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**University-industry collaboration for students' entrepreneurial mindset  
development. Evidence from case study**

Graduate Qualification Work  
2<sup>nd</sup> year master student  
«Master in management» program

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**ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ  
ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ**

Я, Юркина Вера Александровна, студент второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Сотрудничество между университетом и бизнесом для развития предпринимательского мышления студентов. Результаты тематического исследования», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего образования «Санкт-Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квалификационной работы, выполненной другим лицом (лицами)».

  
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## ABSTRACT

Master Student's Name	Vera Yurkina
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Faculty	Graduate School of Management
Main field of study	Management
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Academic Advisor's Name	Karina A. Bogatyreva
Description of the goal, tasks, and main results	<p>The goal of the paper is to identify the way UIC contributes to students' entrepreneurial mindset formation. To achieve the goal, existing literature on the topics of entrepreneurship, UIC, and entrepreneurial mindset development was systematized and analyzed; primary data on the cases studied was collected through the semi-structured interviews with students, business, and university representatives; the data received was analyzed and practical recommendation towards university study was provided. As a result, the research contributes to the theory by highlighting the creation of economic value based on the weak ties that come from the collaboration of two Strong-ties networks. Additionally new goals for UIC were identified, industry role as knowledge provider and facilitator in university transition towards entrepreneurial model was proven. Moreover, the paper provides the suggestion of the approach of organization of the study process, including organization of extracurricular voluntary club for entrepreneurship on the basis of UIC with the corresponding elements to be included into this club study process.</p>

Keywords	University-industry collaboration, university-industry partnership, entrepreneurship, entrepreneurial skills, entrepreneurial mindset
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## АННОТАЦИЯ

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Название магистерской диссертации	Сотрудничество между университетом и бизнесом для развития предпринимательского мышления студентов. Результаты тематического исследования
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Описание цели, задач и основных результатов	<p>Цель - определить, как УИС способствует формированию предпринимательского мышления студентов. Для достижения цели была систематизирована и проанализирована литература по темам предпринимательства, УИС и предпринимательскому мышлению; собраны первичные данные по изучаемым кейсам посредством полу структурированных интервью со студентами, представителями бизнеса и вуза; проанализированы полученные данные и предложены практические рекомендации по организации учебного процесса. В результате исследование вносит свой вклад в теорию, выявляя создание экономической ценности на основе слабых связей, образованных в результате коллаборации между двумя организациями с сильными связями. Более того, дополнительные цели для УИС были определены, роль бизнеса как поставщика знаний и посредника в переходе университета к предпринимательской модели была доказана. Кроме того, в работе предложен подход к организации учебного процесса, в том числе организации внеучебного добровольного клуба предпринимательства на базе</p>

	УИК, и соответствующие элементы, которые должны быть включены в структуру учебного процесса этого клуба.
Ключевые слова	Университетско-индустриальное партнерство, университетско-индустриальное сотрудничество, предпринимательство, предпринимательские навыки, предпринимательское мышление

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## INTRODUCTION

Importance of networks has been recognized long time ago. Granovetter's (1973) theory of strong and weak ties has shown that the closer the ties between organizations the more likely their environments will be overlapping with some other third party, and then this party will be at least of a weak tie. Additionally, the weak ties between organizations could lead to the more likelihood of new ideas generation, however only strong ones could not guarantee it (Granovetter, 1983).

Consequently, the community of different organizations as universities and industries taken into this paper with weak ties could lead to a wider global cohesion to help each other overcome appearing challenges. Moreover, Gulatti and Gargiulo (1999) has stated that the interorganizational relationships that start from the weak ties that are less risky and with low level of trust afterwards can become an embedded relationships where its members shared the knowledge, experience, and resources entre each other and could lead towards new ideas generation together and could help each other in solving the wider challenges. Additionally, the works of Gulati (1998) and Granovetter (2012) proved that networks between organizations – strategic alliances could impact economic output.

The external environment of the modern world indeed is highly volatile. In academics the term VUCA world has appeared in 1987 by Warren Bennis and Burt Nanus. The following acronym stood for volatility, uncertainty, complexity, and ambiguity. Through years milestones for prosper external environment worsen the situation for business conducting. Therefore, two years ago, in 2020, Jamais Cascio, has introduced the new acronym that better fits the current changing environment – BANI world (de Godoy & Filho, 2021). The following acronym stands for brittle, anxious, nonlinear, incomprehensible. The following term describes the modern environment even more chaotic and unpredictable, where people become more unprepared for changing circumstances. However, Jamais has also identified ways to mitigate the chaos. Brittle can be mitigated through development of stability, anxious through sympathy, nonlinearity through flexibility, and incomprehensiveness through transparency and intuition. Consequently, in such a rapidly changing world, with high level of dynamic changes and little possibility of careful planning and preparing for a longer future people, industries and the whole world have to acquire such skill as adaptation, that lead to the necessity to find another source of competitive advantage. Therefore, the capability to quickly adapt to the circumstances, make quicker decisions on the further actions and being stable in the same way make human resource the main competitive advantage for the firms, that includes

entrepreneurial mindset and a high level of development of knowledge and skills (Bhattacharyya, Thakre, 2021). Main source of human capital for firms is considered to be university, as it is the main supplier of talented students. However, the focus of activities of university has also shifted from the traditional teaching and research to so called ‘third mission’ that incorporates entrepreneurial activities that affects social and economic development (Mariani et al., 2018). Entrepreneurial activity is linked with the search, identification and exploitation of opportunities aiming at creation value and is based on a variety of resources, competencies, attitudes, and motivations of the entrepreneur one of which in entrepreneurial mindset (Shams & Kaufmann, 2016). Entrepreneurial mindset, however, is important not only for those who is planning to star their own venture but for any other employee as well despite their field of responsibilities (Urbano et al., 2013). Therefore, UIC is believed to contribute to the development of entrepreneurial mindset and give advantage to all parties included into collaboration.

**Aim:** The following research is devoted to the identification of the way university-industry collaboration contributes to students’ entrepreneurial mindset formation. Expected results are planning to be determination of new goals for both parties included in collaboration; identification of ways, channels and activities of industry helping to facilitate the transition to ‘entrepreneurial university’ model; highlighting the industry impact on higher education in terms of entrepreneurial skills development; provision of the education program study design fostering entrepreneurial skills and mindset development. The results of the following research would be relevant and meaningful for management of both parties: university and business – it could serve as a basis for decision-making in terms of collaboration and methods of teaching as well as further management and organization of collaborative projects and future study designs of the program.

**The novelty of research:** Firstly, research uncovers the teaching role of industry enabling students’ entrepreneurial mindset formation. The essential role of industry as knowledge generator in collaboration and facilitator in transition towards entrepreneurial university model is also studied. Moreover, recommendations for planning the study process with additional aspect to organize the special extracurricular club for entrepreneurship developing skills and mindset are suggested.

**Research gap:** As there were built four clusters for literature subtopics, consequently, for each of its particular research goal was identified. The blue cluster studies the current motives of parties to enter into collaboration, whereas none of them consider any goal related to teaching or educational aspect. All the attention is put towards academics and graduates in the studies, however

the goal to educate current students on the basis of university-industry collaboration doesn't reflect in the literature. The red cluster is dedicated to the transition of university into the model of entrepreneurial one. It is an important step for university before starting to enter in the collaboration with industry, however, the literature does not cover the aspects that industry and collaboration can help to facilitate the transition. The yellow cluster studies the higher education in university with the focus on academic spinoffs and knowledge transfer from university to industry, however the industry impact on students' knowledge is not discovered yet. Finally, green cluster explores the current studies of entrepreneurship in universities and highlights the number of negative feedback about it. However, the solution how to improve the situation is also not discovered in the existing literature.

Based on the following research gaps, consequently, the following four **research questions**, each for one gap were identified:

Research question 1. What are the goals of UIC in terms of the entrepreneurial educational process?

Research question 2. How industry and UIC contribute to the university transition towards an entrepreneurial model?

Research question 3. What is the role of industry and UIC in higher education in terms of entrepreneurial skills development?

Research question 4. How to organize study process in university through UIC aiming at development of entrepreneurial skills and mindset

To achieve the goal of the research and cover all research questions the following **objectives** were set:

1. Provide literature analysis through bibliometric method of keywords co-occurrence on the topic of industry-university collaboration and entrepreneurial mindset development.

2. Identify methodology for conducting a detailed case analysis on industry-university collaboration in large company.

3. Collect qualitative data through interviews with representatives of all different included in collaboration: university, business, and students.

4. Identify goals, ways, and roles of industry in university-industry collaboration that contributes to the development to entrepreneurial skills and mindset.

5. Develop a practical recommendations for study process organization aiming at entrepreneurial mindset and skills formation on the basis of industry-university collaborations.

6. Develop an integrative framework of university-industry collaboration for entrepreneurial mindset development based on research results.

The following research would be performed on the basis of two case studies of university-industry collaboration namely of Graduate School of Management SPbU with two companies: “Megafon” company and VTB Bank and Saint-Petersburg State University of Aerospace Instrumentation. The following universities include as already successful cases of collaboration that develop entrepreneurial mindset as the one that is only in the beginning of this path. The development of entrepreneurial mindset there is achieved through combining various educational formats, combining university activities, and working experience of business representatives. To collect the data 9 semi-structured interviews were hold:

- Rostislav Speransky, head of 5G Dream Lab and VTB Innovation Lab in GSOM
- Janna Khomyakova, head of VTB Innovation Center
- Tatiana Leontieva, Deputy Director of strategic development in SUAI
- Alexandra Borodulkina, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant
- Elizaveta Samsonenko, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant
- Svetlana Troshneva, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant
- Anastasia Kraskovskaya, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant
- Yaroslav Agnevshikov, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant
- Elizaveta Bulantceva, GSOM 2<sup>nd</sup> year MIM student, VTB Lab participant

# 1. CLUSTER CLASSIFICATION OF CURRENT STUDIES

## 1.1. Theoretical foundation of the study

The importance of interconnections has been recognized long time ago. Granovetter (1973) studied Strong and Weak ties, where Strong ties include only close relationships with those who have the same background, interests, society, who are closely connected and who are in constant communication, whereas weak ties are related to the contacts that are considered to be less likely to being “socially involved”. His theory of the Strength of Weak Ties incorporates that acquaintances are more likely to provide a new information and knowledge, rather than close people, who move in the same circles. There are much more weak ties in the social network in comparison with strong ones, and even the majority of information coming from weak ties is of little significance, exactly weak ties play a vital role in transferring unique and extraordinary innovation. Burt (1992) has elaborated the Weak ties theory of Granovetter (1973) by empathizing the vital role of bridges between social networks in weak ties. Social network is defined as a set of actors and a set of ties of different types that link them (Borgatti & Halgin, 2011). Burt (1992) has identified ‘structural holes’ as the existing gaps of information and knowledge and corresponding bridges that conduit knowledge information and value between the networks. Consequently, the bridges, and weak ties correspondingly create value for both parties, and only weak ties that serve as bridges are valuable and spread novel information (Granovetter, 2005). Social networks indeed affect economic output. It is proved that networks influence the flow and quality of information and affect not only price, hiring, production but also the choice of partner for an alliance, decisions on merges and acquisitions, innovations etc. (Granovetter, 2005).

Talking about alliances, the strategic ones are defined as a voluntary cooperation, where different organizations combine their resources to manage the environmental changes (Gulati,1998). The reasons for organization to do it vary from costs sharing and resources usage to the market penetration. Majority organizations, for sure are seeking to access the scarce resources, however they rely heavily on the information from the previous alliances. Therefor new alliances contribute to the development of interorganizational networks (Gulati. 1999).

Consequently, those who are apart of weak ties are considered to be socially disadvantaged. As they limit their access to the novel knowledge and information existing outside their common network (Granovetter. 2012). The same can be transmitted to the notion of innovation where

organizations become isolated from the awareness about current challenges, problems, and opportunities.

As information and knowledge rapidly become not actual, the wide number of weak ties then will allow to stand with the trend. Collaborations as a weak ties between organization therefore are crucial to share the knowledge and resources responding to the environmental challenges. The following paper will study the collaboration between business organizations and educational organizations – namely, universities, in the area of entrepreneurship and entrepreneurial mindset development, in particular. As there are no studies in the existing literature discussing the joint issue of industry-university collaborations, entrepreneurship and entrepreneurial mindset, the following topics should be gathered together and be systemized on the corresponding subtopics. The following action is performed in the next section.

## **1.2. Distribution of existing literature on clusters**

For this literature review, the bibliometric method of keywords co-occurrence (Caputo et al., 2021) was applied. This method of content analysis is used to investigate the components and structure of knowledge in the selected area by underlying the linkages between the keywords identified by the authors (Radhakrishnan et al., 2017). The central idea of keywords co-occurrence analysis lies in the coincidence of the unique keywords extracted from the articles based on which the thematic clusters are developed (Lopez-Fernandez et al., 2016). As analysis complies state-of-the-art content, the literature contained identified co-occurred keywords guarantees the reliability and validity of the research for potential knowledge extension (Lee & Su, 2010).

The first step of the method implementation is the search of literature related to the topic. For this purpose, Scopus database was used. The search included a variety of relevant terms combinations in the section of title, abstract and keywords. Firstly, the following combinations were employed: “entrepreneurial mindset formation university-industry” and “entrepreneurial mindset development university-industry”. However, they showed only one and three publications, respectively, even without any restrictions. Therefore, for the analysis, two literature streams, namely the one devoted to university-industry collaboration and the other about entrepreneurial mindset formation, were brought together. For the first one, related to the university industry collaborations as a whole, the following variations of the keywords were used: “business-university/industry-university/university-business/university-industry” and “collaborate/partner” and “entrepreneur” and “develop\*/form\*” and “*entrepreneur\* mind\*/entrepreneur\* think\**”. As a result, 127 articles were identified before any

filtering. To provide more reliable results, several filters were applied. The first filter was the year of publication, namely, from 2011 to 2021. Thus, the number of outcomes was diminished to 108 articles. The next filter was related to selecting only journals that are listed in the Association of Business Schools (ABS) Journal Quality Guide (Sarat, 2021) and ranked as 4\*, 4, 3, 2 to include only top-tier academic outlets. As a result, 47 publications were selected for the future analysis from this literature stream. The full Keyword Protocol applied in Scopus is presented in Appendix A.1.

The majority of the articles selected within the first stream are devoted only to university-industry collaborations or to creation of the entrepreneurial university on the basis of such partnerships. Therefore, as the current study is focused on the entrepreneurial mindset development, the relevant literature also should be taken into account. Consequently, the second stream of the analyzed literature was devoted to this topic. The keywords employed were “entrepreneurial mindset development/formation”. The result before filters application covered 332 articles. The same filters as for the first stream were applied and the number of articles diminished to 30 (170 with application of the year of publication filter, and 30 with the journal ranking criterium). The full Keyword Protocol for the second stream can be found in Appendix A.2.

Additionally, the initial keyword search was repeated with the amendment to include either “university” or “industry” in the search. Therefore, the keywords used were “entrepreneurial mindset formation university/industry”. This resulted into 10 articles with application of the filter to include only journals, however, not specifying inclusion in ABS Journal Quality Guide. After reading the abstracts, only one relevant paper was identified and included into the selected articles set.

At the second step of the analysis, the keywords co-occurrence map was created. This tool enhances the quality of the analysis as it identifies the major keywords occurring in the literature and their interconnections by this defining the emerging trends within different time horizons (Pesta, B et al., 2018). To create the two-dimensional co-occurrence, map the visualization of similarities (VOS) approach was used (van Eck and Waltman, 2010) with the help of VosViewer freeware (Walsh & Renaud, 2017) that defines the keywords and organizes them into semantic clusters.

Thereby, the 78 articles were subjects to the analysis. After loading the documents, VosViewer identified 534 keywords. Afterwards, the minimum threshold of 4 occurrences was selected, resulting in 23 keywords meeting the threshold. That means that 23 keywords occur minimum in 4 out of 78 articles. The result also shows that these keywords are divided onto four clusters. Figure 1 provides visualization of the clusters.



Next step is to select the articles that contains the identified keywords and afterwards proceed to reading. As a result, only 47 among 78 articles are taken to the next stage.

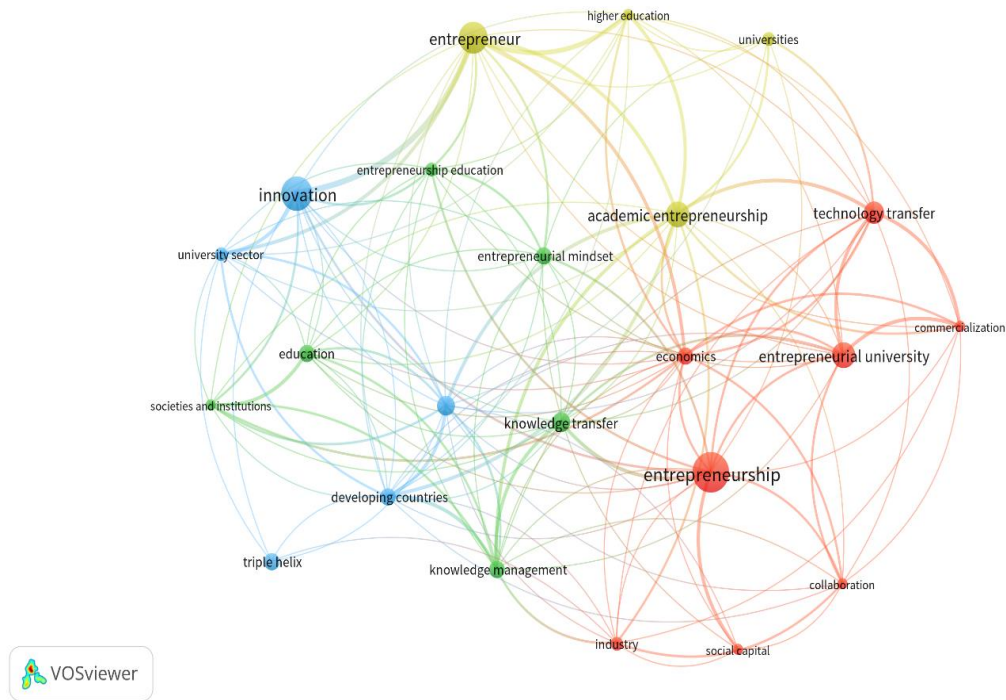


Figure 1 A visualized bibliometric map based on the reviewed articles

The map essentially depicts the 4 clusters of the keywords. Keywords and correlated topic for each cluster are summarized in Table 1. Overall, the findings from the reviewed literature have cumulative and complementary nature as the majority has cited the same authors and, therefore, the base of the literature reviews is common. All articles to some extent examine how universities and industry collaborates, barriers for collaboration, motives, and impact on developing entrepreneurial skills. Consequently, articles could contain keywords that represent different clusters as they are highly correlated. The detailed list of all the articles and their affiliation to the corresponding cluster is presented in the Appendix B.

Table 1. Keywords identified by VosViewer with corresponding cluster topic

Cluster	Key words extracted	Theme
Blue	“University sector”, “University-industry collaboration”, “Triple Helix”, “Innovation”, “Developing countries”	IUC, ecosystem perspective

Red	“Technology transfer”, “Social capital”, “Industry”, “Entrepreneurial university”, “Entrepreneurship”, “Economics”, “Collaboration”, “Commercialization”	IUC, technology transfer and entrepreneurial university perspective
Yellow	“Academic entrepreneurship”, “Universities”, “Higher Education”, “Entrepreneur”	IUC, higher education and academic entrepreneurship perspective
Green	“Societies and institutions”, “knowledge transfer”, “Knowledge management”, “Entrepreneurial mindset”, “Entrepreneurship education”, “Education”	IUC, knowledge transfer and entrepreneurial mindset formation perspective

### **1.3. Current UIC contribution to the entrepreneurship development**

As it was already mentioned, a single article could include the perspective of different clusters, therefore, the conversations are highly interconnected.

In such a way, the blue cluster indicates industry-university collaboration from the ecosystem perspective that includes the role of government in these collaborations – the triple-helix model - and different motives, challenges, and ways to start the joint activities. The red cluster indicates industry-university collaboration related to creation of entrepreneurial university and technology transfer. Yellow cluster covers industry-university collaboration from the perspective of the academic entrepreneurship development. Finally, the green cluster represents industry-university collaborations from the knowledge transfer and entrepreneurial mindset development perspectives.

#### **1.3.1. UIC, ecosystem perspective**

The first cluster is dedicated to industry-university collaboration as is. It covers the main motives of both parties, main barriers in these relationships, ways of how to start it. Additionally, the Triple Helix model, its importance and main functions are discussed by this cluster.

Recently, collaboration between universities and corporations has become an established practice (Linton & Hasche, 2021). Universities have started to target a new mission that is socio-economic development, besides teaching and research. Therefore, the importance of establishing

partnerships between university and industry has been raised as corporations are highly engaged into the economic value creation and universities are the major knowledge providers due to constant research activities and educating new talents. (Ting et al., 2020). According to Shams and Kaufmann (2016), collaborations between universities and industry usually include four major interrelated components: research support, co-operative research, knowledge transfer, and technology transfer. Consequently, universities are considered to become a part of a large coherent system with industry and government that focus on innovation and economic progress (D'Este & Perkmann, 2011). The studies of Huang & Chen (2017) have indicated that collaboration among the following three parties - industry, university, and government, can be an essential factor of success in terms of regional and national innovation systems improvement. Such model of collaboration is called Triple Helix.

Triple Helix is a model developed by Etzkowitz and Leydesdorff (1995, 2000) that formalizes the institutional mechanisms of the interaction among the three parties: universities, industries, and governmental bodies. The aim of this model is to specify the conditions for creating favorable environment for innovation and knowledge-based economic development (Sa et al., 2018).

Yoon (2015) suggested that the triple helix model of innovation has three main propositions.

- Universities, not the industries, are the key players of innovation systems
- Interconnection between the three parties should be co-evolving and enhance condition for innovation
- The evolution of the innovation system should be connected with transformation of relationships between parties on the institutional level.

Such form of collaborations was initially designed with an aim to conduct research and development of national scope that have potential high-impact outcomes. These collaborations capture unique opportunities to facilitate development of science and technology (Carayannis et al., 2014) and work as synergy, meaning that the inherent value and effects are greater within the collaboration of three different parties (Sa et al., 2018). This model highlights developing network of collaborations with one center (Schultz, 2011) and encourages its parties to create innovation based on the knowledge and experience (Yoon, 2015).

According to Sarpong et al. (2017), the triple helix model combines three typologies of innovation systems.

1. Statist model - government plays the controlling role, it plans, manages, and directs the relationship between industry and university in terms of innovation development. Industry plays the major role in innovation, whereas universities responsibilities are limited to teaching and research

activities. Knowledge transfer and commercialization are also limited as universities do not initiate them by themselves.

2. Laissez-faire model - all three parties operate separately in different institutional spheres. Synergy between parties is minimized and consequently, the government's role in innovation development is limited to market failures control. Meanwhile, universities do research and manpower training and businesses from one industry operate separately from each other. Here industry again is a key player of innovation with the other two parties as facilitators.

3. Hybrid triple helix model - mix of the statist and laissez-faire models. This type of model focuses on creation of intersection of responsibilities and interdependent relationships between parties. It creates mutual collaborative relationships among the parties and other stakeholders aiming at innovation on their own rather than by prescription from the government.

The research of Sarpong et al. (2017) suggested that existing collaborations should start their transformation to the hybrid model of innovation.

From the university perspective, the study of Johnston et al. (2021) argues that the established triple helix approach targeting industrial strategy involved two types of universities. The first one is 'entrepreneurial university', the focus of which was already discussed - commercialization of activities such as patenting and spinouts development and licensing income. The second type is 'engaged university' that focuses on the co-creation of knowledge through collaborative research, use of facilities and the provision of training activities. Consequently, universities to enter in such collaborations have to be engaged in both entrepreneurial and engagement functions. Moreover, even though academic spin offs represent a minority of entrepreneurial ventures, collaborations with them could also benefit all parties of the economic system (Colombo et al., 2022). University's responsibility then lies in novel insights generation, as the knowledge catalyst, and in training and provision of consultancy sessions, involving both scholars and consulting partners. (Sa et al., 2018).

Even though it is mostly believed that the main activity of industry is to monetize knowledge, it also targets innovation and regional development through supporting entrepreneurship, and it also produces wealth, whereas government acts as the active supporter and legislative controller, providing public policies that help to support entrepreneurship, thus addressing knowledge and competency gaps (Sa et al., 2018).

The Triple Helix model includes three parties: entrepreneurial university, industry, and government. This type of collaboration highlights the strategic interactions between these three that

are crucial for promotion of innovation and advancement of the knowledge economy (Dalmarco et al., 2018).

Main aim of this collaboration is exchange of knowledge and resources. Nevertheless, parties are motivated by different things and are likely to prioritize different goals, different working practices and approaches to manage problems and different time horizons, that definitely challenge collaboration (Linton & Hasche, 2021). In the literature several challenges that parties could face while collaborating was identified. The majority of the works was dedicated to industry-university collaborations, with no regards to the triple helix approach.

First barrier is low level of engagement - expectations on industry side's engagement are not extended in the employee contracts for researchers, which is not enough for performance reviews. Therefore, each researcher decides on his or her own on how to collaborate with external partners (Brostrom et al., 2019). Secondly, the main fear of universities in such collaborations is that industry engagement could limit academic freedom, i.e., the ability to pursue interesting research without considering commercial gain. As a solution, universities manage to draw boundaries between the different forms of industry engagement that they see as legitimate, and those that they consider commercial (D'Este & Perkmann, 2011). The third barrier is the lack of awareness of what is happening in the industry, its needs and requests leading to poor experience and entrepreneurship to manage and communicate in the business world (Nsanzumuhire et al., 2021). Forth, the absence of appropriate government programs is also a severe barrier to partnerships as well as raising conflicts in terms of rules and regulations (Tartari et al., 2012). Fifth barriers identified include poor support from other parties as government or university, misalignment of practices and property rights issues (Nsanzumuhire et al., 2021). Another barrier is the person-dependent nature of existing networks - one person leaving can lead to loss of sets of existing networks to external organizations (Brostrom et al., 2019). Additionally, many of such collaborations have failed because of the cultural gaps (Carayannis et al., 2014).

Tartari et al. (2012) differentiate barriers that face universities in collaboration on two main sets that he named "Mertorian barriers" and "Williamson barriers". The first is related to the orientation of research, whereas the second stems from transactional costs of working with industry. Mertonian barriers could be overcome by experience through time, whereas Williamson ones are not easily overcome and depend on the nature of collaboration. More broadly, these barriers would be described in yellow cluster.

Despite the barriers, both parties have a number of benefits from the collaboration that overtake the barriers. The following benefits are the major motives because parties decided to enter in collaboration. Partnership between firms and universities is beneficial when it involves a bi-directional knowledge-transfer, exploration, production, and establishing a long-lasting relationship between the parties (Ting et al., 2020).

Industries are mainly motivated by the possibility to gain access to new knowledge, new talents (Wang & Shapira, 2012), expertise and techniques that are not available in-house (Samuel et al., 2021). Industry can achieve business and economic development, market expansion, human capital development, and even the possibility to leverage academia to provide talent pools for operational optimization (Samuel et al., 2021). Businesses identify the problems and involve young and creative students to achieve predefined goals due to exploration of opportunities linked with latent ideas (Secundo et al., 2017). Additionally, industries can raise trust of university scientists, through integration into the scientific community, that can lead to additional network and information channels generation, as well as to enhancement of the credentials through associations with scientists and prestigious universities leading to stronger brand value (Wang & Shapira, 2012).

Motivation of universities to partner industry then lies mainly in commercial exploitation of technology and knowledge, access to in-kind resources (D'Este & Perkmann, 2011), access to external funding and greater research productivity (Fischer et al, 2018). Universities are also interested in such partnerships because it helps to promote technology commercialization and give practical implementation of students' knowledge (Wang & Shapira, 2012).

According to Samuel et al. (2021) there are several forms of knowledge exchange as collaborative research, contract research, consulting etc. that are included in industry-university collaboration. The same channels were studied in other works as Perkmann et al. (2011), D'Este & Perkmann (2011), Wei et al. (2013).

1. Collaborative research (also called joint R&D) refers to formal collaboration between two parties with a goal of creation of cooperation on R&D projects (Perkmann et al., 2011). The following projects are mostly subsidized by public funding (Wei et al., 2013). In majority of the cases, the content of the following research can be considered 'pre-competitive' (D'Este & Perkmann, 2011).
2. Contract research - the one that is directly commercially related to firms (Wei et al., 2013) and ineligible for public support. Therefore, they are application- oriented and funded by industry (Perkmann et al., 2011).

3. Consulting refers to advisory services or sometimes to research provided by academic researchers to their business client (Wei et al., 2013), also funded by the industry (Perkmann et al., 2011).
4. Licensing - the most common way of university technology transfer including patent developed through formal technology-transfer as license to an established enterprise (Wei et al., 2013). Also includes contractual assignment of intellectual property to external organizations (Perkmann et al., 2011).
5. Academic spin-offs or ‘university spin-outs’ - new ventures the creation of which depends on licensing the intellectual property that is developed within an academic institution (Wei et al., 2013). Additionally includes commercial exploitation of academic technologies (Perkmann et al., 2011).

According to Samuel et al. (2021) there are four perspectives through which success factors of industry-university collaborations can be studied:

- Institutional factors - participating institutions
- Relationship factors - links between participating parts
- Output factors - desired results from the collaboration
- Implementation factors - corresponding implementation and management of collaboration to realize benefits for both parties included. Include factors such as resources, culture, trust, communication, commitment, support, geographical distance, social capital, quality, knowledge and technology transfer and university spinoff.

University-industry collaboration raises its importance as an economic growth driver, however there is still lack of knowledge conserving effective ways of its implementation to achieve long-lasting productive relationships (Nsanzumuhire et al., 2021).

To ensure the successful establishment of collaboration parties should build trust and communication between each other. It could be done through creating a perception of legitimacy across different levels as individual, organization, the environment, and the process. It will help universities be considered by firms as more meaningful, more predictable, and more trustworthy partners and by this raise firm’s desire to collaborate with them (Samuel et al., 2021). Trustful relationships are crucial for this kind of collaboration because trust enables both parties to find mutual commitments to different projects and ensure the fair treatment of all parties in case of any

misalignments (Tartari et al., 2012). The study of D'Este & Perkmann (2011) concludes that policy should digress from focusing mostly on monetary incentives for industry collaboration and consider a wider range of incentives for boosting interaction between industry and academia. Additionally, the right choice of partner to collaborate also influences further development of collaboration. Mindruta (2013) has identified three peculiarities of industry – university partnerships that define the matching process:

1. University-industry research collaborations are voluntary and are established with the intention to receive mutual gains.
2. The value of innovation generated through partnership is predefined, at least in expectation, therefore, both parties have own preferences whom they collaborate with
3. Number of partners to collaborate with are restricted by time. Time constraints on the university side leads to careful screening of the number and quality of business partners.

This cluster has provided an overview of the university-industry collaboration as a part of an ecosystem to enable innovation. More detailed study of motives and barriers and ways to manage them will be covered in further clusters that narrow the focus from the whole ecosystem towards entrepreneurial activities of university and development of an entrepreneurial mindset through this collaboration.

Based on the literature discussed the following research gap for this cluster was identified:

**Research Gap (Blue)** – in the current motives for collaboration both parties do not consider any that is related to the educational aspect. It is said that universities partner in order to commercialize knowledge and technology, receive funding, increase productivity of research, and find practical implementation of students' knowledge. Whereas industry enters into the collaboration in order to get access to new knowledge, skills, expertise, and talents. Also, industry through collaboration asks universities to perform some tasks as consultancy or research. In the red cluster it was said that universities now embrace three main activities teaching, researching, and creating economic value, and through the mentioned goals of UIC it could be stated that both parties have no objectives related to teaching mission of universities, as all the focus is devoted to research and value creation. Therefore, it is important to study which goals universities set in UIC to impact teaching activities and what are the industry motives in collaboration from the teaching perspective.

Therefore, the following research question addressing the described problem is identified:



**Research question 1.** What are the goals of UIC in terms of the entrepreneurial educational process?

### **1.3.2. UIC, entrepreneurial university and technology transfer perspective**

The next cluster is devoted to the studies of entrepreneurship in general as well as entrepreneurial university, reasons for its establishment, main motives, and barriers. Additionally, this cluster covers one of the major functions of entrepreneurial university, which is technology transfer.

Entrepreneurship is rather a broad term that comply different aspects and scholars that try to define it tend not to cover all of them. Therefore, in the literature there is no precise and clear definition that could completely cover all issues concerning entrepreneurship. Some scholars believe that it only includes the sole entrepreneur's path towards innovations, however others argue that entrepreneurship, on the contrary, is best described by the collective entrepreneurial team cognition (Larsson, 2019). Additionally, Larsson concludes that this collective cognition falls in between firm action, performance, and individual cognition. The other opinion is that entrepreneurship is important because of creation of stakeholder network that generates social and intellectual capital that ensures the entrepreneurs' success and, therefore, entrepreneurship is considered as 'panacea for economic progress' (Shams & Kaufmann, 2016). Entrepreneurship is also defined as a source of economic growth and increase in social value that foster communities to develop (Sa et al., 2018) Piperopoulos (2012), in his turn, connects entrepreneurship with local, regional, and national success and competitiveness.

Thereby, the most common notions of entrepreneurship as creative thinking, risk taking, co-creation, value creation, innovation, and ownership are used to handle the changes in political, social, economic, environmental, and technological spheres, namely changes in external environment of the current network economy (Shams & Kaufmann, 2016). Therefore, there should be established an institution to teach entrepreneurship and to transfer knowledge out of it.

The concept of the entrepreneurial university was firstly introduced by Etzkowitz (1983, 2004). The entrepreneurial university could not only accelerate the previously mentioned skills but also contribute to the economic activity by translating research results into intellectual property (Samuel et al., 2021). Mostly known, that universities primary activities are teaching new students' generations as well as advancing research, whereas nowadays circumstance have granted universities with the third mission that includes transferring technology to create both social and economic value and ensure its implementation in practice. Current education is directly associated with such notions and activities as entrepreneurship, technology transfer and knowledge commercialization (Dalmarco

et al.,2018). The notion “third mission” is in increased use nowadays while describing the activities of universities, namely entrepreneurial ones, refers to generation, application, use and exploitation of knowledge with external stakeholders and society aiming at the contribution in solving socio-economic problems (Secundo, 2017). Same thought was developed by Dalmarco et al. (2018), he also linked knowledge transfer to companies and boost of socio-economic development with the concept of entrepreneurial university.

Additionally, to target solely economic outcomes, recently entrepreneurial universities have switched their attention towards sustainable societal development (Fischer et al., 2021). Furthermore, entrepreneurial university contributes to social and technological transformations and develops required knowledge, skills, and competencies in students to prepare them to work in the innovation-driven competitive economy (Qureshi & Mian, 2021) Additionally to these activities entrepreneurial universities are in intense collaboration with industry, are directly involved in the exploitation of research results and are well rooted in the regional entrepreneurial ecosystem (Dameri & Demartini, 2020). To ensure the practical implementation of obtained skills inside the universities and test the applications of their research on existing world problems industry-university collaboration is required. Linton & Hasche (2021) consider that through engagement of students into the most recent research, provision of access to industrial partners and creation of entrepreneurial environment, students could reduce the gap of practical experience and professional networks.

Therefore, universities that actively implement entrepreneurial activities are supposed to be more efficient in case of knowledge commercialization through different channels as licenses, patents, technology parks or business incubators. Etzkowitz (2004) identified the universities’ capability to develop these entrepreneurial activities the second academic revolution. However, currently, the commercialization of academic research results depicts the innovative nature of the university (Dalmarco et al., 2018).

Currently, entrepreneurial universities heavily contribute to innovation and entrepreneurship development in the regions of origin and therefore they have become the major actors in an entrepreneurial ecosystem. The contribution is mainly consisting of entrepreneurship education provision that develops entrepreneurial mindset, equips students with various entrepreneurial skills, expands their network (Qureshi & Mian, 2021). Innovations thereby play an important role in the entrepreneurial university establishment, whereas industry-university collaboration accelerates innovation through the previously mentioned activities (Giones, 2019). Fisher et al. (2020) discovered the multidimensional dynamics of frugal innovations that come from university–industry

collaborations. Frugal innovation is defined as the process of reducing costs and complexity during the design and development stage of smart solutions generation both for product and services to cover the needs of low-income customers and consequently generate institutional change in their societies (Fisher et al., 2020). However, it does not mean that frugal innovation always has to be developed by higher education institutions of novel technologies, it also counts that entrepreneurial universities could foster such innovations by provision of the required skills, that support entrepreneurial and innovation initiatives and conduct applied research to cover social needs. Nevertheless, there is still lack of research on frugal innovation in the existing literature.

As it was already mentioned, entrepreneurial university differs from the traditional one as it has three basic pillars: education, research, and socio-economic development. (Dalmarco et al., 2018). To efficiently manage the collaboration with industry, universities commonly establish a technology transfer office (TTO), which also is considered one of the criteria of entrepreneurial university. TTO is defined as an intermediary between the technology producers (universities/academics) on the one side, and companies and entrepreneurs (industry) on the another with an aim to facilitate the knowledge and technology transfer by licensing intellectual property to existing companies or start-ups (Dalmarco et al., 2018). Overall, the scholars rely heavily on the internal capabilities of academics and businesses to firstly boost the collaboration and further transmit to entrepreneurial university (Samuel et al., 2021). The majority of TTOs and liaison offices are expected to be only described with terms of patent activity and spin-offs creation, however, they also include education-oriented perspective of exchange with industry, so called bidirectional exchange and additionally, development of a university's portfolio of joint research projects (Brostrom et al., 2019). Therefore, technology transfer is essential for both, effective collaboration, and entrepreneurial university establishment. Dameri & Demartini (2020) have identified that in the studies “knowledge transfer” and “technology transfer” mean the same thing, that implies knowledge transfer from the university to the market or community and vice versa, therefore, in most of the cases they could be used as substitutes.

The entrepreneurial university can be viewed as both a catalyst and incubator for development in terms of exploration and exploitation of knowledge (Johnston et al., 2021) In that, the university serves as a catalyst, spreading knowledge to the spur of start-ups and other initiatives and acts as a knowledge mediator, by the provision of common sensemaking relying on managerial and entrepreneurial knowledge (Dameri & Demartini ,2020). Universities can play a pivotal role in driving inclusive development through knowledge and technology transfer processes if they focus on issues

associated with societal challenges. Thereby, universities have to be integrated as parts of complex ecosystems that can elaborate knowledge to foster frugal innovation (Fischer et al., 2021).

Qureshi & Mian (2021) have developed a framework for transferring the entrepreneurship best practices among university organizations. According to the model, there are host and sender universities. The sender one is role models representing an entrepreneurial mindset themselves. They have to be inspiring, motivating, and share the insights. The host university representatives should be able to acquire the upcoming knowledge and are willing to improve the absorptive capacity. Thus, the model (Qureshi & Mian, 2021) is built for other institutes of higher education that determines success characteristics of the entrepreneurship education practices transfer. Namely, there are five issues that influence the transfer:

- Specialized design of the program – entrepreneurial education should rely on case studies, storytelling, and hands-on exercises in the local context that could help to develop entrepreneurial mindset
- Quality of the sender team – the qualifications and experience in teaching entrepreneurship of transfer team must be of high quality, and the representatives should be engaged in entrepreneurial initiatives and teach entrepreneurship internationally for several years.
- Absorptive capacity of receiver team – the ‘client’ must have a capability to absorb new knowledge and to implement it in practice effectively
- The relationship between sender and receiver – transfer of knowledge should be pursuit only through clear communication and translation as well as dissemination of knowledge. The sender should convey a message with the balance of power, showing the high level of mutual respect.
- Geographical proximity and cultural understanding - there should be constant frequent interactions between the parties to exchange the tacit knowledge.

Through industry-university collaborations the latter could enhance capabilities for fund- raising via engagement in individual firms (Brostrom et al., 2019) and could receive access to additional funds to research (Samuel et al., 2021). However, the factors that attract industry in collaboration other than funding schemes still are less studied. Besides financial reasons for collaboration, universities additionally benefit from the access to materials and data for academic research and projects as well from knowledge and technology transfer (Samuel et al., 2021). The motives to enter the collaboration could be differentiated into economic benefits, that include the provision of resources and equipment that are connected with the partnerships’ projects, and intellectual benefits, including training, development, learning and satisfying the stakeholders

(Nsanzumuhire & Groot, 2020). There are three categories of nonphysical resources that academia possesses and by this motivates industry to collaborate with universities — intellectual capital, that is on internal research capabilities and scientific knowledge; social capital, that is developed through the network of research and scientific relationships of others and positional capital, that is associated with the reputation of the scientists' institutions. (Wang & Shapira, 2012). Moreover, it is believed that the collaboration provides new opportunities for university PhD candidates by giving them access to courses, graduate schools, and research base (Skute et al., 2019). Additionally, universities benefit from the opportunity to foster the commercialization of the research results and from provision the platform for technology transfer, research rejuvenation and improvement of the curriculum (Samuel et al., 2021; Giones,2019; Sa et al., 2018). However, commercialization is ranked as the least important factor that motivates universities to engage with industry while research-related motivators take the dominant position. The results of the study of D'Este & Perkmann (2011) claim that majority of academics tend to engage with industry to elaborate the further research rather than to commercialize the knowledge. Additionally, it was concluded that the legitimacy of firms and government ameliorate the motivation of universities to enter in such collaboration but only in case that the parties are consistent with the goal to establish entrepreneurial university (Samuel et al., 2021). The congruence of similar values, goals and vision of the stakeholders included is the key factor that leads to the entrepreneurial success (Shams & Kaufmann, 2016).

However, referring to the different channels of engagement identified in blue cluster, different forms are motivated by different activities of universities. In such a way, patenting and spin-off company foundation are motivated mostly by commercialization whereas joint research, contract research and consulting are strongly linked with research-related activities. Additionally, the motivator as learning is also positively linked with higher frequencies of industry engagement across the mentioned channels, which are all actually based on such collaborations that involve personal contacts with industry side. The benefits described previously are directly interconnected with the notion of entrepreneurial university (D'Este & Perkmann, 2011).

Thereby, the context of such universities, where students could obtain the basic experience and entrepreneurial skills becomes of a great concern, especially for students who plan to start new ventures (Linton & Hasche, 2021). It was noted that the new ventures that collaborate with other stakeholders as universities, industries or government have more potential to achieve success than the ones that do not (Bandera & Thomas, 2018). Therefore, the external environment should ensure supportive network for the new ventures' establishment. The parties that should provide this

support includes investors, industry, teachers, and technology transfer offices (Linton & Hasche, 2021). The following parties help students to develop the collective cognition that is related to the definition of the entrepreneurship. Entrepreneurs should share a similar mindset through entrepreneurial endeavor. However, Larsson (2019) during his experiments with team cognition concluded that only on the first steps of decision-making entrepreneurs' cognition is common, whereas later on due to the lack of transparency, communication, trust, and organizational culture it disappears. Therefore, collective entrepreneurial cognition may exist only to a partial extent (Larsson, 2019).

Engagement of different parties to coming up to the common solution is crucial. To engage all interested parties into co-creation process and to ensure their participation organizational dynamic capabilities and mindset should be redeveloped. (Shams & Kaufmann, 2016). Consequently, the importance of entrepreneurial university in innovation system is rising as well as the importance of university-industry collaborations. Therefore, traditional universities need to shift the focus towards transformation into entrepreneurial universities. The reason is that successfully introduced entrepreneurial university models stimulates the development of the entrepreneurial mindset and activities during studies (Giones, 2019).

The most common ways for universities to become entrepreneurial are either started creating new ventures or educate students become entrepreneurs (Linton & Hasche, 2021). However, the process of becoming entrepreneurial university is more complicated. Firstly, universities have to prioritize their goals as entrepreneurial competencies development through attracting human capital, engagement in technology transfer, innovation, in social and regional developments (Secundo et al., 2017). There is a list of activities that can enable to help universities prioritize the previously mentioned goals that include research, licensing or patenting, consulting, technology parks creation, education, contract research activities, industry training, and grant application (Skute et al., 2019).

Dalmarco et al. (2018) have proposed a framework of how to set entrepreneurial university, that includes five discrete dimensions:

- Entrepreneurial perspective that includes the university provision of lectures devoted to entrepreneurship, aiming at expansion of awareness among students on the topic of identification and response to markets or technology opportunities.
- External links of academics, ensuring their participation in local and international applied research domains.

- Access to university resources, proving that potential entrepreneurs are free to use university's laboratories for experimenting
- Innovation arrangement, meaning that the university should provide area for innovation, namely support infrastructure, such as Entrepreneurship Center, Business Incubator, TTO and/or Technology Park.
- Excellence in scientific research - the university beforehand has a well-structured research groups and postgraduate courses, ensuring the quality of the carried research.

The main challenges considering start of entrepreneurial university include the following issues: lack of cultural affinity in the program designs, resource intensiveness, and lack of trained faculty and staff or lack of expertise and funds (Qureshi & Mian, 2021). In the case of entrepreneurial university lack of financial resources such as grants or reduction in public education budget are also obstacles for knowledge acquisition and, consequently, for innovation (Giones, 2019).

To fully transit to the model of entrepreneurial university, the purposeful activation of university-industry partnership is crucial (Giones, 2019), however the exact ways how industry can affect the transition is not studied yet. Nevertheless, there are different channels through which the collaborations could be established. The channels that are related to the entrepreneurial activities such as licensing, patenting, and spin-offs are considered as commercial channels and are the least preferred by academics as well as the least preferred by industry. The choice of the channel is directly linked to the benefits that university and business can get. Both parties establish a link between firms' benefits and researchers' characteristics with the help of which they could detect project channel, intellectual and property right (IPR) channel, and the HR channel as the best channels for interconnection aiming at maximization of the benefits of all parties included (Nsanzumuhire & Groot, 2020). In their review, Nsanzumuhire and Groot (2020) divide informational channels into two categories, one concerning the traditional university, and another is related to entrepreneurial university. Whereas there are also factors from the perspective of industry and university on which they rely on when choosing the channel. In such a way, industries pay more attention on innovation capability, innovation strategy, type of Public Research Organization (PRO), origin of firms, whereas universities focus on fields of knowledge, areas of specialization, origin of funding, qualification, and the size of the research group (Nsanzumuhire & Groot, 2020).

Nevertheless, there are still barriers that complicate the collaboration between industry and university. Mainly, conflicts emerge out of different visions of the collaboration that could include the misunderstanding in working practices of each other as well as in opportunistic behavior (Linton &

Hasche, 2021). Giones (2019) in his study divide barriers for collaboration in terms of entrepreneurial value creation into orientation and transaction. The first ones include the notions concerning the vision of collaboration from the sides of both parties such as the distance between pure and applied scientific research, long and short orientation of academic research as well as different approaches in work. Meanwhile, transaction barriers include the distance between parties in terms of additional transactional costs such as unclear impact of research or the need for specific deliverables in the industry context, misunderstanding linked with IP or confidentiality arrangements, incompatible rules and regulation, and the limited capabilities of universities to establish collaboration with firms in business context (Giones, 2019). Additionally, the following barriers could also be categorized into misalignment barriers; motivation related barriers; capability related barriers; governance-related barriers and contextual barriers (Nsanzumuhire & Groot, 2020).

To overcome the following challenges or facilitate them several enablers were identified. The majority of scholars conclude that provision the appropriate level of trust and communication are the key activities to overcome the barriers (Linton & Hasche, 2021) because successful relationships entail the certain level of risk (Nsanzumuhire & Groot, 2020). Trust between industry and university includes easiness in knowledge exchange and information flow even involving materials that should not be released publicly (Giones, 2019). Scholars concluded that the most useful way of building trust is to enter in collaboration from existing relationships (Nsanzumuhire & Groot, 2020). The reason is that prior experience in collaborations eases the preparation and organization as it already knows some potential risks and ways to manage them (Giones, 2019). Other ways to overcome barriers include the geographical proximity between business and university as closeness have a positive effect on interaction likelihood and novel innovations. Even when there is a significant distance between the university and industrial, there are ways to introduce intermediary organizations such as TTOs or joint research centers that serve as a bridge, and consequently increase the proximity accumulate knowledge and generate trust (Giones, 2019).

Consequently, entrepreneurial universities impact both internal and external stakeholders, overall, the whole community (Dameri & Demartini ,2020). Fischer et al. (2021) identified that, entrepreneurial universities could achieve successful societal engagement through adopting leadership and governance systems facilitating the promotion of organizational culture that is focused on frugal innovation. In majority of the cases, it is related to deeper integration of all stakeholders involved that would lead to democratization of the decision-making process, closer mapping of scientific priorities



and social needs and greater trust and transparency and by this force the university–industry collaborations.

Based on the literature discussed the following research gap for this cluster was identified:

**Research Gap (Red)** - In the literature covered it was stated that university transition towards entrepreneurial model fully depends on university itself. All the steps and ways to transit are performed by the university independently. Additionally, it was studied that collaboration with industry happens only after a university's transition towards an entrepreneurial model. There were no studies concerning the way industry can affect and facilitate the transition as well as there were no cases where partnership occurs before university's transition. Therefore, it is important to study whether UIC can contribute to the transition.

Therefore, the following research question addressing the described problem is identified:

**Research question 2.** How industry and UIC contribute to the university transition towards an entrepreneurial model?

### **1.3.3. UIC, higher education and academic entrepreneurship perspective**

As it was already mentioned in the previous cluster, recently, university–industry collaborations have been concerned as a source of knowledge development and new technological advancements, that boosts the economic and innovative development of local regions (Skute et al., 2019). There are three forms of these collaborations: academic entrepreneurship, educational collaboration, and research related collaboration (Nsanzumuhire & Groot, 2020). Both red and yellow clusters are dedicated to university–industry collaborations from the perspective of university and technology transfer, however the difference is that the focus of red cluster is predominantly on the research side of the university and entrepreneurial university development for knowledge commercialization, whereas yellow one describes universities as institutions of higher education that transfer knowledge, here entrepreneurial mainly, with the aim to develop entrepreneurial mindset. Therefore, the yellow cluster could be considered as an intermediary between the red and green ones.

Mariani et al. (2018) stated that the university plays a key role in the development of regional economy and in society through innovation and technology transfer. The universities are expected to establish incubation centers for young students where they can release their innovative ideas and receive appropriate support for start-ups launch (Jabeen et al., 2017) as well as lose the research 'ivory tower' by establishing an entrepreneurial university targeting socio-economic development (Mariani et al., 2018). Therefore, from the university side there are four mechanisms for collaboration: students'

projects, thesis projects, tailored degree courses, and jointly organized courses. Through these mechanisms, university and industry could go through three phases of relational learning process, which are share knowledge, joint sense-making, and knowledge integration. (Nsanzumuhire & Groot, 2020). Moreover, universities now have become fully responsible for the innovation fostering and technological transformation (Mariani et al., 2018). The reason is that universities now can address the importance and need of new ventures creation with an aim to achieve economic growth through motivation of their students towards entrepreneurial activities (Piperopoulos, 2012)

Higher education is crucial for entrepreneurs' perception and confidence. Universities are centers of higher education and therefore, can play three major roles related to entrepreneurship: creation of entrepreneurial culture that links all activities, provision of entrepreneurial courses, and, finally, provision of special training courses for those who want to start their own venture (Jabeen et al., 2017). Piperopoulos (2012) identified that university educated graduates are more likely to pursue self-employment in comparison with their non-university educated analogues.

Jabeen et al. (2017) proved that in case a higher educational institution provides relevant knowledge for students and inspire them for entrepreneurship, through increased awareness and understanding of entrepreneurship as a process, the chance that these students would choose an entrepreneurial career are higher. Moreover Jabeen et al. (2018) concluded that social networking, risk tolerance, self-efficacy and need for achievement could play a crucial role in the entrepreneurial intentions. In the study of Piperopoulos (2012) none of those who studied entrepreneurship during their degree programs became unemployed, all of them had no failures, and showed relatively quick career growth from self-employment to micro and small business ownership.

Entrepreneurship thereby should be involved across the whole university curriculum, not limited to business courses only. Moreover, for raising entrepreneurial intention, universities could and should provide cross-curricular courses that include more specific training on business creation and development. The attention should be paid to curricular design as it should include courses on decision-making, effective communication, entrepreneurial negotiation, leadership, effective and efficient use of sources, new product development, creativity and critical thinking, and service-based and technological innovation (Jabeen et al., 2017). The study should be carried through students' projects, theses, lifelong learning, and students' mobility, jointly organized courses and tailored degree courses. Through these channels, both partners - university and industry - are involved into three-phase relational learning process, that includes sharing knowledge, joint sense-making, and knowledge integration (Nsanzumuhire et al., 2021)

Entrepreneurship education has been raised during past few decades from a single course offered in the university to a diverse range of programs including undergraduate, postgraduate, and lifelong learning programs (Piperopoulos, 2012), however it will be described in more details in next cluster. During the stage of programs development and designing intervention to foster entrepreneurship it would be better to provide inputs at the higher secondary school level rather than after completion of professional level of education or, even worse, when a person fails to get a job. (Jabeen et al., 2017). Moreover, several aspects should be integrated in terms of curriculum delivery. There are five major activities via which industry can be educationally engaged: internships or cooperative learning, industry tours or field trips, guest speakers, project-based learning, and problem-based learning (Nsanzumuhire et al., 2021)

Creation of synergy among students from unrelated faculties as management and physics, as example would help in the enlargement of the entrepreneurial skills through the exchange of ideas, information, and knowledge. The evidence can be found in the studies of Jabeen et al. (2017), claiming that there is no difference in the entrepreneurial intention of young students with a business background and those who do not have it (Jabeen et al., 2017).

Additionally, it was stated previously that universities are now engaged into so called “third mission”, therefore, there appeared activities related to it and consequently scholars began to refer to an entrepreneurial university model. One key aspect of it is the ability to convert knowledge derived from research into business ideas through creation of industry-university collaborations or spinoffs (Mariani et al., 2018).

The third mission is designed with the aim to encourage the direct usage of knowledge and to impact social, cultural, and economic development of the society. That follows, that the university has four main activities to realize technology transfer and innovation (Mariani et al., 2018). Namely they are:

- Formation of an entrepreneurial culture for both, students, and researchers
- Protection of intellectual property and the commercialization of patents
- Support for academic spinoffs
- Collaborations with industry through different channels

Thereby, the motivation of researchers to collaborate with industry is hidden in factors associated with the aim to be engaged in commercialization of research results or/and in technology transfer activities. The following factors include reputation, financial rewards, and self-satisfaction created from solving challenging problem. Nevertheless, motivation varies for different researchers

depending on their value orientation. Researchers with traditional orientation are mostly motivated by reputation and career reasons (for example gaining funds to enhance their research interests), whereas researchers with entrepreneurial orientation are interested even in generating income from their research results. (Nsanzumuhire et al., 2021). Therefore, universities benefit from both intellectual and economic sides (Nsanzumuhire & Groot, 2020). However, the industry's side criteria that motivates the selection of particular academic partner for a collaboration remains an underexplored topic (Skute et al., 2019)

Proceeding to the barriers for collaboration from the prospective of university and higher education it is important to mention that different scholars have proposed different categorization of the boundaries. Another classification from the same study includes 5 groups of barriers: misalignment barriers, motivation related barriers, capability related barriers, governance-related barriers, and contextual barriers (Nsanzumuhire & Groot, 2020). Whereas Nsanzumuhire & Groot (2020) identified disciplinary, institutional, and other cultural boundaries between the partners, whereas Tartari et al. (2012) divide them on "Williamson" and "Mertonian" barriers.

"Mertonian" barriers are created in result of the lack of agreement about such issues as focus of research projects, working priorities, expectations about research and timing of dissemination of research findings that occur during university-industry collaboration. Simply it is orientation conflict between academics and industry. "Williamson" barriers are the costs of dealing with the standards and regulations from the university side and conflicts over intellectual property with industry side. One of the example of "Williamson" barrier is university technology transfer office. The reason is that university bureaucracy imposes such a procedures that are too rigid to match the particularities of specific technology transfer processes. (Tartari et al., 2012).

However, there are also identified two pools of costs from the university side connected with interaction between university and industry that could be evaluated as barriers to engage in knowledge transfer, and consequently, barriers to collaboration: secrecy and subject skewing. The skewing problem is based on the fear that following collaboration might raise constraints on the university scientists such as on the autonomy to elaborate research agenda. The secrecy problem alludes the extent to which this collaboration could be associated with standards on the disclosures of research findings and dissemination of research results (Tartari et al., 2012). Overall, according to Tartari et al. (2012) orientation barriers are more strongly perceived by university side than transaction barriers.

Moving to the different ways to establish collaboration, it can be highlighted that most studies on industry – university collaborations focus on research collaboration (Nsanzumuhire et al., 2021).

However, in this cluster we would discuss academic entrepreneurship. The main difference underlies in the fact that research collaboration tends to be informed by research-related rationales, whereas academic entrepreneurship by an explicit desire to acquire financial returns on academic knowledge (Perkmann et al., 2011). Academic entrepreneurship is defined by Nsanzumuhire et al. (2021) as the process via which a researcher or student could conduct innovative research the results of which would lead to commercialization. The concept of academic entrepreneurship has been shifted firstly, from traditional focus on generating direct financial returns to achieving social and economic benefits as well and secondly, from the traditional spinoff, licensing, and patenting to students' start-ups and job creation (Nsanzumuhire et al., 2021). Therefore, the support from the academic staff in entrepreneurial university to students, developing their entrepreneurial mindset, with business ideas in their start-up process is essential (Dalmarco et al., 2018).

Academic spinoffs are considered to be key driver of knowledge and technology transfer activities (Mariani et al., 2018). The founders of these spinoffs could develop entrepreneurial competencies as well as mindset through adding experience to their teams from the university-industry collaboration or transfer opportunities to those parties who already possess required knowledge (Fini et al., 2019).

The hypothesis of Dalmarco et al. (2018) about the importance of academic entrepreneurship and necessity of more attention to be paid to developing in students entrepreneurial mindset and intention and support students with business ideas in their start-up process, has been there proven by Nsanzumuhire et al. (2021), that in their findings identified the low perceived level of engagement of academia in academic entrepreneurship activities as conducting research dedicated to novel invention or presenting it for patent and developing a business idea from research results

From the perspective of knowledge development and transfer, universities are promoting an entrepreneurial mindset, stimulating new businesses, and creating new jobs (Mariani et al., 2018). Jabeen et al. (2017) claimed that education that has focus on entrepreneurship motivates students to gather human capital that is required for entrepreneurship itself. The scarcity of resources leads students to organization of particular human capital to achieve the entrepreneurial opportunities. (Jabeen et al., 2017). Human capital is concerned to be a part of intellectual capital. In terms of social contribution intellectual capital have the following components: human capital, structural capital, and relational capital. Human capital refers to people as, professors, researchers, technical staff, administrative staff, and students as well as their skills including knowledge, and experience. Structural capital includes databases, intellectual property, research projects, routines, and all other

intangible resources existing in organization. Relational capital is system of relationships between private and public partners (Mariani et al., 2018).

Intellectual capital represents a key source for competitive advantage for any enterprises. It is defined as an intangible asset that creates value and provide benefit, such as social welfare and/or progress. The literature concerning IC is mostly dedicated to the private sector, whereby IC in public and non-profit organizations, with a focus on higher education and research institutes and the value creation process in the public sector has been started to study only a decade ago (Mariani et al., 2018).

Based on the literature discussed the following research gap for this cluster was identified:

**Research gap (yellow)** – in the studies university is described as only one figure that is responsible for provision of higher education, regardless of the notions of entrepreneurial models. However, the role of industry in teaching and sharing their expertise is not yet studied. Additionally, one of the major reasons for collaboration is said to be knowledge exchange between parties, however, taking into account the studies in the red and yellow clusters it could be stated that industry is considered to be knowledge receiver, and the exchange is only one-sided, as universities are the knowledge providers.

Therefore, the following research question addressing the described problem is identified:

**Research question 3.** What is the role of industry and UIC in higher education in terms of entrepreneurial skills development?

#### **1.3.4. UIC, knowledge transfer and entrepreneurial mindset formation perspective**

The last cluster is dedicated to narrowing all the previous studies to the notion of knowledge transfer and entrepreneurial education (learning), its importance, common ways to establish and the influence of this education on entrepreneurial mindset creation.

Universities are key players in terms of provision of new knowledge that could affect innovation systems of the local regions. Therefore, considering the raising importance of knowledge and innovation, universities actively respond to industry needs (Berbegal-Mirabent et al., 2013) As such, active implementation of the third mission is essential for academies, even taking into account that many universities combine their activities of teaching and learning, with knowledge transfer, however, still forget about the university's third mission - business incubation (Towers et al., 2020).

Universities that hire more business experts to look for potential partners for collaboration could facilitate interaction between academia and business, consequently contributing to intensification of such partnerships (Huang & Chen, 2017). Meanwhile, knowledge-intensive

enterprises should have individual and organizational capacities and competencies that enable them to create economic and social value through implementation of innovative business models and transformation of new ideas, technologies, and inventions (Secundo et al., 2017).

Knowledge is a crucial strategic resource, difficult to imitate, that aims at achieving sustainable competitive advantage, therefore firms are interested in knowledge-transfer to attain this advantage (Qureshi & Mian, 2021). As it was already mentioned, “knowledge transfer” and “technology transfer” are substitutes, therefore the parts of the literature review in different samples are highly interrelated between each other, however mostly the latter terminology is being used (Dameri & Demartini, 2020). Therefore, adding to the previous clusters, Qureshi & Mian (2021) in their study propose a model of knowledge transfer where there are two main players, namely sender, who share the knowledge and receiver, who absorb it. Two main processes are communication and interpretation. In discussion of knowledge in university-industry collaboration commonly two types of knowledge are considered: tacit knowledge and codified explicit knowledge. The latter is transferred via formal modes such as written reports, publications, patents, and licenses, whereas tacit one through more informal and continuous interactions between university and industry (Nsanzumuhire & Groot, 2020). Qureshi & Mian (2021) have also identified two factors that lead to successful knowledge transfer: quality of the practice, and quality of the transfer process. Quality of the transfer process depends on the delivery capacity of the sender, the absorption capacity of the receiver, and relationship between both that should be based on mutual trust and motivation. Whereas in the same study it was identified two types of barriers. Firstly, from the sender side people that are engaged in knowledge transfer could not be open to communication and could resist sharing their knowledge. Secondly, the difficulties can arise because of context and cultural issues. Context heavily influences knowledge transfer as industries or even universities in their routine activities develop their own terminology and other tacit knowledge that could be misunderstood by those who receive knowledge outside the organization.

Entrepreneurial universities should be established not only with focus on fostering frugal innovation, knowledge generation and knowledge transfer but also with focus on students’ acquisition of the appropriate skills and knowledge to address current social demands. For this, an emphasis should be established on problem-based learning and entrepreneurship education programs across a variety of scientific and social disciplines (Fischer et al., 2021).

The promotion of entrepreneurial education has been considered a crucial element for sustainable social and economic development since 2008, when the Global Education Initiative of the World Economic Forum initiated it (Zobnina et al. 2019). Consequently, many countries around the

globe have started to integrate entrepreneurship education and training in their curriculum and the ways to sustain it. Additionally, universities have started to research what drives entrepreneurial intentions to understand the required focus (Jabeen et al., 2017). The final goal of entrepreneurial learning is to develop a combination of awareness, capability, and entrepreneurial mindset (Secundo et al., 2017).

Entrepreneurship education and training are crucial for identification and development of the entrepreneurial potential among young talents to foster their engagement in economic development of any region (Jabeen et al., 2017). It could also provide insights towards development of entrepreneurial skills, mindset, and attitudes; it can also have an impact both on current and future behavior and intentions (Piperopoulos, 2012). The enhancement of entrepreneurial competencies is critical for higher education institutions and thanks to digital revolution the process of training entrepreneurially equipped students is being facilitated (Secundo et al., 2021).

Nevertheless, the current experience with entrepreneurial education is not so positive. In the interviews provided by Piperopoulos (2012) vast majority of respondents express disappointment with the way they are taught business and management in university, especially that existing curricula does not include any education on becoming an entrepreneur and starting new venture. Another case has shown that the majority of graduates fails to realize their entrepreneurial ambitions until about five years after graduating - therefore appropriate entrepreneurial education system should be established (Towers et al., 2020). Moreover, there are doubts that entrepreneurship education existing in business schools provide a vital effect on the quality and number of graduate entrepreneurs that will participate in the process of economic value creation, because entrepreneurial intentions could deteriorate during four-year studies (Piperopoulos, 2012). Additionally, the research in Russia by Zobnina et al. (2019) has found out that classical lectures format is not working well when teaching entrepreneurship. One of the participants of this study has claimed: "If you provide only lectures without projects, the course is not so lively." That proves the necessity to establish more practice-oriented project-based learning that would help to cover existing business needs and shift focus on learning by doing approach. Main problem lies in the limited understanding and lack of practice in terms of entrepreneurship (Towers et al., 2020).

The study of Towers et al. (2020) suggests that the novel model of entrepreneurial education pedagogy should involve practice of play, creation, empathy, and reflection that helps potential employees to experience the nature of business. Therefore, teachers should complement both formal and non-formal entrepreneurial education, so that entrepreneurial study programs would be designed



with non-cognitive (that is, constructive) teaching methods and learning outcomes. (Debarliev et al., 2020). Verzat et al. (2017) have identified main teaching methods that could release entrepreneurial mindset. They include courses on entrepreneurship, business games, case studies, academic projects, consulting or other real projects as business plan creation on real or imagined businesses. However, the most effective is considered the ones that are related to real businesses tasks. This form of education could be delivered in different formats as full-time bachelor's and master's degree programs, separate courses, certification programs etc. (Zobnina et al. 2019). Particularly, Secundo et al. (2021) in their study emphasized necessity of introduction of Contamination Labs through which students are involved in entrepreneurial education activities such as idea generation, creative thinking, elevator pitch, business games, business plan development and challenging projects proposed by partner companies. The main purpose of contamination labs is to ensure universities are completing their third mission. Additionally, such labs could have to establish proper connection with other corporations, businesses, investors, angel groups and venture capital funds that would positively affect development of entrepreneurial capabilities (Secundo et al., 2021).

Students can acquire tacit knowledge via informal entrepreneurship education by integration of practice-oriented approach that recreates the context in which entrepreneurial learning occurs (Debarliev et al., 2020). Context and real business practice highly impact entrepreneurial learning due to the reason that despite all the courses on the decision-making, networks etc., lack of real practice does not allow students to fully fulfil their potential as they do not see it as real-life project. Therefore, the capacity building should be closely linked with real business cases from university partners (Towers et al., 2020). Through the collaborations industry can help students to acquire necessary entrepreneurial experience through guest lectures, invitation of professional bodies and provision of toolkits for career planning that would cover the employers' needs (Towers et al., 2020).

Entrepreneurs are engaged in learning by doing process and indeed learn from everything from all engaged stakeholders to experience (Secundo et al., 2017). The study of Gordon et al., (2012), confirms that entrepreneurs tend to learn as and when they need knowledge and preferably through experiential learning. The study of Verzat et al. (2017) compares and study two different approaches on learning: teacher-directed and self-directed. Both of them include collaborative group work, projects accomplishment, action, and reflection, whereas differs in the extent of expertise and guidance by the professor and in the extent of autonomy, freedom and responsibility offered to the students. The result of the study confirms that more attention should be put on the self-directed learning and the responsibility for learning should be in the hands of learner, not teacher, and these

students should be proactive. Every student, indeed, has a talent to entrepreneurship to some extent, however the appropriate entrepreneurial education can help to develop and maximize it (Secundo et al., 2021). It is important to develop entrepreneurial mindset as graduates who has it are more likely to capture new opportunities. (Zobnina et al. 2019).

Recent literature has also noted the importance of emotions in students learning, because they are reactions on internal and external stimuli and could have different consequences for individuals. Another important component in education is freedom, as students would be more willing to share their feeling and experience “joy of being” and have more energy to study that will also generate new pool of emotions (Verzat et al., 2017). The studies of Debarliev et al. (2020) have found that informal entrepreneurial education is positively associated with the entrepreneurial mindset, knowledge and skills and affects human capital in general in greater extent compared to formal education.

“Entrepreneurial mindset” is defined as a specific state of mind that directs human conduct towards entrepreneurial activities, outcomes, opportunities, innovation, and new value creation. Individuals with entrepreneurial mindset are risk-takers and those who accept the realities of rapidly changing environment and uncertainty. Therefore, it is vital for the current enterprises to understand how an efficient and effective culture can nurture an entrepreneurial mindset encouraging firms and involved stakeholders to entirely engage in and support novel ideas, experimentation, and creative proposition (Shams & Kaufmann, 2016). Some definitions of it vary from a ‘way of thinking about entrepreneurship to gain benefit and advantage’ to “a growth-oriented perspective for promotion of flexibility, creativity, innovation, and renewal”. Additionally, entrepreneurial mindset is linked with emotional aspects and personality traits of entrepreneurs. Entrepreneurial mindset is defined as “a way of thinking about your business that captures the benefits of uncertainty” (Pidduck et al., 2021). Entrepreneurial mindset is also highly related to the ability of a person to see and exploit opportunities with no regards to the existing resources and taking into account changes in external environment may render opportunities unfeasible or inappropriate, regardless the entrepreneur's best efforts (McMullen & Kier, 2016). Østergaard & Marinova (2018) refer to the notion of human capital as a pool of knowledge, experience, and personality attributes that are focused on creation of economic value. Labour and educational skills, as well as knowledge, and experiences, therefore, are gathered from organized short and long-term educational institutions; formalized narrow and broad labor periods; as a tacit knowledge during all labor periods and educational courses. Entrepreneurial mindset is required to ensure that all entrepreneurial players are creative and confident in whatever they under all ambiguity, complexity, and vulnerability of the external environment (Secundo et al., 2021).

Entrepreneurial mindset is also defined as a state of mind that focuses human conduct towards entrepreneurial activities and results and that consists of two areas: cognitive that refers to the way of thinking and contrive that relates to the responding to external environment (Verzat et al., 2017).

Entrepreneurial skills include combination of knowledge, know-how, and experiences that were acquired and considered useful for implementation of professional activity. Entrepreneurial mindset focuses on proactive activities and responsibility. Majority of non-cognitive entrepreneurial skills are often closely related to the individual's mindset (Debarliev et al., 2020). Verzat et al. (2017) have studied in their research the relationship between proactivity and entrepreneurial mindset and the way how students could learn proactivity in the university. The results of the research have shown that proactivity is considered an essential component of entrepreneurial mindset and could be learned through collaborative teamwork, creative team spirit and positive emotions. Proactivity is characterized by the following patterns: feeling of inspiration, energy and enthusiasm, goal-orientation, desire to change, pleasure from studying, learning by doing. Then who could be considered as proactive people - the ones that capture opportunities, initiate activities, and persevere until reaching their aim. The main issue is that the study underlies that on the year of the research, namely 2017, there was not a lot of information concerning the learning and teaching methods to develop entrepreneurial mindset, and now till 2022, the topic has not been developed a lot (Verzat et al., 2017).

Jabeen et al. (2017) identified 10 strategic drivers through which universities induce entrepreneurial mindset. They include improvements of soft skills; establishing incubation centers in universities; introduction of the entrepreneurial courses across the curriculum; positive interventions by the government; establishment of strong university-industry interaction; introduction of platform for entrepreneurs to interact; provision of opportunities to interact within role models; development of synergies inside and outside the university; improvement of technical skills; and development of innovation skills. Additionally, the mentoring programs from industry to students boosts a collaborative mindset and improves student' interactions with business professionals (Jackson et al., 2021).

Pidduck et al. (2021) identified that in the existent literature on entrepreneurial mindset has identified two streams: cognitive schemas driven by opportunity beliefs and dispositional beliefs based on value beliefs and individual traits. Disposition mostly is described as "information available to the mind" including knowledge, feelings, and intuition. On the contrary, opportunity beliefs present the cognitive aspect of entrepreneurial mindset that boosts task completion; therefore, mindset

involves cognitive processes for goal achievement. Consequently, when both streams opportunity and dispositional believes are strong, then the likelihood of entrepreneurial mindset creation is higher (Pidduck et al., 2021). The presence of entrepreneurial mindset could be identified through occurrence in individual a set of personality traits, as self-efficacy, independence, precedence for limited structure, nonconformity, risk acceptance, proactivity, passion, and necessity for achievement. The important issue is that single trait can be associated with entrepreneurial mindset, it must include the mixture of the following traits (Pidduck et al., 2021).

Verzat et al. (2017) highlights several pedagogical principles, on how to develop courses to release entrepreneurial mindset in universities:

1. Provide students responsibility for learning process
2. Give students freedom to practically implement and manage learning process
3. Create for students' space for cooperative learning from each other and from other stakeholders outside the university
4. Let students reflect on their experience
5. Link project with tasks on innovation and responding to real business needs
6. Ask students to evaluate the course through formative means and external assessment

Based on the literature discussed the following research gap for this cluster was identified:

Research gap (green) - the literature studied there provided several examples of negative experience of entrepreneurial education and the main reason for that experience is said to be lack of practice. However, the precise studies concerning the appropriate study design to develop entrepreneurial skills and entrepreneurial mindset as well. Obviously, it was mentioned that for developing the following skills it is crucial to give more practical assignments as ordinary lectures are no longer working. Therefore, it is important to investigate, how precisely the study should be designed in order to develop required skills in students, and what roles do both parties of UIC play in establishing this education.

Therefore, the following research question addressing the described problem is identified:

Research question 4. How to organize study process in university through UIC aiming at development of entrepreneurial skills and mindset

#### **1.4. Summary of literature classification**

Overall, the following literature review has studied industry-university collaboration as in general as ecosystem with its motives, barriers, and channels as in more focused field – entrepreneurial

focus. It includes studying the reasons of establishing entrepreneurial university, main ways and barriers of its implementation, necessity of academic spin-offs and knowledge & technology transfer. Finally, it explores the issue of entrepreneurial education based on university-industry collaboration and necessity of practice-oriented approach through partnership with industries to fulfill entrepreneurial potential and release entrepreneurial mindset. Each of the cluster was analyzed independently and corresponding research question were formulated:

RQ 1. What are the goals of UIC in terms of the entrepreneurial educational process?

RQ 2. How industry and UIC contribute to the university transition towards an entrepreneurial model?

RQ 3. What is the role of industry and UIC in higher education in terms of entrepreneurial skills development?

RQ 4. How to organize study process in university through UIC aiming at development of entrepreneurial skills and mindset

## **2. RESEARCH METHODOLOGY**

### **2.1. Case study method**

For addressing the stated research questions the work would be focused on the case study approach. The following research method includes a detailed in-depth multi-faceted study of a particular field that regularly applied in social, educational, or business research (Crowe et al., 2011). The case study approach can include both qualitative and quantitative data analysis, however this research would be focused on qualitative data only in order to investigate different aspects of university-industry collaboration.

In particular, this research is hold on the basis of two cases of university-industry collaborations which are

- 1) Graduate School of Management Saint-Petersburg State University (GSOM SPbU later) collaborations with “Megafon” company (5G Dream Lab) and with VTB bank (VTB Innovation Lab).
- 2) Saint-Petersburg State University of Aerospace Instrumentation (SUAI later) collaborations with various companies

### **2.2. Data collection**

For this research, case study, the primary data would be collected. The research will use semi-structured approach to interview. This type of interview corresponds to qualitative data collection approach, where the series of already prepared questions are asked through two-way communication. The format of questions is open-ended, the order is predetermined but not necessarily obligatory to be followed (Given, 2008).

For this particular research, three stakeholders affected by the collaboration would be interrogated. Namely they are universities and industry’s representatives as protagonists in collaboration, and university student’s that are affected by the direction of collaboration. The predetermined list of questions prepared independently for each of the group could be found in the Appendices, Section C. There are 23,17 and 19 questions prepared for university, industry, and students correspondingly.

9 interviews were hold, namely with the head of 5G Dream Lab and VTB Innovation Lab in GSOM, head of VTB Innovation Center, Deputy Director of strategic development in SUAI, and six VTB Innovation lab participants, who are also GSOM SPbU 2<sup>nd</sup> year full-time master students.

## **2.3. Cases description**

### **2.3.1. GSOM SPbU collaborations case**

GSOM SPbU – is a leading Russian business school that trains specialists in the field of management and administration, international business in undergraduate, graduate, postgraduate, MBA, Executive MBA, and corporate advanced training programs. Main goals of the university are to provide knowledge, develop leaders and change world to best<sup>1</sup>. In 2019 the previously mentioned university launched the joint project with Megafon company – 5G Dream Lab on the basis of GSOM campus and will become a site for the development of services based on fifth generation network technology<sup>2</sup>.

Megafon is its turn is a leading provider of integrated digital communications. Around Russia. The mission of the company is to develop and provide opportunities to its clients in the digital world<sup>3</sup>. The project is focused on the development of specialists that will create new digital products through working with 5G technologies. Students of 3<sup>rd</sup>-4<sup>th</sup> year of bachelors, masters, and recent graduates of SPbU are welcome to participate. The result from participation is a creation of a valuable product and development of required skills for digital business conducting. The feedback from 1<sup>st</sup> year Lab graduates claim that they were satisfied from working on a real business case that found real implication in the world.

From the main results of the collaboration the following can be mentioned:

- In July 2020, the first graduation of students from the laboratory took place, where teams of students from various fields of St Petersburg University developed an MVP based on 5G technologies. The study program was held 8 months including online courses on skills improvement and practical tasks<sup>4</sup>

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<sup>1</sup> About GSOM. GSOM official website. Retrieved from: <https://gsom.spbu.ru/about-gsom/>

<sup>2</sup> About 5G Dream Lab. Official website. Retrieved from: <https://5gdreamlab.spbu.ru/>

<sup>3</sup> About Megafon. Megafon official website. Retrieved from: <https://corp.megafon.ru/about/>

<sup>4</sup> First results of 5G Dream Lab (2020). GSOM News. Retrieved from: [https://gsom.spbu.ru/all\\_news/event2020-09-9/](https://gsom.spbu.ru/all_news/event2020-09-9/)

- 2 teams were engaged in the development of tariff plan design for the youth audience. Plan was design for a youth audience of 14-24 years old, through conducting a study of the competitive environment in Russia and abroad, trend analysis, calculation of tariff subscribers' dynamics, revenue, and margin for the upcoming year<sup>5</sup>
- Laboratory participants have developed a neural network that helps a person with disorders of the heart and brain. They developed a mobile application for monitoring the body's water balance and calorie absorption, analyzing the user's health status, and receiving recommendations on taking vitamins and pills, a technology for recognizing, fixing, and monitoring human body temperature for an access system, and a solution for tracking the location of an employee during the working day. The participants experienced 10 online-courses, 7 webinars and tens consultations by mentors from both GSOM and Megafon in only 5 month<sup>6</sup>

Last year, in 2021, GSOM launched one more joint project with VTB bank – VTB Innovation Lab<sup>7</sup>. VTB is Russian universal commercial bank with state participation, working as with corporate clients as physical bodies<sup>8</sup>. The project welcome 3<sup>rd</sup>-4<sup>th</sup> year bachelor students, masters of GSOM to participate. The Lab proposes the real business tasks aiming at enhancement of the products, technologies, and communications and development of innovative solutions. The main result for the first year of Lab is successfully hold case championship, where three teams presented the results of their projects which now are implemented. Two teams worked for the ecological project in Izhevsk and provided different solutions for the problem identified by the company. The third team introduced a service for booking meeting rooms, co-working spaces, conference rooms and other office spaces - by analogy with calling a taxi. Overall, VTB had 38 cases, providing opportunity to students prioritize them. VTB Laboratory is the first experience for the GSOM and VTB collaboration in a format where GSOM students could work on real bank cases in the format of distant practice. The Lab showed high efficiency of the proposed format of joint creativity of the

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<sup>5</sup> First results of 5G Dream Lab (2020). GSOM News. Retrieved from: [https://gsom.spbu.ru/all\\_news/event2020-09-9/](https://gsom.spbu.ru/all_news/event2020-09-9/)

<sup>6</sup> New program developed (2021) Gsom News. Retrieved from: [https://gsom.spbu.ru/all\\_news/event2021-04-29/](https://gsom.spbu.ru/all_news/event2021-04-29/)

<sup>7</sup> VTB Innovation Lab. Official website. Retrieved from: <https://career.gsom.spbu.ru/inn-lab-vtb#rec302062826>

<sup>8</sup> VTB bank. Official website. Retrieved from: <https://www.vtb.ru/about/bank/>



Bank's employees and GSOM students and received high marks from participants on both sides. The GSOM SPbU team and the VTB Innovation Center plan to make the Laboratory a regular project<sup>9</sup>.

### **2.3.2. SUAI collaborations case**

Saint-Petersburg State University of Aerospace Instrumentation - for almost 80 years is considered to be the leading scientific and educational institutions around the world in the field of aerospace complexes, control systems, and the latest educational technologies. Artificial intelligence, cloud technologies, Big Data, the Internet of things, unmanned aerial vehicles, robotics are priority areas for the scientific development of the university. The creation of industry and problem laboratories in these areas is the primary task of the SUAI School of Engineering, a new educational and scientific department of the university, which was opened in 2016. Its task is to bring the training of engineering personnel to a higher level, to establish effective interaction between education, science, and industry<sup>10</sup>.

Since 2020, the Institute of Entrepreneurship Technologies, together with the SUAI School of Engineering, has been developing the "Technological Entrepreneurship" competency. It is dedicated to the creation of innovative technological solutions, search for market niches, the creation of a company for the subsequent commercialization of new technologies. Students try on the role as entrepreneurs: identify the target audience, conduct problem interviews, develop the product, calculate the economics of the project, and then present their technology projects to investors<sup>11</sup>. On June 27 2022, SUAI plans to launch Institute of Technological Entrepreneurship<sup>12</sup>

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<sup>9</sup> VTB Innovation Lab in GSOM. GSOM News. Retrieved from: [https://gsom.spbu.ru/all\\_news/event2021-08-](https://gsom.spbu.ru/all_news/event2021-08-)

<sup>10</sup> SUAI. Official website. Retrieved from: <https://new.guap.ru/>

<sup>11</sup> SUAI. Technological Entrepreneurship. Retrieved from: <https://guap.ru/wsr/tpr>

<sup>12</sup> SUAI. Institute of Technology Innovation. Retrieved from: <https://new.guap.ru/i08>

# RESEARCH RESULTS

## 3.1. Findings from interviews

There were held 9 interviews with various universities, business representatives and participants of Laboratory. The interviews with students included 19 questions concerning the experience in Lab, main skills developed and challenges as well as experience of their studies besides laboratory in GSOM to understand the experience of collaboration and effectiveness of studies from the student perspective. Detailed results of each participant response are gathered and summarized in the Appendix D. Interviews with universities included questions concerning main motives of collaboration, current results in terms of entrepreneurship skills development, study design and goals set in terms of entrepreneurship. The same issues except for study design were discussed with industry representatives.

The results of the interview, first of all, have shown that, indeed, universities' management is of a high concern about entrepreneurship development. As an example, Tatiana Leontieva, Deputy Director of strategic development in SUAI highlighted:

*“Our university does not have the same experience in entrepreneurship as GSOM or any other management or economics university has. We now are only on the beginning of our way towards entrepreneurship, but we want to develop it and set it as obligatory course next year”.*

GSOM has already introduced some elective courses devoted to entrepreneurship and include different tasks and projects enabling entrepreneurial skills and mindset development. To develop entrepreneurial skills and mindset GSOM has launched two innovation laboratories – 5G Dream Lab and VTB Innovation Lab. In both labs as Rostislav Speranskiy, head of 5G Dream Lab and VTB Lab in GSOM, has claimed the main motives from the university side are “develop student's project thinking and entrepreneurial mindset”. Whereas in these two Lab cases companies' interests initially was not the same as for GSOM. Megafon wanted “to hold a PR exercise and force employer brand name”, while VTB wanted “to develop internal entrepreneurship and give employees to develop their own initiatives”, - shared Janna Khomyakova, head of VTB Innovation Center. Additionally, Janna has noted that in majority of the cases when people want to implement their ideas into reality, they do not have enough resources to do it, and consequently VTB wanted to gather new ideas and new view from young students to develop creative thinking and innovations. That were initial goals that were set before the Labs started. During the Labs the goals have been

mixed, as they didn't contradict each other's but rather complement others, as a result GSOM not only achieve own goals but also increase its brand name and had the same PR exercise. Whereas Megafon started "to care about student's entrepreneurial mindset development through the employer brand" and VTB managed to "reveal students that could work in the area of entrepreneurship and provide an offer to one of the students, however hunting was not the goal of collaboration", - told Rostislav Speransky and Janna Knomyakova, respectively. Rostislav also shared what students have written in their forms to apply for the 5G-Dream Lab. Therefore, the main motives for them were desire to work for a real business company, receive practical skills for solving business projects and communicate with real business representatives. The same motives were highlighted during the interviews with students participating in VTB Innovation Lab. All respondents come to the Lab with an aim to pass summer internship through the interesting and involving tasks that direct real business problems as they wanted to contribute to the company's performance on the market and create valuable solution. Additionally, everybody is satisfied with the results achieved during project, especially as they saw interest from the company to create really meaningful solution.

SUAI in its partnerships with such companies as RZHD, Gazprom-Neft, Rosset' is motivated by increase of brand name recognition, reputation, and commercialization of activities through development of creative and talented students, whereas these companies want accomplishment of some project tasks or employees hunting. Both of Labs have achieved appreciable results in terms of economic value creation. Rostislav Speransky claimed that Megafon has already implemented some of the ideas developed by students during Labs. VTB has also achieved results Janna Khomyakova has claimed:

*"Two initiatives developed by students are now in the process of implementation in VTB bank, and one is implementing outside VTB as a personal project of our employee. As we wanted initially to develop internal entrepreneurship in VTB, we can state that we fully achieved our goal, because as a project that is unrelated to our common operations is developing to be introduced to the market by our employee, it means that he became entrepreneur. It is interesting that three out of seven mentors that were chosen to include their projects into VTB Lab have passed special coaching innovation trainings during VTB Lab. Exactly the projects of these three now are in the process of implementations. It could mean that coaching innovation sessions helped mentors to achieve positive results".*

Therefore, the main conclusion is that coaching sessions and provision of mentors, indeed, affect and directs students or even employees towards right path to create each own entrepreneurial project. VTB Lab worked in the following way: each of the mentor has each own idea and after students has chosen their priorities mentors worked directly with corresponding teams. They set deadlines, provide required information and resources, on the calls support students ideas and support them on the following tasks. Tatiana Leontieva also mentioned mentorship during the acceleration program organized by Gazprom that is unrelated to the educational process to understand the basis of entrepreneurship. In addition to mentors, there were courses consisting of 10 modules and guest lectures.

Rostislav Speransky has also mentioned that initially there was prepared a special set of courses aiming to prepare students to solve the existing tasks process in the 5G Dream Lab, however eventually, they understand that the courses have not lived up to expectations:

*“We created a set of courses that students have to pass in order to develop entrepreneurial skills. From the beginning we thought that without profound obligatory education there is no way to solve tasks, but it was not so obvious to students to understand what they need; therefore, they missed a lot of courses but even if they passed, they showed the high level of incomprehensibility. That’s the reason why we decided to transfer educational courses in the form of ‘by request’. People do not often understand their field of incompetence that should be improved and until they understand it, they will not be willing to study. Then we need to shake their confidence that they know everything, in order they recognize their gaps and want to fulfil them. Even more we have to teach them how to find information and how to study it, like ‘I don’t know it, but I know where to find it’”.*

Tatiana Leontieva has also confirmed that overwhelming majority of the students have no understanding of the importance of entrepreneurial skills and mindset in their future life, therefore do not know whether they want to become entrepreneurs or not. Current students that are engaged in some entrepreneurial project then could not manage to solve them properly, due to the lack of experience, as basic education is required. SUAI, consequently, decided to introduce obligatory course of entrepreneurship to their 2<sup>nd</sup> years bachelor students in order them to understand the basic and necessity of entrepreneurship. GSOM students for example claimed that not all of them see themselves as entrepreneurs, but they have basis of entrepreneurship and university create the conditions to know how to behave if they decide to create a venture. However, Janna Khomyakova

declared that “with only academic education there is no way to learn entrepreneurship and develop entrepreneurial skills and mindset, as practice here is essential”. Learning by doing approach has been highlighted by all the speakers as from industry-university side as from students. The practical tasks from the real companies have been highlighted to be essential part of acquiring the skills from all the respondents. Rostislav Speransky said that during Megafon Lab they “through students into the conditions as cats into swimming pool in order they managed to do and learn everything by themselves”, the same learning by doing was mentioned by Janna Khomyakova, as in VTB they also allowed students to organize work and distribute entire tasks by themselves and actually perform them. Tatiana Leontieva has also claimed that:

*“Currently universities suffer from the lack of practice, however if students would pass internships or practical exercises on their own projects or start-ups, this would be the most effective scenario, it is current environment, and they would definitely learn faster”.*

Students claimed that during studies in GSOM the important skills they have developed are analytical thinking, decision making, communication, strategic planning, time-management, teamwork, creativity, time management, adaptation, seeing opportunities and see the wider prospective, delegation, empathy – them all are entrepreneurial skills and linked with entrepreneurial mindset. Students highlights that almost all skills are developed during project works for real business problems that were proposed by companies during studies. All respondents experienced such projects and unanimously claimed that they contribute to their entrepreneurial skills and mindset development as they are fully directed to the real cases of the companies, and therefore requires more serious approach to solve it. There is where leaning by doing force all the skills development. From such tasks also motivation in increased and therefore – proactivity develops.

Moving to the guest-lectures as a form of knowledge transfer from industry to university, non-students respondents has claimed that ordinary business representatives will not bring enough knowledge in terms of entrepreneurship even when they have practical tasks to accomplish. Rostislav Speransky, has said:

*“Such practical tasks are project ones and can give the basis for entrepreneurial mindset but do not teach students to be entrepreneurs. Entrepreneurship is defined as a possibility to see opportunities beyond the resources controlled, that is about the ways how to possess the resources and how to market them. The difference is that during project thinking, ordinary tasks from the*

*companies, students consider actions that are within set of resources, whereas entrepreneurial mindset for sure should include antecedent and posterior steps to project thinking as how to make somebody give me the resources I don't own and how to sell that resource further”.*

Therefore, Rostislav Speransky said that “it’s not so important to communicate with business representative as with their founders and real entrepreneurs, because if I want my own business why then I need some lectures of middle managers”. Tatiana Leontieva has also confirmed that “it is important for students to hear about others experience, about the types of start-ups, how to start them etc.”. Janna Khomyakova agreed with the previous speakers that exactly ‘current active entrepreneurs influence and could inspire students to become entrepreneurs”.

From the students’ side in terms of current studies besides the lab, the interview was focused on the industry impact on learning process and the contribution of both, university, and industry on entrepreneurial skills development. Therefore, it was asked, how often students face guest lectures-company’s representatives during studies, and the majority told that almost on every course, however everybody agreed on the fact that it is almost always boring and useless because it includes some overview of the company or department with no really important information that can help to enhance skills or knowledge. Several respondents share their experience with guest lectures that were invited to teach some aspects related to the course topic and provide vital live and practical examples on the behavior in real business contexts rather than some imaginative and not relevant situations. These lecture, by the words of respondents really create value and contribute to the development of required knowledge and skills. Even more, when such lectures include some practical tasks to work on a real business situation or think as a person on a particular position it helps to feel yourself on that position and enhance your decision-making skills, consequently. In terms of enhancement of entrepreneurial skills and mindset it works in the same way, the more practice comes from the industry side with an aim to solve real business problems the more students want to be engaged and create something that would be valuable for the company and be implemented by it. Guest lectures are advantageous, therefore, when they hold a value for students either new knowledge corresponding to the course topic they study, or provision of business tasks to solve and to think about, because students show interest in working with real cases, not imaginative. In terms of disadvantage, the respondents highlighted the useless content about industry or company overview that could be found on the websites or internet and failures to establish a connection with audience as it is not interested in it. Some respondents suppose that the failures come from the lack of company’s goal and desire to contribute to the student’s knowledge and experience in the studied

field. However, students want to receive this knowledge from industry representatives. When respondents were asked what they wanted to improve in the guest lectures, everybody agreed to keep them more topic specific and practice oriented, in such a way that industry representatives could share their practical insights about the course topic and share the experience of their own behavior in some crisis situations. Additionally, students suggested that guest lecturer can in advance communicate with professor what theoretical things were discussed in order to be on the same page with the course timeline. Every respondent positively answered about the importance of knowledge received by the industry as it differs from the ordinary lectures by the existence of real experience in current world situations which potentially could not be yet reflected in the theory, therefore knowledge from industry can help both students and universities' professors be in touch with current market conditions.

Moving back to the practical tasks, all the students anonymously agreed that during studies they have various projects and group tasks devoted to creation of a new business or some idea, but in a majority of the cases they were simulative. Whereas practical and business-related projects impacted skills development in a more productive way. One of the interviewee from the students' side has claimed:

*“Obviously, imaginative tasks and solutions are easier to accomplish, as from the side of a professor as there is no need to contact company and establish special task boundaries, as from the side of the student team, as there are not those barriers and we can create everything from everything on a hypothetical way, and despite the easiness, we understand the inapplicability of these ideas. Therefore, students don't take such tasks on a serious concern, however, when we work for a real company, with precise set of tasks, indicators limitations, set of resources – we then have a desire to help company to manage the challenge, therefore our motivation rises”.*

Additionally, students were asked about their experience in improving skills that in the literature were directly linked with entrepreneurial mindset: creative thinking, risk taking, opportunity seeking proactivity and teamwork. In a result, students claimed that creative thinking is developed when there is a necessity to solve real business problems and they try to brainstorm all possible ideas to find the one that worth, as the idea should cover real people's needs that is linked with design thinking approach. Additionally, the freedom of action, empathy and tolerance also release creativity. Tatiana Leontieva during the interview has shared:

*“We understand the necessity to develop creative thinking for our students as they should look wider on the situations and not being stuck with only one point with no possibility to be flexible, but we do not know how to develop it, correctly”.*

Whereas Janna Khomyakova shared that to the creative thinking it contributed ‘the freedom of ideas flow, desire to work what they want on as we allowed students to choose what exactly they wanted’. After the discussion Tatiana Leontieva agreed that teamwork and collective thinking contribute to the creative thinking because “new ideas arises when each person shares its own experiences and ideas and listens to the ideas of others, as a result new, extraordinary ideas arise, especially when participants are from different spheres of interest and specialties”.

Students noted both that as business as university contribute to the creative thinking development as many tasks need out-of-the box thinking and creation of new ideas, whereas business in its turns provides more opportunity as you know the main goal, when in university some tasks could be unapplicable to real business. Risk taking, according to the students is developed when person is experienced enough with practical issues, so he/she is sure that the analysis was made correctly as other estimations etc. therefore, he/she knows all risks potential and ready to be responsible for it. Additionally, strict deadlines and time-management contributes to the risk-taking, as well as readiness and fearless to make mistakes. The reality and viability of the project/problem also increases your willingness to take risks.

Janna Khomyakova considered that in order to develop risk taking it is important to show students that be mistaken is not a bad thing, and that exactly being ready to fail increases risk-taking skill. In that case it is important to listen to the speakers that will share their stories of failure is that is not so terrific in it. Rostislav Speransky, here has the same opinion.

Possibility to see opportunities in students’ opinion also arises from the fearless of making mistakes and your previous experience in market and company analysis. The learning by doing approach also contribute to it. Proactivity is developed through doing what you want and through providing initiative to perform actions and presenting info. The possibility to adapt to a changing environment also contributes to proactivity. The same actually was discussed in creative thinking development. Teamwork is developed when everybody is inspired to achieve the goal and therefore, everybody feel responsibility for the task accomplishment. Additionally, the brainstorming of ideas also contributes to the team cohesion. As it could be seen all the skills are mutually dependent and by developing and enhancing one you simultaneously develop others. Respondents note that the



opportunity to choose project during VTB they want to develop inspires them and release maximum efforts to create something innovative and valuable. Participants have enhanced such skills as time-management, risk-management, communication, coordination, delegation, budgeting, presentation, multitasking etc. They also confirm that they had a possibility to implement the received knowledge from the lectures into project elaboration such as perform different analysis of external and internal environment, benchmarking, budget planning and etc. Moreover, the perception of solving the real case that can help target audience to fulfill their needs is a strong point if students understand what their ideas will be worth in future. So, they managed to implement design-thinking approach. In terms of weaknesses, they mentioned artificial tasks in some projects that lessen the desire to work on, and mixing students with different experience as they couldn't support each other in brainstorm sometimes.

In such a way, it could be stated additionally, that all the respondents agreed on the fact that practical tasks are essential to develop skills and mindset, however before receiving profound knowledge it is important to make students understand the necessity of such knowledge. Students were even asked to distribute the desired proportion of studies by theory lectures, guest lectures and practice to develop entrepreneurial skills. All of them agreed that half of the studies for entrepreneurship should be devoted to practical tasks, whereas another half should be distributed between academic theory and guest lecture experience. However, for entrepreneurship the guests should be corresponded to the start-upers or those who failed and the raised. Finally, students should have mentors that will support their ideas and direct them towards future steps.

## **3.2. Discussion**

### **3.2.1. Goals for collaboration**

Through the interviews with students, it was identified that they need industry engagement in the teaching process in order to receive the practical knowledge of working in a particular industry firsthand. They claimed that this type of knowledge contributes to the entrepreneurial skills development more than ordinary lectures as they reflect current business practices that probably still are not studied in theory. Moreover, students highlighted that the task provided by real companies that reflect their real performance are more motivated to solve and consequently, the entrepreneurial skills and mindset are developed.

The same findings are followed by the interviews with business and universities, as it was proven that universities need to develop entrepreneurial mindset and skills in their students and

should set it as a goal for collaboration with industry. Whereas businesses in its turn are also of a high concern to develop entrepreneurial skills in their potential employees and be close to the learning process.

Therefore, it can be stated that the other goals of collaboration should be focused on students learning for both parties. Then for university the goals are to develop entrepreneurial skills and mindset in students, to supply students with up-to-date practical knowledge and to provide tasks from the industry to complement the existing theory. Whereas for industry the goals are to teach its potential employees with its experience and practical skill required by the industry as entrepreneurial skills and mindset and to delegate solving problems to the younger generation

### **3.2.2. University transition to “entrepreneurial” model**

In the existing literature it was stated that one of the possible ways how universities can become entrepreneurial is starting to create economic value in the universities, and literature covers only the possibility of academic spinoffs, however the studied cases prove that students of bachelors and masters are also motivated to help companies create economic value and even achieved visible results during the Lab or big projects. Megafon has launched several projects developed by students during 5G Lab, whereas VTB has 3 projects in a process of implementation

Therefore, industry can help universities to transmit to the model of entrepreneurial university through establishment labs on the basis of university or through provision real case tasks that will be solved by students during studies and consequently implemented by the company that in a result will create solutions implemented by the company in a real environment.

### **3.2.3. Industry role in higher education devoted to entrepreneurial skills development**

Industry can contribute to the development of entrepreneurial skills and mindset through provision of previously discussed practical knowledge and insights from its experience especially by communication with real start-upers or business founders. It definitely has to provide students an opportunity to solve real cases and listen to their results and directs them as a mentor or coach on the right path in terms of entrepreneurial mindset. The tasks could be as big consultancy projects, as medium projects to cover some gap existing in the company. Knowledge from industry can impact both students and universities' professors in order to be in touch with current market conditions and issues not discovered yet in theory. Industry indeed is perceived by the students as knowledge

provider again especially from entrepreneurs and founders, but it should structure and content the lectures in advance and confirm with professor that it contributes to the topic.

#### **3.2.4. University program study design aiming at entrepreneurial mindset formation**

Taking into account the responds of all interviewees the following organization of studies is suggested. Entrepreneurship should not be taught as involuntary obligatory course as not everyone wants to start their own business, however initially as obligatory program students must receive the basic understanding of what entrepreneurship is, main activities etc. So, they should understand whether they want to link their future career with entrepreneurship or not and only after they entirely recognize it and want it, they should dive in it deeper. The basic familiarizing course on entrepreneurship should include theoretical lectures on the overview of entrepreneurial activities and invited speakers-entrepreneurs who can share their experience and inspire students to be entrepreneurs. The best choice is to put this course on the 2<sup>nd</sup> year of studies as on the 1<sup>st</sup> year students will start to become familiar with the basics of its own specialty, whereas on the second year they could start their acquaintance with entrepreneurship.

For those students who after the basic course has recognized that they do not want to become entrepreneur the following study process is proposed. The lectures should include guest lecturers from different businesses to share their experience, whereas afterwards to strengthen it students have to perform some practical tasks developed by the industry on a real problem that exists in the company. Even not becoming entrepreneurs, students will develop corresponding skills as creative thinking, opportunity seeing, teamwork, and give a basis for entrepreneurial mindset development.

The students that recognize their willingness to become entrepreneurs, should have a possibility to further develop their entrepreneurial skills and start preparing to the future. As this should be on voluntary and deliberate choice the suggestion then is to organize extracurricular club in the universities, with no linkage to marks, ECTS, particular year of study or specialty. It should be organized for all, who wants. It is recommended to start from the 3<sup>rd</sup> year of study but there are no such limitations. This should be working as a sort of Labs but with no precise linkage to one business companies. It rather should be as a platform for joining students with different interests and experiences, professors and mentors leading them and business representatives to share their experience and lifehacks. Overall, this extracurricular activity is recommended to be subdivided on two complemented paths to be included. In sum, it should involve 7 obligatory conditions to prepare

students for entrepreneurial activity and starting their venture and develop entrepreneurial mindset. Overall, the entire activity of this ‘club’ should have this 7 conditions that in the abbreviation could be summed to the notion of ‘GEMS DNA’, where each letter corresponds to one of the elements. As it was stated the activity should be subdivided on two related activity the first one – GEMS would be dedicated to the knowledge exchange from the side of university and businesses to students to show the real examples from an active entrepreneurs. It should be as theoretical contribution from university about some reliable models that will be useful for students, so the professor should be also aware of everything concerning as university should also invite real business founders and start-uppers, those who will share their knowledge based on real practice of business establishment.

So, moving to the abbreviation and corresponding elements, the visual representation could be seen on the Figure 2 below.

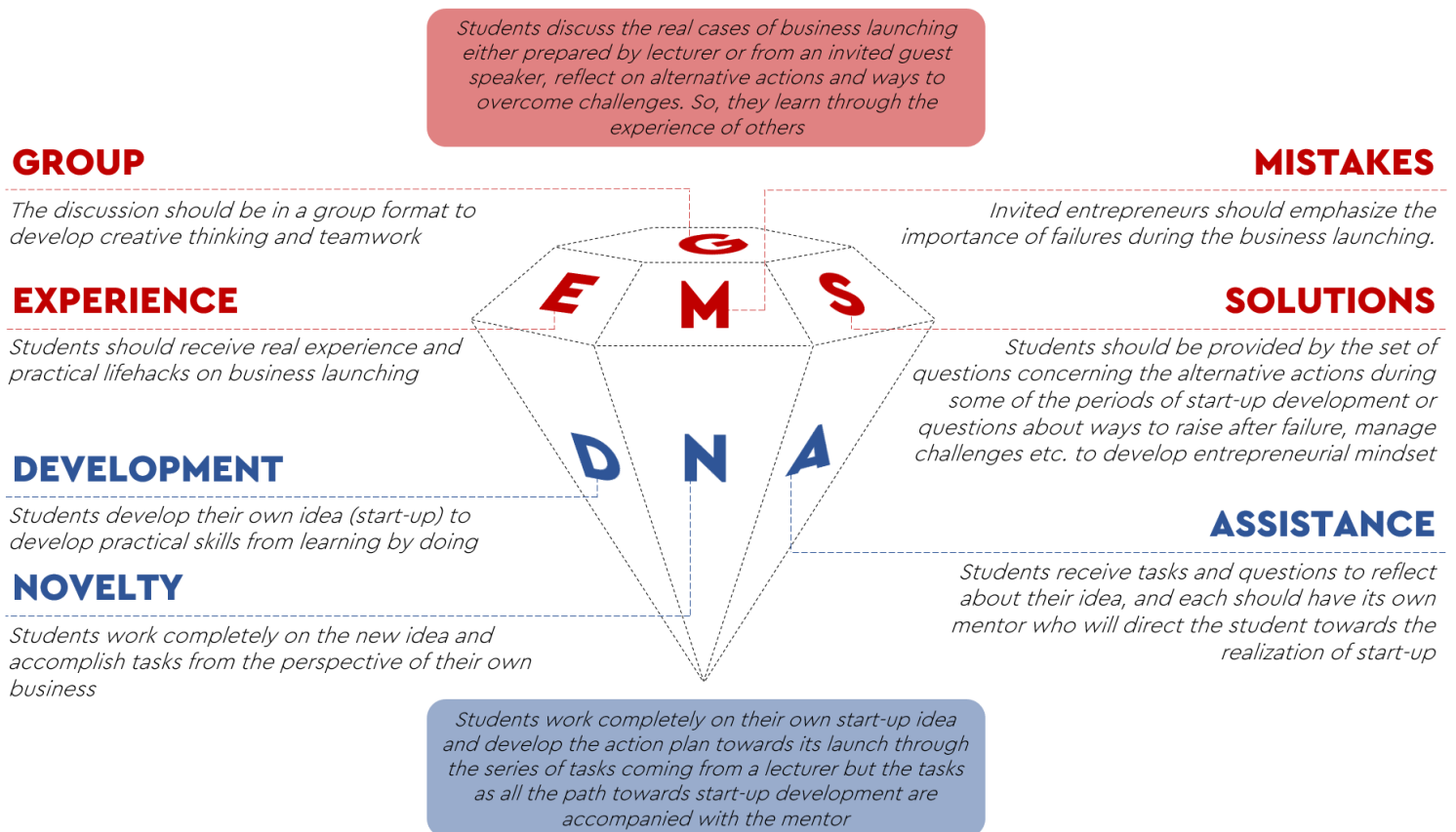


Figure 2. Visual interpretation of the components of GEMS DNA model of entrepreneurial club organization (created by the author)

G stands for ‘Group’ – as all the communication appeared should be hold in a community to argue, support, or discuss the ideas and opinions of others as group communication contributes to the creative thinking as a part of entrepreneurial mindset.

E goes for ‘Experience’ that comes from the business founders, sharing their path towards business foundations, some lifehacks, how they came to the idea etc. Overall, it should include the real experience of successful start-uppers that could not only inspire students as on the familiarizing courses discussed previously, but also share some practical issues of managing different stages of business establishment. This stage could also be substituted by case studies prepared by ‘club’ organization, professor, who will find the same experience of start-ups and business foundations from international companies for example. During the case either from professor or from invited business representative, the speakers could ask students how they would behave in one or another situation and directs them towards the thought path.

M reflect ‘Mistakes’ – this is a crucial part that is required to develop entrepreneurial mindset, especially the skills as risk-taking and opportunity seeking. It is important to show students that failures are inevitable and without them there is no way. Consequently, in both scenarios described above as with business representative case, or prepared by the professor, them both should include part of failures and mistakes. Therefore, speakers should not tell in advance how they managed the situations, they should also ask students how to behave – here again team discussion is opened.

S comes to ‘Solutions’- the final part of these discussions described above, students together with speakers comes to the final version of the correct solution of a problem either during ordinary steps of business opening or after occurred failure. In both cases students firstly will see that after failures success also comes. Secondly, they will develop a set of alternative actions, so generate ideas and contribute to creativity thinking. Thirdly, through the set of cases students will have a portfolio of cases and the appropriate ways of its management, therefore they would not be scared of mistakes, and will be more willing to take risks as they know ways to recover.

The second part of the ‘club’ activity should be devoted to students’ business ideas itself. It is a practical part of the ‘club’, where on their own created ideas they will complete tasks and become more prepared for a future business establishment. For example, student wants to open business in industry X, and then he has a set of tasks on a regular basis as from professor or from guest speaker, regarding resource search, or planning ways to overcome mistakes discussed during

GEMS. In such way, student on their own project will already work and receive practical skills. As a result, university will graduate students with a required set of entrepreneurial skills and mindset to start business. The second part includes 3 elements.

D stands for ‘Development’ – meaning that students would develop the one particular project through the period of ‘club’ activity.

N goes to ‘Novelty’ – as the project students will work on is not created yet. It will be their potential business the development of which they will perform. So, the work will be fully for non-existing venture.

A is for ‘Assistance’ – obviously students should be directed and supported by mentors or coaches. It could be either business representatives or professors or speakers, anyone who is interested in and have experience in it. The major thing here is that all the tasks would be discussed exactly with mentors and assistants, hat will guide them towards the correct path to develop entrepreneurial mindset.

The directions of development of the ‘club’ could have different alternatives, as students could work on own project solely with mentors, or students could joint in pairs and work for one idea, or some guest speaker could like the idea of a student and support him or her and become the mentor with further opening the business together, or professor could like the idea and behave as a guest. There are many alternatives, but they all come to the final result, that through the UIC universities graduate students ready to start their business with full set of entrepreneurial skills and mindset.

The results of all 4 research questions could be found on the Figure 3 below.

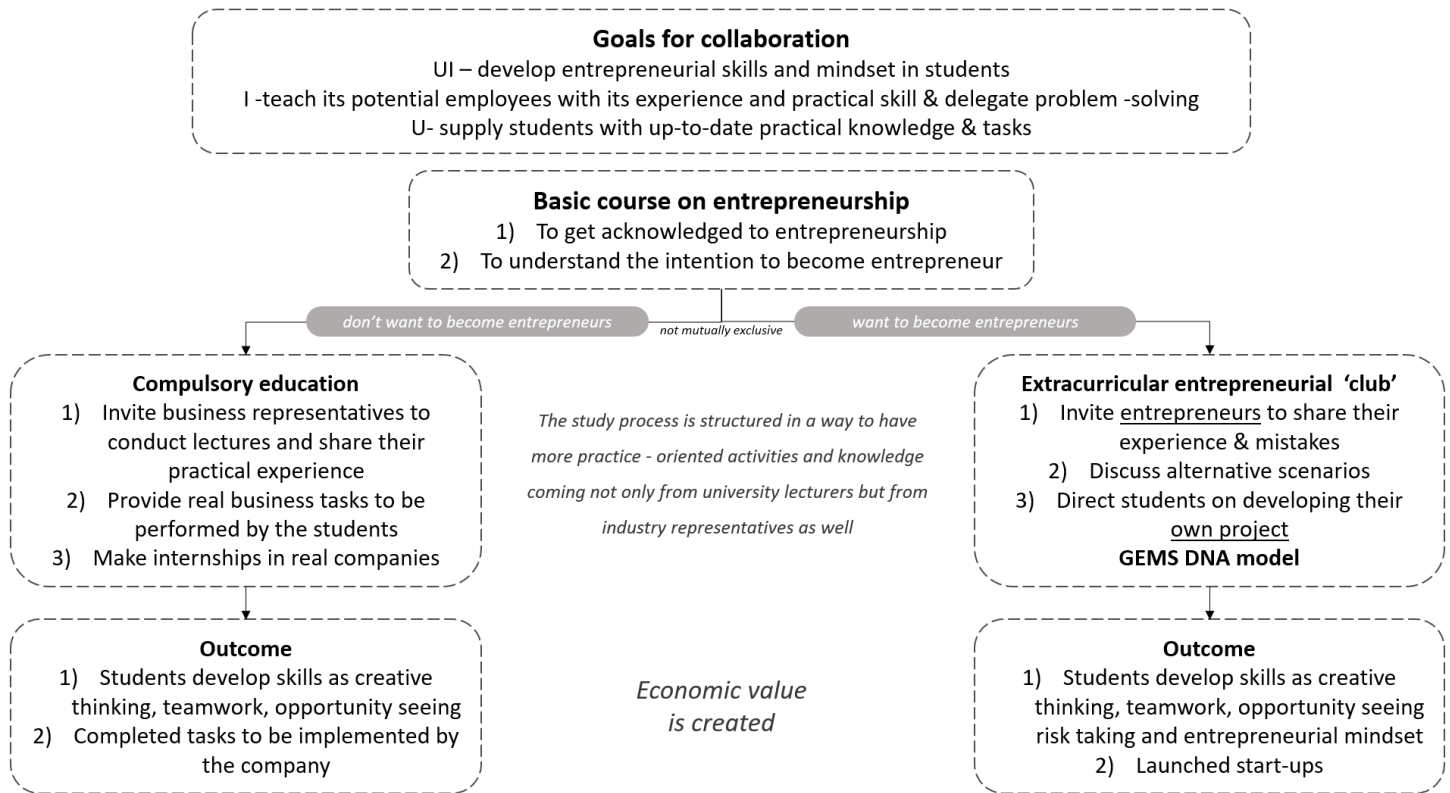


Figure 3. Integrated framework of the research results (created by the author)

### 3.3. Theoretical contribution

The research studied the collaboration between at least two organizations aiming to develop entrepreneurial mindset to manage the changing environment and challenges for both parties included. This refers to the notions of strategic alliances by Gulati (1999) and Strong and Weak ties of Granovetter (1973). As it is discussed in the literature such alliances contribute to the development of the networks between organizations, and affect the economic outcome in terms of setting prices, policies, hiring etc. However, this research also proved that joining two networks with Strong ties, as both organizations are considered to be Strong-ties networks, will lead to the creation of plurality of the weak ties, which are not only much more creative as ordinary intraindividual weak ties, but also to the weak ties that contributes to the economic output by creation economic value for both parties. Therefore, through the exchange of the resources which in this case are knowledge from industry and creative ideas from the students, the following weak ties led to the creation of the solutions that organizations faced during their performance.

The following research contributes to the existing literature of UIC and entrepreneurship by providing more insights of industry participation in the collaboration and as a result provides new

opportunities for university-industry collaborations – development of entrepreneurial mindset. The results of the research identified new goals and reasons for starting the collaboration and potentially widening the list of partners. The goals are concerning the learning process aiming to develop an entrepreneurial mindset. It also identified that industry could help universities to transmit to the entrepreneurial model by allowing students of bachelors and masters to contribute to the economic value creation through case projects or lab organization. Additionally, it was discovered that not only university is a knowledge provider in UIC, but industry as well provides practical knowledge to students and to professors as well allowing them to be in touch with current trends on the market. Additionally, companies can help to develop entrepreneurial skills and mindset through provision of practical tasks devoted to real problems that students would implement.

### **3.4. Managerial implication**

The following research contributes to the organization of study process in universities by provision of recommendations on elaborating the compulsory education's lectures and on creation of a special extracurricular club for entrepreneurship on the basis of UIC, where students would discuss the already existing cases on businesses launch and appeared failures and challenges there, together with active entrepreneurs, start-uppers, and university professors. Simultaneously, students will be working on their own project that in future they want to realize under the direction of the mentor. As a result of UIC and performance of this club, university will graduate students with full set of skills, mindset, and experience to start their own business.

### **3.5. Research limitations**

The limitation of the research includes the narrow focus of cases studied as there are only two universities studied and only one business. The results mainly were based on the successful result of one business university and not taking into account the opinion and necessities of other faculties and specialties. However, SUAI was also analyzed, and it has not shared its own practices that could enhance entrepreneurial skills and mindset as it is still unexperienced in this field. Additionally, the results were based on the qualitative data and no quantitative analysis was performed. Therefore, the results were not checked for the applicability and resultativeness from the student side. No experiments were conducted on the study design yet.



### **3.6. Further studies**

As this research has a number of imitations further it is suggested to provide quantitative data analysis that will measure the difference in some indicators relating to entrepreneurial skills and mindset before and after several years of studying or before and after participation in the lab in order to identify factors that positivity influence their development. Therefore, there are several propositions for further research:

1. To see the resultativeness of the basic course of entrepreneurship: compare the number of students before and after course bout their entrepreneurial intentions
2. To compare the development of such skills as creative thinking, opportunity seeing, risk-taking between universities which have proposed study structure (guest lectures + real practical tasks) and those who do not
3. To provide pilot test of the suggested extracurricular club on start-ups and to analyze the difference in number of launched start-ups of university students before and after club introduction
4. To compare the difference in entrepreneurial mindset and skills between students participating in the 'club' and those who only attend ordinary lectures

Overall, the further research should include statistical test to prove the results of this paper. Additionally, more UIC from non-management field should be studied and tested as they are less close to the entrepreneurship as it is.

### **3.7. Conclusion**

The research was devoted to the investigation the role of UIC in the higher education and its impact on students in terms of the development of entrepreneurial skills and mindset. All the objectives set were completed, and all the research questions were answered. For the literature analysis the bibliometric method of keywords cooccurrence was used to classify the literature on 4 independent clusters devoted to the main aspects of UIC. The research was conducted through the case study approach and included 2 cases of UIC and 9 interviews. For the research the primary data was taken from the semi-structured interviews with industry, business, and students. As a result, the research contributes to the existing theory by proposing additional role of collaboration before organizations with Strong-ties networks and by identification of additional goals that exist in the collaboration and devoted to the development of entrepreneurial mindset; proving the role of industry as knowledge generator and provider; proving that industry could facilitate the university transition towards

entrepreneurial model. From the managerial and practical side, research provides suggestion towards introduction of the additional special extracurricular club for entrepreneurship in university on the basis of different UIC for students wanting to become entrepreneurs and composition of lectures for those who do not. The club will include students willing to become entrepreneurs and develop their skills and mindset through working on their own projects and continuous discussions and knowledge exchange with other business founders and entrepreneurs taking into account components of GEMS DNA model of club organization.

# APPENDICES

## Appendix A. Keywords applied in Scopus

### Appendix A.1. For the first stream of literature

TITLE-ABS-KEY ( business-university OR industry-university OR university-business OR university-industry ) AND TITLE-ABS-KEY ( collaborat\* OR partner\* ) AND TITLE-ABS-KEY ( entrepreneur\* ) AND TITLE-ABS-KEY ( develop\* OR form\* ) OR ( enterpreneur\* AND mind\* OR enterpreneur\* AND think\* ) AND ( LIMIT-TO ( SRCTYPE , "j" ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( PUBYEAR , 2021 ) OR LIMIT-TO ( PUBYEAR , 2020 ) OR LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2011 ) ) AND ( LIMIT-TO ( EXACTSRCTITLE , "Journal Of Technology Transfer" ) OR LIMIT-TO ( EXACTSRCTITLE , "Technological Forecasting And Social Change" ) OR LIMIT-TO ( EXACTSRCTITLE , "International Journal Of Entrepreneurial Behaviour And Research" ) OR LIMIT-TO ( EXACTSRCTITLE , "Entrepreneurship And Regional Development" ) OR LIMIT-TO ( EXACTSRCTITLE , "IEEE Transactions On Engineering Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "International Journal Of Technology Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Business Research" ) OR LIMIT-TO ( EXACTSRCTITLE , "Management Decision" ) OR LIMIT-TO ( EXACTSRCTITLE , "Research Policy" ) OR LIMIT-TO ( EXACTSRCTITLE , "Cambridge Journal Of Economics" ) OR LIMIT-TO ( EXACTSRCTITLE , "European Planning Studies" ) OR LIMIT-TO ( EXACTSRCTITLE , "Higher Education" ) OR LIMIT-TO ( EXACTSRCTITLE , "International Journal Of Retail And Distribution Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Cleaner Production" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Intellectual Capital" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Knowledge Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Management Studies" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Rural Studies" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Small Business And Enterprise Development" ) OR LIMIT-TO ( EXACTSRCTITLE , "Managerial And Decision Economics" ) OR LIMIT-TO ( EXACTSRCTITLE , "Public Organization Review" ) OR LIMIT-TO ( EXACTSRCTITLE , "Qualitative Market Research" ) OR LIMIT-TO ( EXACTSRCTITLE ,

"Regional Studies" ) OR LIMIT-TO ( EXACTSRCTITLE , "Research Evaluation" ) OR LIMIT-TO ( EXACTSRCTITLE , "Scientometrics" ) OR LIMIT-TO ( EXACTSRCTITLE , "Small Business Economics" ) OR LIMIT-TO ( EXACTSRCTITLE , "Strategic Management Journal" ) )

### **Appendix A.2. For the second stream of literature**

TITLE-ABS-KEY ( entrepreneurial AND mindset ) AND TITLE-ABS-KEY ( formation OR development ) AND ( LIMIT-TO ( PUBYEAR , 2021 ) OR LIMIT-TO ( PUBYEAR , 2020 ) OR LIMIT-TO ( PUBYEAR , 2019 ) OR LIMIT-TO ( PUBYEAR , 2018 ) OR LIMIT-TO ( PUBYEAR , 2017 ) OR LIMIT-TO ( PUBYEAR , 2016 ) OR LIMIT-TO ( PUBYEAR , 2015 ) OR LIMIT-TO ( PUBYEAR , 2014 ) OR LIMIT-TO ( PUBYEAR , 2013 ) OR LIMIT-TO ( PUBYEAR , 2012 ) OR LIMIT-TO ( PUBYEAR , 2011 ) ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ) AND ( LIMIT-TO ( SRCTYPE , "j" ) ) AND ( LIMIT-TO ( EXACTSRCTITLE , "International Journal Of Entrepreneurial Behaviour And Research" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Business Venturing" ) OR LIMIT-TO ( EXACTSRCTITLE , "International Journal Of Entrepreneurship And Small Business" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Small Business And Enterprise Development" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Small Business Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Vocational Behavior" ) OR LIMIT-TO ( EXACTSRCTITLE , "Management Decision" ) OR LIMIT-TO ( EXACTSRCTITLE , "Technological Forecasting And Social Change" ) OR LIMIT-TO ( EXACTSRCTITLE , "Computers In Human Behavior" ) OR LIMIT-TO ( EXACTSRCTITLE , "Entrepreneurship And Regional Development" ) OR LIMIT-TO ( EXACTSRCTITLE , "Entrepreneurship Research Journal" ) OR LIMIT-TO ( EXACTSRCTITLE , "Entrepreneurship Theory And Practice" ) OR LIMIT-TO ( EXACTSRCTITLE , "European Journal Of International Management" ) OR LIMIT-TO ( EXACTSRCTITLE , "European Management Journal" ) OR LIMIT-TO ( EXACTSRCTITLE , "Geoforum" ) OR LIMIT-TO ( EXACTSRCTITLE , "Higher Education" ) OR LIMIT-TO ( EXACTSRCTITLE , "Information Technology For Development" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Intellectual Capital" ) OR LIMIT-TO ( EXACTSRCTITLE , "Journal Of Technology Transfer" ) OR LIMIT-TO ( EXACTSRCTITLE , "Research Technology Management" ) )

**Appendix A.3. For the third stream of literature.**

TITLE-ABS-KEY (entrepreneurial AND mindset AND formation AND university OR industry) AND (LIMIT-TO (SRCTYPE, "j"))

## Appendix B. Cluster allocation of articles used for literature review

#	References	Clusters			
		Blue	Yellow	Red	Green
1	Bandera C., Thomas E.(2018)			x	
2	Berbegal-Mirabent J., Lafuente E., Solé F.(2013)	x			x
3	Broström A., Feldmann A., Kaulio M. (2019)	x		x	
4	Calcagnini G., Favaretto I., Giombini G., Perugini F., Rombaldoni R. (2016)				x
5	Carayannis E., Giudice M.D., Peruta M.R.D. (2014),	x		x	x
6	Colombo M.G., Guerini M., Rossi-Lamastra C., Bonaccorsi A.(2022)	x			
7	Dalmarco G., Hulsink W., Blois G.V. (2018),	x		x	
8	Dameri R.P., Demartini P.(2020),			x	x
9	Debarliev S., Janeska-Iliev A., Stripeikis O., Zupan B.(2020),				x
10	D'Este P., Perkmann M. (2011),	x		x	
11	Fini R., Rasmussen E., Wiklund J., Wright M. (2019),		x	x	
12	Fischer B., Guerrero M., Guimón J., Schaeffer P.R(2020),			x	x
13	Fischer B.B., Schaeffer P.R., Vonortas N.S., Queiroz S. (2018)	x			
14	Giones F. (2019),	x		x	
15	Gordon I., Hamilton E., Jack S.(2012),				x

16	Huang M.-H., Chen D.-Z. (2017),	x			
17	Jabeen F., Faisal M.N., Katsioloudes M.I.(2017)		x		x
18	Jackson D., Shan H., Meek S. (2021)	x			
19	Johnston A., Wells P., Woodhouse D.(2021)	x		x	
20	Larsson A. (2019)			x	
21	Linton G., Hasche N.(2021)	x		x	
22	Mariani G., Carlesi A., Scarfò A.A. (2018)		x		
23	McMullen J.S., Kier A.S. (2016)				x
24	Mindruta D. (2013)	x			
25	Nsanzumuhire S.U., Groot W.(2020)		x	x	
26	Nsanzumuhire S.U., Groot W., Cabus S.J., Bizimana B.(2021)	x	x		
27	Østergaard A., Marinova S.T. (2018)				x
28	Perkmann M., King Z., Pavelin S. (2011)	x	x	x	
29	Pidduck R.J., Clark D.R., Lumpkin G.T. (2021)				x
30	Piperopoulos P. (2012)		x	x	x
31	Qureshi S., Mian S. (2021)			x	x
32	Sá E., Casais B., Silva J. (2018)	x		x	x
33	Samuel Adegbile A., Sarpong D., Cao D.(2021)	x		x	
34	Sarpong D., AbdRazak A., Alexander E., Meissner D. (2017)	x			

35	Schultz L.I. (2011)	x			
36	Secundo G., Del Vecchio P., Schiuma G., Passiante G. (2017)	x			x
37	Secundo G., Mele G., Vecchio P.D., Elia G., Margherita A., Ndou V.(2021)				x
38	Shams S.M.R., Kaufmann H.R. (2016)			x	x
39	Skute I., Zalewska-Kurek K., Hatak I., de Weerd-Nederhof P. (2019)	x	x	x	x
40	Tartari V., Salter A., D'Este P. (2012)	x	x		
41	Ting S.H., Yahya S., Tan C.L (2020)	x			
42	Towers N., Santoso A.S., Sulkowski N., Jameson J.(2020)	x			x
43	Verzat C., O'Shea N., Jore M. (2017)				x
44	Wang J., Shapira P. (2012)	x		x	
45	Wei W., Li D., Chok J., Yang D., Shang H. (2013)	x		x	
46	Yoon J. (2015)	x			
47	Zobnina M., Korotkov A., Rozhkov A. (2019)				x
	Total	24	9	23	20



## **Appendix C. Interview questions**

### **Appendix C.1. For universities' representatives**

1. Why did you decide to start cooperation with XX and form a special laboratory on the basis of the university?
2. What results do you currently see from the activities of the laboratory?
3. For what purposes do students come to the laboratory?
4. Do labs encourage entrepreneurial thinking? How? What tasks are given to students, what do they develop?
5. What difficulties and barriers do you overcome in this cooperation?
6. How can undergraduate and graduate students help companies create economic value?
7. Do you invite representatives of various companies to give lectures within the educational process at the university? If yes, what is the purpose of these invitations? What is the focus of these lectures?
8. Do you think it is important to integrate industry into the learning process? Why?
9. In your opinion, are industry representatives interested in teaching students?
10. Is the introduction of company representatives into the educational process one of the goals of cooperation?
11. What knowledge can industry representatives give students that the university cannot provide?
12. How do companies promote the commercialization of activities?
13. How can companies help students start their own business?
14. How do companies help students develop creative thinking? Willingness to take risks. Ability to see opportunities.
15. How do companies help students develop innovative solutions?
16. How do companies help students develop entrepreneurial skills?
17. How can companies and the university train students to “be entrepreneurs”?

18. Do you think companies can provide more hands-on experience and expertise to both students and faculty and researchers?

19. What lectures and subjects should students have on their schedule to help develop entrepreneurial skills?

20. What should study projects and assessment forms include in order to develop entrepreneurial skills?

21. Which courses require more introduction of the industry into the educational process, which less? What should be the ratio of lectures and seminars aimed at practice and theory?

22. When compiling the schedule for students, what share should be allocated to entrepreneurial subjects and projects so that during the study period (4/2 years) students acquire entrepreneurial skills?

23. Does the university need access to industry resources to complete projects or lectures?

### **Appendix C.2. For industry representatives**

1. Why did you decide to start cooperation with XX and form a special laboratory on the basis of the university?

2. What results do you currently see from the activities of the laboratory?

3. What difficulties and barriers do you overcome in this cooperation?

4. How does the company promote entrepreneurial skills for undergraduate and graduate students?

5. Does the company conduct guest lectures at the university? What are these lectures about?

6. How does your company promote student entrepreneurial skills?

7. How do companies promote the commercialization of activities?

8. What tasks are presented in these laboratories on behalf of the industry? What skills do they develop in students? Is economic value created while working in the laboratory?

9. How is the experience of the company useful for students?

10. Do you consider the goal of your company to train students as potential employees? What qualities are important to develop? Entrepreneurial skills? Thinking?

11. Is the company ready to provide open access to its resources if students need it to complete certain projects?

12. How can companies help students start their own business?

13. How can companies and the university train students to “be entrepreneurs”? What is important to focus on in order to achieve the final goal - to open your own business?

14. How do companies help students develop creative thinking? Willingness to take risks. Ability to see opportunities.

15. How do companies help students develop innovative solutions?

16. In your opinion, which tasks contribute to the faster development of entrepreneurial skills and thinking, which less?

17. Do you share your experience and expertise with university representatives/students/teachers?

### **Appendix C.3. For students, lab’s participants**

1. For what purpose did you take part in the laboratory?

2. What are the main results you have achieved by participating in the laboratory?

3. Which of your personal skills and abilities have you improved?

4. Did you experience any difficulties while working in the laboratory? Which?

5. What tasks did you perform? Which of them do you find more effective in terms of improving your skills?

6. What strengths and weaknesses do you see in the organization of the current laboratory?

7. During your studies outside the lab, how often do you encounter guest lectures?

8. Do guest lectures from company representatives improve your skills and knowledge in the field of entrepreneurship?

9. What are the advantages and disadvantages of guest lectures? / Do you think that guest lectures are useful for students

10. What tasks, in your opinion, contributed to the development of creative thinking? Willingness to take risks. Ability to see opportunities. Proactivity? teamwork?

11. What would you recommend improving in conducting guest lectures at the university?
12. During your studies, is it important for you to have open access to company resources?  
Why do you need resources?
13. Is it important for you to get knowledge from industry representatives? How are they different from regular lectures?
14. Have the University and Industry contributed to the development of creative and innovative ideas?
15. Do you want to open your own business in the future? Did you want to study at the university? Have you acquired enough skills during your studies to do this?
16. What are the most important skills you have acquired during your studies that will help you in your future career? Whose contribution to the development of these skills was greater than the university or the industry?
17. What did you fail to acquire in terms of theoretical or practical knowledge/skills during the current time of study?
18. In what ratio, in your opinion, should practical work, teacher lectures and guest lectures be presented during training?
19. Do you have experience with tasks/projects that address a real existing problem within the industry? How useful were such projects? How do they differ from the point of view of the development of entrepreneurial thinking from projects with fictitious and hypothetical conditions?

## Appendix D. Students-lab participants' interview summary

Question	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6
1. Goal of participation in the lab	Want to pass Internship and solve real case project under supervision of specialist + possibility to create something new and innovative	Internship, acquire skills for solving cases, communication with company to see how they implement innovations	It was interesting to solve a real project in a large company, to prove myself for a possible future employment and, together with this, to count it as an internship. It was interesting not to shift papers, but to be creative and create	To pass internship and acquire case solving skills	Need to complete summer internship and choice was made for the company where I could work for real tasks relevant for some initiatives and create something new as work with mentors of the company.	To pass internship and receive teamworking skills
2. Main results achieved during the lab	2 <sup>nd</sup> place in the idea competition + VTB likes the idea so hope that this idea will have a practical implementation + new meetings – fully random teamwork (important knowledge exchange)	Project development, market analysis, interviews conducted, consumer needs identification and afterwards we chose project where we created a roadmap that allows VTB to implement it in future	In terms of the project, we worked out its mechanics, analyzed the markets and the need for it, learned how to perform custdev and improved other skills. In terms of teamwork - we met and worked effectively in a team, developed presentation skills	Winning the case championship. New knowledge about ecology and related projects.	We won the case championship and obviously skills were improved.	Successful internship accomplishment and receive skills essential for future career.
3. Skills improved	Time-management, risk-management, budgeting – key skills in project management	Data-gathering, communication skills, networking, team coordination and delegation	Coordinate the work of the group, speak to the public, make presentations for a startup audience	Multitasking, information gathering, brainstorming, creative thinking, comfort teamwork, not only ideas generation but adding something new to the ideas of others, adaptation to unexpected	Time-management, communication, coordination, team management and practical skills of bots' creation	Teamwork, time-management, communication skills
4. Challenges during lab	Hypothetic project – no understanding of limitations (real life experience always have time limits and budget limits), so it was difficult to realize the worthwhile idea without context. Geographical issues (The task included interviews with citizens of Izhevsk – difficult to connect with them especially without opportunity to introduce ourselves, lack of trust in changes), lack of blogging and advertisement. No real numbers – difficult to practically assess	The person identified as a leader didn't do anything and therefore, we have to make all by our own.	It was a little uncomfortable to work online - teammates answered for a long time, some did not get in touch for weeks	No severe challenges identified	In general, no challenges, but we have to analyze large amount of data, it was crucial to distribute task weighty and in accordance with team members skills	No severe challenges, but as soon as all meetings were online there were some inconvenience and delays.
5. Tasks performed and results from them	Fully self-organized tasks, only several video calls with mentors, but all the tasks we scheduled by ourselves as well as goals. Task – develop three tools interview, roadmap & questionnaire). Market analysis (market situation, ecology, initiatives, brand reliability) study of	Interviews conducting, gathering and analysis of quantitative data, budgeting and trying to build ideas on this data.	Analysis of the markets - it was cool, presentation of the results to the audience - the laboratory also helped a lot, communication with the mentor - helped me feel more confident in front of the official representative of the company and just an older and more experienced colleague	Main task – develop eco initiatives for VTB in Izhevsk. Objectives include students' attraction, promotion, market analysis, audience analysis, questionnaire	Main task was to develop a strategy for brand image of VTB increase through implementation of eco initiatives. The most resulted were analysis of current situation inside VTB, current level of eco-awareness, find	Market research, benchmarking, promotion and advertising channels search, cost evaluation.

	sustainability initiatives impact (link on brand)			development and launch. Present info.	potential partners and develop promotion strategy.	
6. Key strength and weaknesses in current lab organization	W – strict limitations on final presentations (seems like company doesn't want to listen potential solutions to integrate) – stress level rises S- freedom on creativity, possibility to create everything	S-full supervision and organization by mentors W- unproportioned team distribution as we were as masters and bachelors therefore, we have different experience and knowledge	S - that a mentor from the company was connected, that students from masters and bachelors mixed up and worked together W- not all projects were further developed, that some projects were artificially (in my opinion) formulated	S- possibility to choose case you really are interested in (were about 10)- satisfaction from task implementation. Experienced mentors that are open to communication.	S- organization. We all got acknowledged with limitations, tasks, and background of the case. The spirit of productivity was created by mentors. Moreover, we chose from 10 cases the one we want to work on, thereby we weren't forced to do it but do it with interest. W- online format but it rather external factor than weakness.	S- perception that you work for a real case and your results will be implemented in reality, not just for mark, good potential for creativity. W- as its case championship not all the ideas would be implemented and probably you work for nothing So, it works like to coin sides
7. Besides lab, how often you face guest lectures in university	Almost every course in GSOM	Almost on every course, sometimes even more than once	Once or twice in semester	Do not have a lot of experience. There were several during bachelors and masters but either because of lack of time or lack of desire miss it.	Unfortunately, not so often if we don't speak about invited company representatives who promote their company	Almost on every course we face it, but to be honest I don't find it useful, because the interaction is only one sided, students only listen to the experience which will in no way impact on their future, the other thing when it is in the way of workshop, and you enhance your practical skills.
8. Whether guest lectures enable entrepreneurial skills improvement	More “no” than “yes”, person talks about personal experience rather than provides some insights – therefore these lectures are almost always boring and useless, however when lectures are devoted to skills improvement as decision making and course subject – they worth a lot.	It depends on the lecturer, when the person comes with real problem that needs some innovative ideas to solve it, it is more interesting to be engaged and to really try to help company somehow, but in all other cases of simple company description – lectures are almost always boring. Also, it is useful when guest lecturers share their own practices of business conducting or decision making.	I think yes. Some share their working expertise and practice, which is very valuable and opens my eyes to new things for me.	Such lectures inspires when lecturer is eager with its profession and want to share it with students and burn desire in their eyes.	Yes, for sure, it is so crucial to receive not only theory but practical experience from real business representatives	Yes, when it contains some practical tasks and questions and not simple overview of a position or company.
9. Key advantages and disadvantages of guest lectures	D - Guests often fail to establish contact with auditory and it looks like simple talks with no intention of guest to teach you something (because they don't have such goals) A - useful as a part of case studies or workshops for students. When there is a real problem and Co comes with already prepared materials and gives you a tasks – that is much more useful from the side of industry. Then students are more likely to listen carefully and be engaged in speech. A - networking & possibility to learn new from industry you know little	A-Receive practical experience from the person who is more engaged in real business operations and have more knowledge about practice than a simple lecturer D- lecturers are not engaged in studies, therefore they can repeat the same things that were discussed during lectures or say to superficially	D- are that there are few of them, that you can't customize or vote for the topic of such a lecture, because sometimes you want to hear something specific and practical in my area of interest. A - a representative of the company participates in them, i.e. practitioner, potential employer. Sometimes they are very helpful.	A-new perspective of ordinary things D- almost always boring because the content is not useful and not related to course	A - knowledge and experience exchange as guest lectures can help students to get acquainted with particular industry and profession and to share their expertise in a particular sphere consequently explaining a course topic	Guest lectures about industry experience are useful on the first years of study to let students be introduced to key issues in the industry, but later on more practical things from companies to know how businesses solve problems.

	about, and you can ask any question you are interested in					
10. Contributors to the development of creative thinking, risk taking, opportunity seeking, proactivity, teamwork	<p>Tasks on solving real business problems, through design thinking approach, when you are creating basing on real human needs.</p> <p>Decisions would be more creative and precise when they have concrete real goal. Then your responsibility is also risen and you become ready to take risks and sees opportunities in your actions.</p>	<p>Tasks that are linked with real business problems, not the one like “just create something” with no real goal. In the second case, you from the beginning does not feel any responsibility for the outcome, therefore this skills not developing in a full manner.</p> <p>Teamwork – when all team members feel responsibility, complex tasks</p>	<p>Creative thinking - freedom of action.</p> <p>Risk-taking -deadlines and weekly meetings, calls with a mentor at which we showed progress, sometimes the teammate let us down and we had to adapt in order to be on time and do it well. Often, we had to decide for ourselves what to do and in what sequence, come up with interview questions and look for the target audience. See opportunities - market analysis tasks and benchmarking, analysis of best practices and, in general, how something similar, SWOT, functions.</p> <p>Proactivity was taught by presentation tasks, in which we, anticipating questions, presented the material logically and consistently, deduced the necessary numbers.</p> <p>Teamwork - creative tasks for which we brainstormed ideas, having worked individually before that, so that the brainstorm was not just a stream of thoughts, but reasoned proposals</p>	<p>Empathy and tolerance contribute to creative thinking, because you are calmer react on disagreements, critics, and opinions of others</p> <p>Risk- taking – readiness to make mistakes, the more risks you take the less you are afraid of it</p> <p>Opportunities are like the other side of the risk, and it is also about readiness to make mistakes</p> <p>Proactiveness could be developed through reactions and the fast way of responding to changes. More diverse teams.</p>	<p>Freedom in task execution, we don't have any limitations therefore could offer either basic or most ambitious ideas, and teamwork work boost these idea flow and creative thinking.</p> <p>Teamwork was facilitated as we were directed by the mentor.</p>	<p>Creative thinking – teamwork, brainstorming, and creativity arise when group discuss it and not individually.</p> <p>Risk taking – understanding that the idea will be certainly implemented in reality and it's all not about a n imaged game</p> <p>Opportunity recognition comes from exercising many practical tasks, when you do more, you learn more about it</p> <p>Proactivity develops from doing what you want, therefore the desire to show initiative occurs. That was VTB Lab did</p>
11. What do you suggest improving in guest lectures provision in university?	<p>Make lectures more goal oriented as to teach new things, in advance discuss with guest lecturer the way of interconnection and potential results. Exclude “experience talks”, because everyone has different backgrounds, different career perspectives etc. but we are gathering in class to acquire common skill or knowledge. More practical.</p>	<p>Provide more practical knowledge and engage students to solve real problems and when their lecture contributes to the course</p>	<p>Make them customized and more practical and possibly integrate them into the corresponding courses</p>	<p>In advance prepare the content, conform with lecturer</p>	<p>Make lectures more linked to the course and practice rather than company's promotion and probably add extra time after class to speak with speaker informally</p>	<p>More interaction and practice, lectures should reflect actual topics.</p>
12. Is free access to company resources is important during studies? What for?	<p>During project tasks free access to company resources is crucial in order to solve the problem they have. When company is unwilling to present some info, the results are less reliable and are built on a hypothetical issues which obviously reduce desire to solve it really.</p>	<p>During studies no, everything could be found</p>	<p>It is important if I am doing a project on it, for example, a detailed description of products, finances, and organizational structure - depending on the task</p>	<p>When we are working for a case where real data indeed support or deny the idea the resources from the company are very important. More essential is to have to ask for these resources as some companies may not be willing to</p>	<p>Yes, for sure. Very often we need more precise information for company detailed analysis then it is presented in free sources, but in majority of the cases companies deny providing it.</p>	<p>Common resources as final report is easy to find, but when the task is too specified you need more access to particular area and data that is not relevant for all</p>

				share information for all people, but could in order to solve particular task		
13. Is knowledge received from industry important? Their difference from ordinary lectures	Yes, essential. Because company representatives know better which skills are required and know how to develop them. Ordinary lectures could be over theoretical and even outdated but companies are more in touch with current changes and trends.	It is useful, when lectures are not abstract and reflect some real cases and problems and the ways of solving it. I mean when their lecture practically contributes to the theoretical lecture.	Important, they are formed by practice, show what really happens in the world, and not how everything functions in theory	The knowledge from industry can play more than from ordinary lectures as industry representatives inspire from their experience and interesting cases and not only theory	Yes. Lectures provided by industry representatives provide more deep knowledge and experience about practical understanding of some processes or models with particular industry specifics.	Obviously, knowledge and experience from industry is important, as sometimes real experience does not match with theory told on lectures. Another aspect is that guest lectures from graduates are useful as they know your position and already experienced some real practice and could teach students some new skills and set required direction for learning
14. Whether industry and university contribute to the development of creative and innovative ideas?	Yes, they contribute. As there are many case studies that are focused on creation of an innovative solutions, where you try to perform your best and think out of the box. Industry in this case provide more opportunity to it, because some university tasks could be unapplicable for real business world.	University – definitely, yes, as it supports all students’ startups, and we have many projects and design-thinking course that enables creativity and innovation.	I think so, because the industry approached the challenge that the university allowed it to achieve by attracting creative students with a fresh perspective	University provides such opportunity but with imagined situations, not real company, therefore sometimes it is not worth it to create something unique and meaningful.	Yes, definitely, in terms of the lab many teams continue their work and now became a startups, but nevertheless, we were asked during lab and during classes to create something new, so almost any project or tasks requires idea generation and innovation creation	University contributes a lot as it collaborates with others, organize some events, and promotes innovations and new ideas on tasks and cases.
15. Do you want to open your own business in future? Have you wanted during studies? Whether you acquired enough skills for it?	Yes, I want to start my business. Before you started to do something by your own you will not learn how to do it. Therefore, learning by doing is crucial. University obviously provides some essential skills, but when you start business, you are responsible fully for it and you learn many other required skills. Moreover, university provides a solid background for business start as you know about market analysis, competitors, risks, etc.	No, I don’t want to open business, but I’m sure I have all necessary skills for them, and even not developed in university but mostly from work experience.	It would be interesting for me, including during my studies. I think that I have acquired enough business skills and knowledge, but I lack competencies in the field of bureaucratic procedures such as registration of legal entities and taxes	No, I never wanted to become an entrepreneur, and try to avoid entrepreneurial courses when it was possible.	Definitely yes, I do not think that I can fully realize myself as an employee. Numerous projects at the university, non-trivial tasks that need to be completed within a limited time frame helped me form an entrepreneurial mindset that I would like to apply in my life.	No, I do not interest in entrepreneurship or any related things
16. Key skills required for your future career you acquired in university? Whose impact is more business or university?	Analytical thinking of in-depth study of market, digits etc. The most crucial skill acquired now is decision making as they are built on an arguments of digits and analysis. University’s role is prevalent	Quantitative methods and hard skills – now I have sureness that I know how to work with data Strategic planning Communicative skills, creativity.	Handle different tasks in a short amount of time, communication and presentation skills, the ability to dive into a new area quickly enough, structuring, analytical and problem-solving skills. University and the activities that it gives, however, the industry also definitely contributed	Time management & survival skills in terms of education (possibility to combine different tasks and submit them in earlier deadlines), networking and collaboration & teamwork,	Team management, time management, critical decision making, the ability to solve non-standard problems - these are all skills that I have significantly improved during my master's studies. I think it's more of an industry contribution, as all of these skills were most actively developed while working on	Create personal brand, seeing opportunities and see wider, teamwork and delegation, soft skills, social intelligence, empathy,



					real projects in collaboration with companies.	
17. Which theoretical or practical knowledge/skills you didn't acquired during current studies?	Analytical skills (hard ones) – in working with some programs to have more solid ground	Legislative aspects of business conducting	knowledge of taxes, registration of legal entities, practical insights from business owners about the pitfalls of doing business	Some hard skills	I would like more courses on working with software such as Power BI, SAP, Python, and others. It would be useful to study how these programs solve the real problems of companies.	Lack of practical (hard) skills, not enough statistics and no opportunities to study it Excel, powerbi, sql, R – no studies even for entry positions
18. In which proportion should guest lectures, practical tasks and ordinary lectures should be presented?	More practical tasks and projects with collaboration with companies – around 50% of the studies. 35% to theory and 15% for guest lectures	Practice – 50%, Theory -30%, Guests – 20%	practice - 50%, teacher lectures 35%, guest lectures 15%	40% to lectures, 10% guest lectures and 50% to practice.	I think most of it should be devoted to working with business representatives and practical projects. I would say that the approximate ratio should be 50:25:25, where 50% - practical work, 25% - lectures of teachers, 25% - guest lectures.	Practice, engagement + lectures are the key parts, but guest lectures should be either obligatory for one course and be entirely focused on topic discussed to introduce real industry insights to it or be voluntary for all students in the universities for simple familiarizing meetings. Guest lecture should be 10% of the studies, or 20% when it contains practice or workshop, and 50% should be devoted to practice.
19. What is your experience in practical tasks execution devoted to real company problems? How useful they are? What is their difference from imagined problems cases in terms of entrepreneurial mindset development?	Yes, definitely I had some. They developed the majority of the previously mentioned skills due to its practical implementation, however sometimes the problem was imagined, and I didn't feel real desire to solve it, just to receive pass. They for certainly enables to think from the entrepreneurial point of view to assess all the risks of your decisions.	Yes, I had such experience as in case championships and projects, real cases indeed create the feeling of importance and serosity and you tend to be more engaged and willing to solve it in a best possible way, whereas imagined cases and projects creates abstract thinking	I have a business project for Coca Cola, a case for IKEA about hiring in a pandemic and creating gamification to teach employees the principles of sustainability. It was very useful - we got to know the company, business task and trends better, worked cool in a group. That there is a representative of the company who, if anything, will tell you in which direction to move, will immerse you more in the task and will be involved in ensuring that the result is as high-quality as possible	Yes, I had several such tasks, one was even held in company, so we solved everything from their office, and it helps to feel more real atmosphere of the tasks and our motivation was higher than from ordinary tasks.	Yes, a consulting project for Lenta is one such example. We have to create a new hypermarket concept based on consumer analysis, market trends and the company's capabilities. This type of work was one of the most useful. Some of our ideas are already implemented by Lenta now. We also saw how engaged were both parties as our team as Lenta's representatives to share with us all possible info that we asked for. Problems with fictitious conditions are useful only for the initial acquaintance with the problem and may be useful for first-year students. I think that modern education should be focused on training specialists who will be able to solve specific business problems immediately after graduation from the university or even during studies.	Yes, there were several such projects, they bring more than ordinary lectures because you understand the reality of the case and there is a possibility that your ideas and project would be implemented in reality, and you can really crate some value to the company.

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