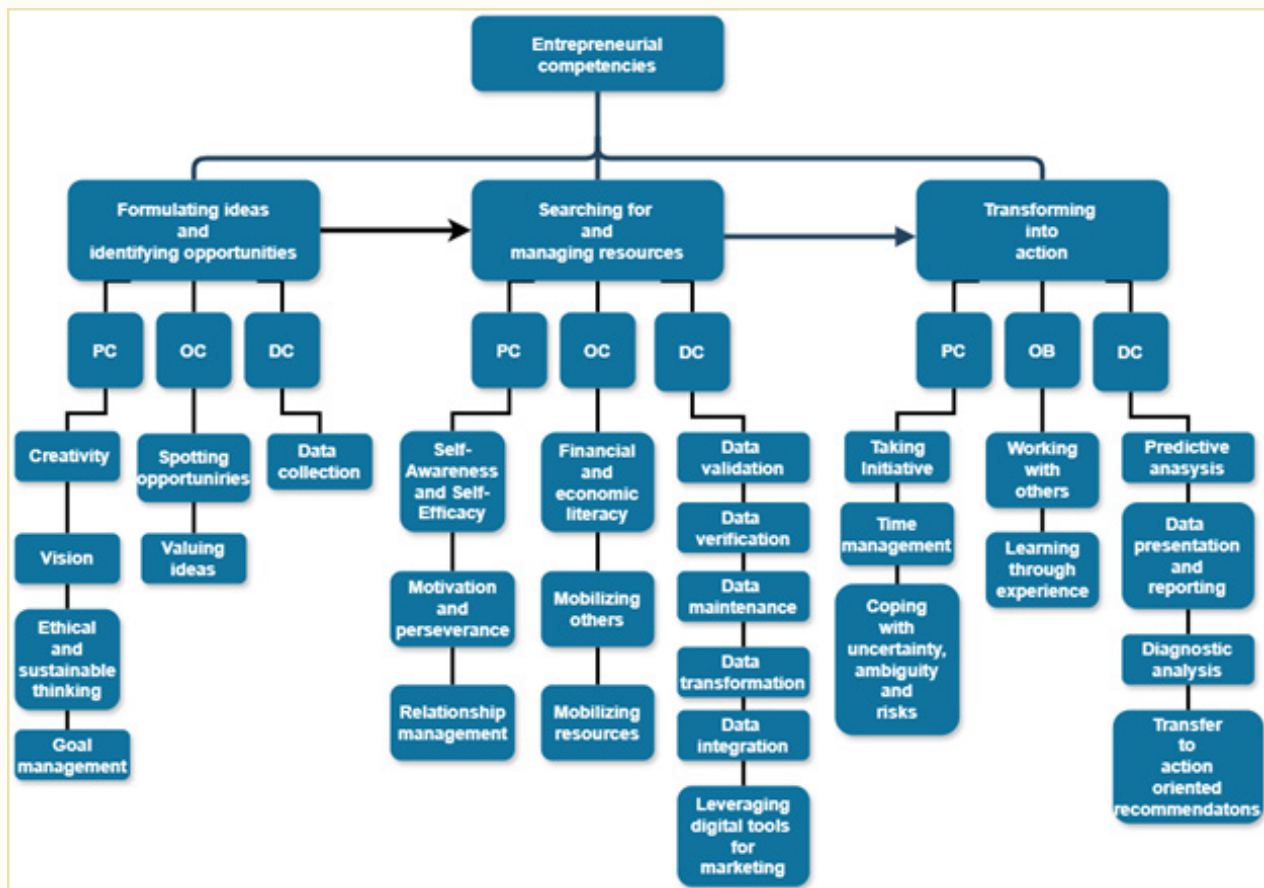


Figure 2 Proposed StudEntrComp Framework Model for Digital Economy

Table 1

Frequency of use and importance of entrepreneurial competencies

Competency	Frequency of use M	Importance M
Operational Competencies		
Spotting opportunities	3,4	4,1
Valuing ideas	3,75	4,2
Mobilizing resources	3,5	4,3
Financial and Economic Literacy	3,4	4,7
Mobilizing Others	4	4,7
Working with others	3,9	4,6
Learning Through Experience	3,9	4,6
Personal Competencies		
Creativity	4	4,6
Vision	3,6	4,8
Ethical and sustainable thinking	3,9	4,3
Goal Management	3,9	4,5
Self-Awareness and Self-Efficacy	3,75	4,3
Motivation and perseverance	3,9	4,4
Relationship Management	3,75	4,4
Taking initiative	4,1	4,4
Time Management	3,4	4,5

Coping with uncertainty, ambiguity and risks	4	4,5
Digital competencies		
Data Collection	3,25	4,3
Data Validation	3,5	4,1
Data Verification	2,3	4,1
Data Maintenance	2,5	4,1
Data Transformation	3,4	4
Data Integration	3,3	4
Diagnostic Analysis	3,3	4,1
Predictive Analysis	2,2	4,1
Data Presentation and Reporting	3,6	4,4
Transfer to action-oriented recommendations	3,7	4,2
Leveraging digital tools for marketing	3,5	4,3

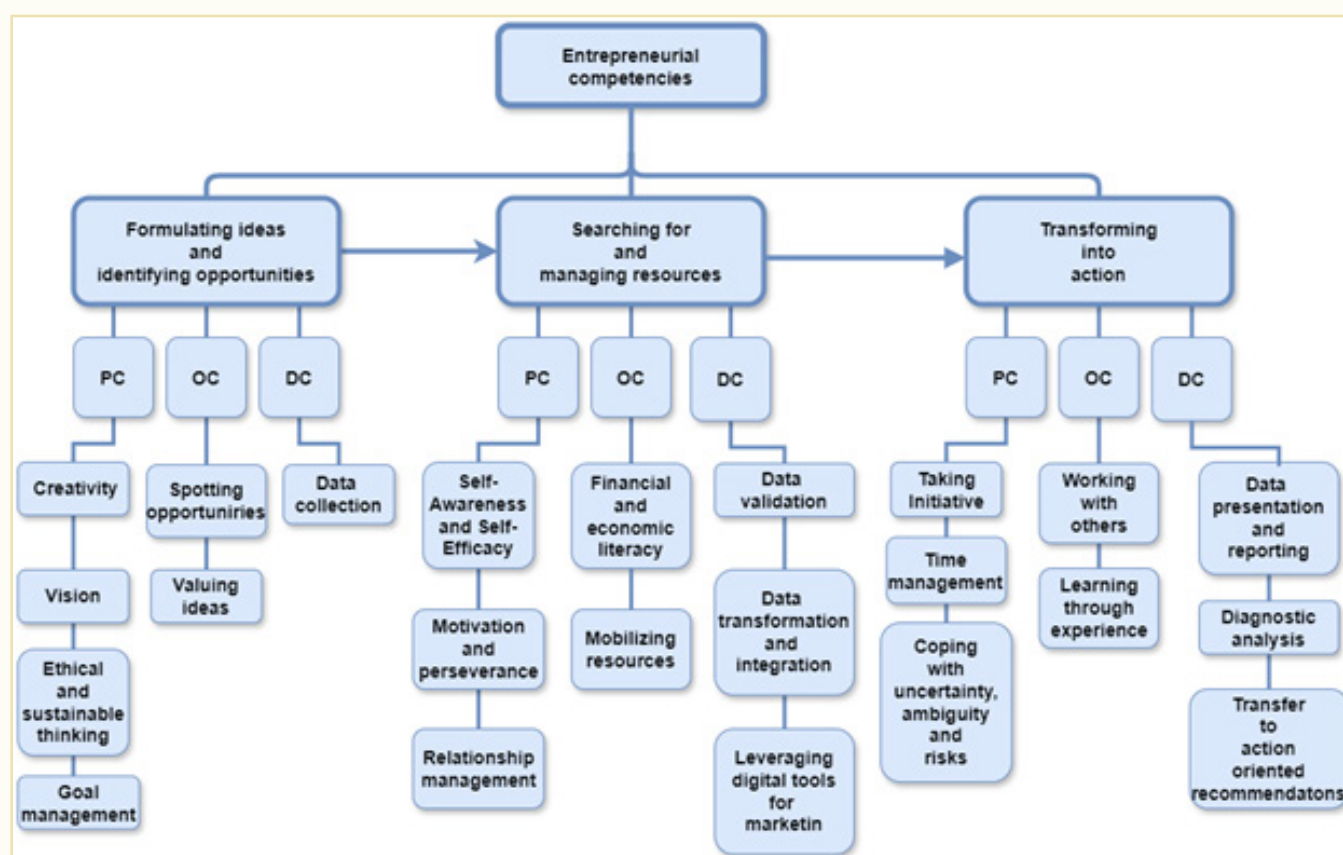


Figure 3 Framework Model of Students Entrepreneurial Competencies (StudEntrComp)

The correlation analysis (tabl. 3) has shown that the frequency of use of 10 competencies has moderate and strong correlations with entrepreneurial experience: "transfer to action oriented recommendation" ($r = 0.334$); "working with others" ($r = 0.548$); "mobilizing resources" ($r = -0.260$); "valuing ideas" ($r = -0.274$); "creativity" ($r = 0.250$); "goal management" ($r = 0.255$); "self-awareness and self-efficacy" ($r = -0.349$); "data transformation and integration" ($r = 0.264$); "data presentation and reporting" ($r = 0.365$); "leveraging digital tools for marketing" ($r = 0,357$). It is noteworthy that three competencies have a negative correlation with work experience: "mobilizing resources", "valuing ideas" and "self-awareness and self-efficacy," during entrepreneurial activity the frequency of using these competencies may decrease, which may be associated with business expansion and delegation of some functions.

Table 2

Student`s Entrepreneurial Competencies Progress Model

Competency	Level of Proficiency		
	Beginner	Intermediate	Advanced
Personal competencies			
Creativity	Able to develop multiple ideas that create value for others	Able to test and refine ideas that hold value for other	Able to transform ideas into solutions that create value for others
Vision	Able to imagine a desirable future.	Able to build an inspiring vision that engages others.	Able to use the vision to guide strategic decision-making.
Ethical and sustainable thinking	Able to recognize the impact of their choices and behaviors, both within the community and the environment	Able to be driven by ethics and sustainability when making decisions	Able to act to make sure that their ethical and sustainability goals are met
Goal management	Able to formulate short-term goals and break them down into a chain of tasks	Able to formulate short-term and medium-term goals, breaking them down into a chain of specific tasks.	Able to create strategic, tactical, and short-term goals as an integrated interconnected system, flexibly responding to changing situations.
Self-awareness and self-efficacy	Able to trust their own ability to generate value for others	Able to make the most of their strengths and weaknesses.	Able to compensate for their weaknesses by collaborating with others and developing their strengths.
Motivation and perseverance	Want to follow their passion and create value for others.	Able to put effort and resources into following their passion and create value for others	Able to stay focused on their passion and keep creating value despite setbacks
Relationship management	Able to express support and recognition to a team, to communicate ideas clearly and with enthusiasm members	Able to engage people, and set a team up for productive activity, to persuade, involve and inspire others in value-creating activities	Able to support and recognize team members, provide feedback, and build trusting relationships within a team, to inspire others and get them on board for value-creating activities
Taking initiative	Able to have a go at solving problems that affect their communities	Able to initiate value-creating activities	Able to look for opportunities to take the initiative to add or create value
Time management	Skills in short-term planning, allocation, goal setting, delegation, time analysis, monitoring, organizing, listing and prioritizing	Skills in short-term and middle-term planning, allocation, goal setting, delegation, time analysis, monitoring, organizing, listing and prioritizing	Skills in strategic planning, allocation, goal setting, delegation, time analysis, monitoring, organizing, listing and prioritizing
Coping with uncertainty, ambiguity and risks	Able to not be afraid of making mistakes while trying new things	Able to evaluate the benefits and risks of alternative options and make choices that reflect their preferences	Able to weigh up risks and make decisions despite uncertainty and ambiguity
Operational competencies			
Spotting opportunities	Able to find opportunities to generate value for others	Able to recognize opportunities to address needs that have not been met	Able to seize and shape opportunities to respond to challenges and create value for others
Valuing ideas	Able to understand and appreciate the value of ideas	Able to understand that ideas can have different types of value, which can be used in different ways	Able to develop strategies to make the most of the value generated by ideas
Financial and economic literacy	Able to create a budget for simple activities	Able to find funding opportunities and manage the budget for their value-creating activities	Able to create a financial stability plan for activities aimed at creating value

Mobilizing resources	Able to find and use resources responsibly	Able to gather different types of resources and manage them to create value for others	Able to define strategies to mobilize the resources they need to generate value for others
Working with others	Able to work in a team for value creation	Able to work together with a wide range of individuals and groups to create value	Able to build a team and networks based on the needs of their value-creating activity
Learning through experience	Able to recognize what they have learnt through taking part in value-creating activities	Able to reflect and judge their achievements and failures and learn from these	Able to improve their abilities to create value by building on their previous experiences and interactions with others
Digital competencies			
Data collection	Able to use the digital data collection tool to do basic tasks, identify data requirements and extract relevant, reliable data to suit the purpose and task, check, validate and verify the data sources	Able to make corrections or updates to data based on judgement. Break down the collected information and record it to evaluate the outcomes of the study. Be able to switch formats of datasets to suit needs and circumstances. Analyze gaps in data sources and address data gaps. Add new data to an existing dataset by creating a new case/observation, appending data from different sources	Able to map existing information flows related to the data to collect. Design and develop relevant data collection tools for defined indicators. Select relevant data collection methods for each defined indicator. Identify situations when the specified method may need to be modified due to context. Confidently launch and monitor new rounds of data collection. Ascertain the data collected is fit for purpose
Data validation	Able to complete basic data validation using standard rules/guidelines for the key data quality characteristics	Able to complete a data quality validation check based on the eight characteristics of data validation (originality, attribution, accuracy, consistency, legibility, contemporaneousness, endurance, completeness).	Able to perform validity checks on any type of data, determine when changes need to be made to data and identify and correct systematic errors in data quality.
Data transformation & integration	Able to perform basic data transformation tasks using existing software and apply the core concepts and basic principles in a basic data integration task	Able to perform data transformation tasks, customize data transformation process, transfer saved data from data collection software to a data warehouse within a data management system and apply basic data integration processes in various integration contexts.	Able to define the purpose of the intended data transformation, identify data elements required for processing, determine whether the selected data elements are accessible and suitable for further usage, and transform data using specialized software, integrate current results to justify actions aimed at improving efficiency of current operations.
Diagnostic analysis	Able to use basic statistical methods of diagnostic data sets.	Able to select the most suitable methods of diagnostic analysis, which should be applied based on data types, research design and analysis purpose. The methods include statistical methods or other broader methods in both qualitative and quantitative areas, data visualizations, etc.	Able to identify significant differences or test hypotheses based on univariate indicators, draw conclusions from current data for broader and generalized conditions, and apply selected statistical methods to specific tasks and contexts.
Data Presentation and Reporting	Able to identify and apply the main types of data, terms, and methods used in the data processing.	Able to interpret and draw basic conclusions based on the obtained data, visualize data using text and graphics.	Able to use the obtained data to formulate more accurate conclusions, present the results obtained, and develop an action plan based on the conclusions.

Transfer to action-oriented recommendations	Able to apply the core concepts (purpose and underpinning) principles of how data can be used to form actionable insights	Apply the SMART criteria framework to the data to formulate actionable recommendations	Able to develop various strategies for applying actionable insights
Leveraging digital tools for marketing	Able to differentiate and apply basic digital marketing strategies such as content marketing, SEO, SMM, email marketing, use basic analytics tools such as Google Analytics at a basic level.	Able to apply advanced analytical tools to understand user behavior in more detail and evaluate key performance indicators, work with automation platforms such as HubSpot or Malichimp	Able to develop and implement integrated marketing strategies that combine digital and traditional methods, use emerging technologies such as artificial intelligence and machine learning to optimize marketing processes and personalize the customer experience

Table 3

The relationships between the entrepreneurial experience and the frequency of competencies use

Competencies	Entrepreneurial activity experience	
	r	p
Creativity	,250*	0,046
Goal Management	,255*	0,042
Valuing ideas	-,274*	0,028
Self-Awareness and Self-Efficacy	-,349**	0,005
Mobilizing resources	-,260*	0,038
Data Transformation and integration	,264*	0,035
Data Presentation and Reporting	,365**	0,003
Transfer to action-oriented recommendation	,334**	0,007
Working with others	,548**	0,000
Leveraging digital tools for marketing	,357**	0,005

Entrepreneurial experience has moderate and strong correlations with the assessment of the importance of 7 entrepreneurial competencies: "spotting opportunities" ($r = -0.296$); "relationship management" ($r = -0.310$); "time management" ($r = -0.437$); "taking initiative" ($r = -0.293$); "data validation" ($r = -0.303$); "data transformation and integration" ($r = -0.265$); "diagnostic analysis" ($r = -0.543$) (table 4). All of 7 identified correlations are negative, which means that the importance of these competencies decreases with work experience for entrepreneurs.

Table 4

The relationship between entrepreneurial experience and the importance of competencies

Competencies	Entrepreneurial activity experience	
	r	p
Spotting opportunities	-,296*	0,018
Relationship Management	-,310*	0,013
Data Validation	-,303*	0,015
Data Transformation and integration	-,265*	0,034
Taking initiative	-,293*	0,019
Time Management	-,437**	0,000
Diagnostic Analysis	-,543**	0,000

Factor analysis was used to determine the internal structure of entrepreneurial competencies and their contribution to the framework model (Table 5). A three-factor solution was adopted, based on a theoretical model that includes 3 blocks.

Table 5

Factor structure of entrepreneurial competencies for the frequency of use and the importance of competencies

Competency	I factor		II factor		III factor	
	Level of Frequency of use	Level of Importance	Level of Frequency of use	Level of Importance	Level of Frequency of use	Level of Importance
Entrepreneurial Competencies / Operational Competencies						
Spotting opportunities	0,559	0,788				
Valuing ideas	0,578	0,606				
Mobilizing resources		0,678	0,85			
Financial and Economic Literacy		0,655			-0,439	
Working with others					0,245	0,236
Learning Through Experience	0,524	0,887				
Cross-functional Competencies / Personal Competencies						
Creativity		0,649			0,697	
Vision	0,643			-0,659		
Ethical and Justified Thinking	0,566	0,648				
Goal Management	0,722					-0,121
Self-Awareness and Self-Efficacy		0,734			-0,271	
Motivation and perseverance	0,508	0,641				
Relationship Management		0,667			0,369	
Taking initiative		0,754	0,653			
Time Management				0,211	-0,356	
Coping with uncertainty, ambiguity and risks	0,662			-0,31		
Data competencies						
Data Collection			-0,748			0,405
Data Validation	0,635	0,751				
Data Transformation and integration	0,794			0,467		
Diagnostic Analysis	0,507	0,65				
Data Presentation and Reporting	0,57					0,183
Transfer to action-oriented recommendations			0,574			0,221
Leveraging digital tools for marketing					0,387	0,265

The factor structure of entrepreneurial competencies, assessed by frequency of use ("real model") and importance ("ideal model"), shows some differences.

The first factor of the "real model", as well as the first factor of the "ideal model" include 12 competencies, 7 of which are common: "spotting opportunities" ("real model" = 0,559, "ideal model" = 0,788), "valuing ideas" ("real model" = 0,578, "ideal model" = 0,606), "learning through experience" ("real model" = 0,524, "ideal model" = 0,887), "ethical and justified thinking" ("real model" = 0,566, "ideal model" = 0,648), "motivation and perseverance" ("real model" = 0,508, "ideal model" = 0,641), "data validation" ("real model" = 0,635, "ideal model" = 0,751), and "diagnostic analysis" ("real model" = 0,507, "ideal model" = 0,650). The presence of these competencies in both models

indicates their importance; they ensure effectiveness at all stages of entrepreneurial activity: goal setting, resource provision, and transformation into action. The remaining 6 competencies differ between the "real" and "ideal" models.

The first factor of the "real model" (28% of variance) includes personal competencies such as "vision" (0,643), "goal management" (0,722), "coping with uncertainty, ambiguity and risks" (0,662), "data transformation and integration" (0,794), "data presentation and reporting" (0,570). These competencies describe the tasks that entrepreneurs most frequently perform in real life at the stages of goal setting and transformation into action.

The first factor of the "ideal model" (39.8% of variance) is complemented by "mobilizing resources" (0,678), "financial and economic literacy" (0,655), "creativity" (0,649), "self-awareness and self-efficacy" (0,734), "relationship management" (0,667), and "taking initiative" (0,754) competencies: from the entrepreneurs' point of view, the main challenge that all business owners face is finding and managing all kinds of resources.

The second factor of the "real" model (14.4% of variance) includes four competencies: "mobilizing resources" (0,850), "transfer to action-oriented recommendations" (0,574), taking initiative" (0,653), and "data collection" (-0,748). This factor can be defined as an activity factor.

The second factor of the "ideal" model (14.1% of variance) includes such competencies as "vision" (-0,659), "time management" (0,211), "coping with uncertainty, ambiguity and risks" (-0,310), "data transformation and integration" (0,467). In the ideal model, excessive time management and data transformation are seen as threats to vision and the ability to cope with uncertainty.

The third factor of the "real model" (10.8% of variance) consist of "financial and economic literacy" (-0,439), "working with others" (0,245), "creativity" (0,697), "self-awareness and self-efficacy" (-0,271), "relationship management" (0,369), "time management" (-0,356) and "leveraging digital tools for marketing" (0,387):entrepreneurial competencies related to management and communication with others support a high level of creativity while suggesting reduced attention to financial issues, diminished time control, and a focus on evaluating one's weaknesses.

The third factor of the "ideal" model (10% of variance) includes: "working with others" (0,236), "goal management" (-0,121), "data collection" (0,405), "data presentation and reporting" (0,183), "transfer to action-oriented recommendation" (0,221) and "leveraging digital tools for marketing" (0,265). In the ideal model, this factor is substantively a factor of data competencies, which role in successful entrepreneurial activity is primarily linked to transformation into action; however, the role of this factor in the structure of entrepreneurial competencies is less pronounced than that of the first two factors.

DISCUSSION

Findings of the Study

The presented study has theoretically substantiated and empirically confirmed a StudEntrComp framework model for digital economy, which includes 23 competencies related to operational/functional, personal/cross-cutting, and digital competencies. These competencies enable individuals to solve problems related to goals setting, searching for and managing resources and transforming to action at each stage of professional activity.

The relevance of the proposed model has been confirmed through empirical research.

The results support the idea of distinguishing between professional (special) and personal (cross-cutting) competencies of entrepreneurs (Draksler & Širec [21]; Ferreras-Garcia et al. [22]; Tittel & Terzidis [27]). Unlike existing models, the current framework model includes an additional block of digital competencies, the importance of which for entrepreneurs has been highlighted by Kurmanov et al. [32]; Obschonka and Audretsch confirmed in this study [49]. Proposed framework can be used as a guideline for developing entrepreneurship training programs and individual academic courses.

The progress model presented in proposed framework (beginner, intermediate, advanced) may be used to assess the level of entrepreneurial competencies of students in any field of study, since mastery of entrepreneurial competencies is considered a resource, increasing an economic value of each individual (Vasiliadis et al. [6]; Marvel et al. [4]; Chaker & Jarraya [50]). Additional validation of the progress model requires the development of a special diagnostic tool.

The most compelling results emerged from the comparison of the real and ideal competency models. Despite the substantial structural disparities, eight competencies were identified as universal, given that the amalgamation of these competencies fosters the realization of objectives at all phases of entrepreneurial activity. These are "spotting opportunities", "valuing ideas", "learning through experience", "ethical and justified thinking", "motivation and perseverance", "data validation", and "diagnostic analysis". Five of the aforementioned competencies are extensively represented in research (Moberg et al. [24]; Bird [51]; Lans et al. [52]; Mitchelmore et al. [53]), while the remaining two competencies, pertaining to data skills, have been incorporated into the competency model for the first time.

The identified differences in the factor structure between the real and ideal models of entrepreneurial competencies may be related to the heterogeneity of the empirical sample, primarily concerning differences in business sectors and entrepreneurial experience. On the other hand, the real model of competencies aligns more closely with the specific challenges faced by Russian entrepreneurs today—such as finding a "niche," identifying target groups, creating a unique product, and defining its value, as well as implementing ideas in practice. In contrast, the "ideal" model is more universal and includes a group of competencies related to active action and implementation (Factor 1), overcoming difficulties and uncertainty (Factor 2), and working with data and information (Factor 3).

It is imperative to underscore that, as demonstrated by correlation analysis, the frequency of utilization of specific competencies may decline with age, a consequence of business development and the delegation of certain functions to subordinates.

Which competency model: "ideal" or "real" should be used to determine the set of students' entrepreneurial competencies?

There is no definitive answer to this question; however, the ideal model has greater explanatory power. Furthermore, the real model can be viewed as a result of adapting the ideal model to the current business conditions. While personal and operational competencies can be cultivated through targeted entrepreneurship education programs, collaborative learning and interactions with industry professionals [54; 55], practical experiences and real-world challenges [56], the formation of data competencies, financial and economic literacy, as well as ethical and sustainable thinking requires development within specialized academic disciplines. Entrepreneurial education should provide students with the necessary tools and knowledge to navigate financial landscapes and leverage technology effectively [16; 41], to analyze market trends and consumer behavior, essential for making strategic business decisions in digital economy.

CONCLUSION

From a methodological perspective, the developed model is beneficial because it establishes a shared reference point for initiatives related to entrepreneurial learning. StudEntrComp framework describes entrepreneurship as a lifelong competence, identifies what are the elements that make someone entrepreneurial in digital age. The results indicate the significant role of digital competencies in the framework of entrepreneurial competencies, which are crucial for the digital economy.

The Progress model of StudEntrComp can be used to determine the goals and educational outcomes, as well as their level of achievement, in higher education institutions. It can also be used to determine the development prospects of participants in start-ups, non-profit, and public organizations. By focusing on the competencies needed for digital economy StudEntreComp breaks

down the boundaries between science, education and entrepreneurial activity. In this respect, the StudEntreComp is transversal to formal and non-formal learning contexts and applies equally to education and training systems.

It is important to emphasize that the results of the study have several limitations, primarily related to the limited size of the empirical sample and its imbalance concerning entrepreneurial experience and business sectors. Nevertheless, it can be used by institutions to create programs for teaching entrepreneurship and developing entrepreneurial competencies in students of other specialties.

Future research could focus on further verification of the proposed model of entrepreneurial competences. This would include clarifying the level characteristics of each competence. A significant research direction could involve the development and evaluation of a range of methods for assessing the development of entrepreneurial competencies.

ETHICAL APPROVAL

Approval was obtained from the RUDN ethics committee. The statement about informed consent was included in the questionnaire. All participants provided an informed consent.

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REFERENCES

1. Loué, C., Lavolette, E. M., & Bonnafous-Boucher, M. (2008). L'entrepreneur à l'épreuve de ses compétences: Eléments de construction d'un référentiel en situation d'incubation. *Revue de l'Entrepreneuriat*, 7(1), 63–83.
2. Bacigalupo, M., Kampylis, P., Punie, Y. & Van den Brande, L. (2016). EntreComp: The Entrepreneurship Competence Framework. DOI: 10.2791/593884
3. Marvel, M. R. (2013). Human capital and search-based discovery: A study of high-tech entrepreneurship. *Entrepreneurship theory and practice*, 37(2), 403–419. DOI: 10.1111/j.1540-6520.2011.00465.x
4. Marvel, M., Davis, J. & Sproul, C. (2016). Human Capital and Entrepreneurship Research: A Critical Review and Future Directions. *Entrepreneurship Theory and Practice*, 40, 599–626. DOI: 10.1111/etap.12136
5. Acs, Z., Braunerhjelm, P., Audretsch, D., & Carlsson, B. (2008). The Knowledge Spillover Theory of Entrepreneurship. *Small Business Economics*, 32, 15–30. <http://dx.doi.org/10.1007/s11187-008-9157-3>
6. Vasiliadis, A. & Thomas, P. (2007). Entrepreneurship among graduates: Reality and prospects in tertiary education. *Proceedings of the Academy of Entrepreneurship*, 13, 75–82.
7. Kraus, S., Vonmetz, K., Orlandi, L. B., Zardini, A., & Rossignoli, C. (2023). Digital entrepreneurship: The role of entrepreneurial orientation and digitalization for disruptive innovation. *Technological Forecasting and Social Change*, 193, 122638.
8. Zahra, S. A., & Wright, M. (2011). Entrepreneurship's next act. *Academy of Management Perspectives*, 25(4), 67–83. DOI: 10.5465/amp.2010.0149
9. Castellacci, F., & Natera, J. M. (2013). The dynamics of national innovation systems: A panel cointegration analysis of the coevolution between innovative capability and absorptive capacity. *Research Policy*, 42(3), 579–594. DOI: 10.1016/j.respol.2012.10.006
10. Guerrero, Maribel & Urbano, David & Alain, Fayolle & Klofsten, Magnus & Mian, Sarfraz. (2016). Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Business Economics*, 47, 551–563. DOI: 10.1007/s11187-016-9755-4
11. Ruleva, A. A. (2018) Students' attitudes towards entrepreneurship: the results of a study at Vitebsk State Technological University. *Proceedings of the 51st International Scientific and Technical Conference of Teachers and Students*, 1, 128–130.

12. Radygina, S. V. (2022) Creation of a platform for technological entrepreneurship at university: trends and. *Technological and social entrepreneurship in Proceedings of the International Scientific and Practical Conference "Technological and social entrepreneurship"*. 5–11.
13. Medne, D., Lastovska, A., Lāma, G., & Grava, J. (2024, October). Unlocking Potential: Exploring the Interplay Between Entrepreneurship and Research Competence Across Diverse Academic Disciplines. *Frontiers in Education* (Vol. 9, p. 1415599). Frontiers Media SA.
14. Brauer, S. (2021). Towards competence-oriented higher education: a systematic literature review of the different perspectives on successful exit profiles. *Education+ Training*, 63(9), 1376–1390.
15. Bachmann, N., Rose, R., Maul, V., & Hölzle, K. (2024). What makes for future entrepreneurs? The role of digital competencies for entrepreneurial intention. *Journal of Business Research*, 174, 114481.
16. Kyndt, E. & Baert, H. (2015). Entrepreneurial competences: Assessment and predictive value for entrepreneurship. *Journal of Vocational Behavior*, 90, 13–25. DOI: 10.1016/j.jvb.2015.07.002
17. Rahman, S. A., Ahmad, N. H., & Taghizadeh, S. K. (2016). Entrepreneurial competencies of BoP entrepreneurs in Bangladesh to achieve business success. *Journal of General Management*, 42(1), 45–63. DOI: 10.1177/030630701604200104
18. Mohsin, A. M. B. A., Halim, H. A., & Farhana, N. (2017). Assessing the role of entrepreneurial competencies on innovation performance: A partial least squares (PLS) approach. *The Journal of Business Inquiry*, 16(1 Spec), 88–101.
19. Faggian, A., Modrego, F., & McCann, P. (2019). Human capital and regional development. *Handbook of regional growth and development theories*, 149–171.
20. Tehseen, S., Ahmed, F. U., Qureshi, Z. H., & Uddin, M. J. (2019). Entrepreneurial competencies and SMEs' growth: the mediating role of network competence. *Asia-Pacific Journal of Business Administration*, 11(1), 2–29.
21. Draksler, T. & Sirec, K. (2018). Conceptual Research Model for Studying Students' Entrepreneurial Competencies. *Naše gospodarstvo/Our economy*, 64 (4), 23–33. DOI: 10.2478/ngoe-2018-0020
22. Ferreras-Garcia, R., Sales-Zaguirre, J., & Serradell-López, E. (2021). Developing entrepreneurial competencies in higher education: a structural model approach. *Education+ Training*, 63(5), 720–743. DOI: 10.1108/ET-09-2020-0257
23. Man, T. W., Lau, T., & Chan, K. F. (2002). The competitiveness of small and medium enterprises: A conceptualization with focus on entrepreneurial competencies. *Journal of business venturing*, 17(2), 123–142.
24. Moberg, K., Vestergaard, L., Fayolle, A., Redford, D., Cooney, T., Singer, S., Sailer, K., & Filip, D. (2014). How to assess and evaluate the influence of entrepreneurship education: a report of the ASTEE project with a user guide to the tools. The Danish Foundation for Entrepreneurship – Young Enterprise
25. Bashkin, E. B., Chudina, Yu. A., & Shlyakhta, D.A. (2023). Questionnaire "Drivers of Mental Health". *Proceedings of the IV International Scientific and Practical Conference "Commitment to Mental Health"*, 17–25.
26. Lans, T., Blok, V. & Wesselink, R. (2014). Learning apart and together: Towards an integrated competence framework for sustainable entrepreneurship in higher education. *Journal of Cleaner Production*, 62, 37–47. DOI: 10.1016/j.jclepro.2013.03.036
27. Tittel, A., & Terzidis, O. (2020). Entrepreneurial competences revised: developing a consolidated and categorized list of entrepreneurial competences. *Entrepreneurship Education*, 3(1), 1–35. DOI: 10.1007/s41959-019-00021-4
28. Jones, M., Baldi, C., Phillips, C., & Waikar, A. (2017). The hard truth about soft skills: What recruiters look for in business graduates. *College Student Journal*, 50(3), 422–428.
29. Holtzman, D. M., & Kraft, E. M. (2011). Skills needed in the 21st century workplace: A comparison of feedback from undergraduate business alumni and employers with a national study. *Business Education & Administration*, 3(1), 61–76.
30. Bencsik, A. (2020). Challenges of Management in the Digital Economy. *International Journal of Technology*, 11(6), 1275–1285.
31. Bharadwaj, A. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, 24, 169–196. DOI: 10.2307/3250983
32. Kurmanov, N., Aliyeva, Z., Kabdullina, G., & Mutaliyeva, L. (2020). Digital entrepreneurship competencies among students: Methodological aspects of the maturity level and development program making. *Journal of Entrepreneurship Education*, 23(2), 1–11.
33. Tondeur, J., Howard, S., Zanten, M. v., Gorissen, P., Neut, I. V. d., Uerz, D., & Kral, M. (2023). The HeDiCom framework: Higher Education teachers' digital competencies for the future. *Educational Technology Research and Development*, 71(1), 33–53.
34. Brynjolfsson, E., & McAfee, A. N. D. R. E. W. (2017). Artificial intelligence, for real. *Harvard business review*, 1, 1–31.

35. Mamonov, S., Misra, R., & Jain, R. (2015). Business analytics in practice and in education: A competency-based perspective. *Information Systems Education Journal*, 13(1), 4.
36. Kambatla, K., Kollias, G., Kumar, V., & Grama, A. (2014). Trends in big data analytics. *Journal of parallel and distributed computing*, 74(7), 2561–2573. DOI: 10.1016/j.jpdc.2014.01.003
37. Fernández-Manzano, E. P., Neira, E., & Clares-Gavilán, J. (2016). Data management in audiovisual business: Netflix as a case study. *Profesional de la Información*, 25(4), 568–577. DOI: 10.3145/epi.2016.jul.06
38. Hattingh, M., Marshall, L., Holmner, M., & Naidoo, R. (2019). Data science competency in organizations: A systematic review and unified model. *Proceedings of the South African Institute of Computer Scientists and Information Technologists 2019*, 1-8. DOI: 10.1145/3351108.3351110
39. Staegemann, D., Volk, M., Lautenschläger, E., Pohl, M., Abdallah, M., & Turowski, K. (2021, July). Applying test driven development in the big data domain—lessons from the literature. *2021 international conference on information technology (ICIT)* (pp. 511-516). IEEE. DOI: 10.1109/ICIT52682.2021.9491728
40. Lull, J., Cervelló, R., & Devece, C. (2022). Digitalization in EU companies: Challenges and Evolution. Digitalization in business: On the Road to a sustainable world. *Nova Science Publishers*, 9–54. DOI: 10.52305/TUTV9605
41. Larsen, I., & Neergaard, H. (2024). What lies beneath: using student reflections to study the entrepreneurial mindset in entrepreneurship education. *International Journal of Entrepreneurial Behavior & Research*, 30(5), 1149–1176.
42. Butcher, L., Sung, B., & Cheah, I. (2024). Synergistic competencies of business graduates for the digital age: directions for higher education. *International Journal of Educational Management*, 38(5), 1375–1390.
43. Sansone, G., Ghezzi, A., Landoni, P., & Rangone, A. (2024). Students' Entrepreneurial Engagement and Student Entrepreneurship: Do Coding and Digital Skills Matter? *IEEE Transactions on Engineering Management*, 71, 5733–5743.
44. Cockburn, I. M., Henderson, R., & Stern, S. (2018). The impact of artificial intelligence on innovation (Vol. 24449). Cambridge, MA, USA: National bureau of economic research.
45. Albergaria, M., & Jabbour, C. J. C. (2020). The role of big data analytics capabilities (BDAC) in understanding the challenges of service information and operations management in the sharing economy: Evidence of peer effects in libraries. *International Journal of Information Management*, 51, 102023.
46. Kozjek, D., Vrabič, R., Rihtaršič, B., Lavrač, N., & Butala, P. (2020). Advancing manufacturing systems with big-data analytics: A conceptual framework. *International Journal of Computer Integrated Manufacturing*, 33(2), 169–188. DOI: 10.1080/0951192X.2020.1718765
47. Ghasemaghahi, M., Ebrahimi, S., & Hassanein, K. (2016). Generating valuable insights through data analytics: a moderating effects model. Available at: <https://aisel.aisnet.org/icis2016/ITImplementation/Presentations/7/> (accessed 6 April 2025)
48. Basilotta-Gómez-Pablos, V., Matarranz, M., Casado-Aranda, L., & Otto, A. (2022). Teachers' digital competencies in higher education: a systematic literature review. *International Journal of Educational Technology in Higher Education*, 19.
49. Obschonka, M., & Audretsch, D. B. (2020). Artificial intelligence and big data in entrepreneurship: a new era has begun. *Small Business Economics*, 55, 529–539. DOI: 10.1007/s11187-019-00202-4
50. Chaker, H., & Jarraya, H. (2021). Combining teaching "about" and "through" entrepreneurship: A practice to develop students' entrepreneurial competencies. *Industry and Higher Education*, 35(4), 432–442. DOI: 10.1177/0950422221991005
51. Bird, B. (1995). *Towards a Theory of Entrepreneurial Competency: Advances in Entrepreneurship, Firm Emergence and Growth*. CT: JAI Press, Greenwich.
52. Lans, T., Baggen, Y., & Ploum, B. (2018). Towards more synergy in entrepreneurial competence research in entrepreneurship education. *A research agenda for entrepreneurship education* (pp. 224–242). Edward Elgar Publishing. DOI: <https://doi.org/10.4337/9781786432919.00018>
53. Mitchelmore, S., & Rowley, J. (2010). Entrepreneurial competencies: a literature review and development agenda. *International journal of entrepreneurial Behavior & Research*, 16(2), 92–111. DOI: 10.1108/13552551011026995
54. Ardyan, E., & Wijaya, O. (2018). Effect of the effectiveness of entrepreneurship education programs on entrepreneurial competency and business performance. *International Journal of Management Education*, 12, 393.
55. González-López, M., Pérez-López, M., & Rodríguez-Ariza, L. (2020). From potential to early nascent entrepreneurship: the role of entrepreneurial competencies. *International Entrepreneurship and Management Journal*, 1–31.
56. Iwu, C., Opute, P., Nchu, R., Eresia-Eke, C., Tengeh, R., Jaiyeoba, O., & Aliyu, O. A. (2019). Entrepreneurship education, curriculum and lecturer-competency as antecedents of student entrepreneurial intention. *International Journal of Management Education*, 19(1), 100295.

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