BULGARIAN NASCENT STUDENT TECHNOPRENEURS: MOTIVES, PERCEPTIONS OF BARRIERS AND STARTUP ACTIVITIES

PRELIMINARY COMMUNICATION/PRETHODNO PRIOPĆENJE **UDK: 005.591.6(497.2)** **JEL: M13; L26**

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ABSTRACT

The research objective of the present study is to identify motives, startup activities and perceptions of barriers of Bulgarian nascent technopreneurs. This study utilizes a database about technology entrepreneurship collected using a cross-sectional survey among science and engineering students in 15 Bulgarian universities. Technology entrepreneurship is defined as the creation of a new technology-based business while technology-based business is described as a business whose products or services depend largely on the application of scientific or technological knowledge (Allen, 1992). The sample for this study is extracted from the database and is composed of science and engineering students, who are involved in nascent technology entrepreneurship. The research findings reveal the most important motives, most frequently performed startup activities and the perceived barriers to nascent student technopreneurship. There are differences in the motives, startup activities and perceptions of barriers between Bulgarian nascent student entrepreneurs and intrapreneurs. The study provides recommendations for future research.

KEY WORDS: nascent technopreneurs, motivation, startup activities, barriers

1. INTRODUCTION

In the global economy, entrepreneurship and technology are considered as two important engines for economic growth and sustainability and their combination may create value for firms and may increase the wealth of nations and regions (McPhee & Bailetti, 2012; Bailetti, 2012). Technology entrepreneurship is an important and fascinating scientific field which is relatively unexplored and thus presents various new research opportunities (Shane & Venkataraman, 2003). Since the first symposium on technology entrepreneurship at Purdue University (USA) in 1970 (Bailetti, 2012), technology entrepreneurship is receiving increasing attention among academics, policy makers, entrepreneurs, managers, investors, etc. because of its positive influence on economic development (Mosey, 2016).

Technology entrepreneurship is a distinct research line at the nexus of Entrepreneurship and the Management of Technology and Innovation (Spiegel & Marxt, 2011; Hsu, 2008; Mosey et al., 2016). It was acknowledged that the field of technology entrepreneurship tends to be organized around a phenomenon rather than being oriented around any particular academic field (Hsu, 2008). In comparison with other scientific fields such as economics and management, the field of technology entrepreneurship is in its infancy (Beckman et al., 2012; Bailetti, 2012). During the past decades the academic research in the field of technology entrepreneurship has progressed rapidly in terms of volume, breadth and diversity (Ratinho et al., 2015; Bailetti, 2012). However, the number of scholars in this field is not large and the research on technology entrepreneurship has not contributed substantially to other scientific fields such as economics, entrepreneurship, and management (Bailetti, 2012). As a relatively underresearched topic, technology entrepreneurship is seen as a promising area for entrepreneurship research and practice (McPhee & Bailetti, 2012). Academic research in technology entrepreneurship has generated a complex and interdisciplinary literature which relies on diverse theoretical backgrounds and addresses a wide number of topics (Ratinho et al., 2015).

Several studies reviewing technology entrepreneurship research (Ratinho et al., 2015; Ferreira et al., 2015; Bailetti, 2012; Spiegel & Marxt, 2011; Mosey, 2016; Mosey et al., 2017) demonstrate that there is a lack of understanding about pre-venture processes in technology entrepreneurship. Therefore, the research objective of the present study is to identify motives, startup activities and perceptions of barriers of Bulgarian nascent technopreneurs.

2. TECHNOLOGY ENTREPRENEURSHIP

There is no consensus among scholars about the definition of the concept of technology entrepreneurship. Although the available definitions in the literature emphasize on different activities or stages of entrepreneurial process, ascribe different meanings, refer to different levels of analysis and mention explicitly diverse outcomes of technology entrepreneurship, they coincide that technology entrepreneurship is a combination of two different concepts: entrepreneurship and technology (Petti, 2009; Nacu & Avasilcăi, 2014). Several authors perceive technology entrepreneurship as the act of creation of a new technology-based business (Gans & Stern, 2003; Antoncic & Prodan, 2008; Colovic & Lamotte, 2015). Other authors view technology entrepreneurship as a process of development of innovative products and services (Nacu & Avasilcăi. 2014; Spiegel & Marxt, 2011; Pathak et al., 2013). For example, Nacu & Avasilcăi (2014) argue that technology entrepreneurship involves technological innovations and their evolution from idea to "prototype". Spiegel & Marxt (2011:1626) define technology entrepreneurship as a process of "formation, exploitation and renewal of products, services and processes". The stage of formation involves assembly of resources and systems and opportunity search and recognition. The stage of exploitation is related to pursuing of opportunities. The renewal stage refers to the renewal products, services and processes of technology-driven firms. Petti (2009:xiii) views technology entrepreneurship as a process incorporating four main sets of activities:

- the creation or identification of technologies: involves the recognition of relationships and connections that lead to discoveries (revealing something that was unknown) and inventions (the possible applications of discoveries into the real world);
- recognition of opportunities to match the potential applications of the technology created/identified with a market need or space and decide about intellectual property securing and protection to ensure the potential of value creation;
- technology development/ application: product and related business model design, development and prototyping;
- creation of a business that utilizes the technology/application developed to generate value.

Bailetti (2012:9) emphasizes that technology entrepreneurship:

- is about creating and capturing value for the firm through projects that combine specialists and assets to produce and adopt technology;
- involves collaborative experimentation and production of new products, new assets, and their attributes, which are intricately linked to scientific and technology advances and the firm's asset ownership rights;
- may entail projects that search for problems or applications for a particular technology, launch new ventures, introduce new applications, and exploit opportunities that rely on scientific and technical knowledge provided that their ultimate outcome is to create and capture value for the firm;
- is not about the general management practices used to operate small businesses owned by engineers or scientists or just about small businesses.

The proposed definitions of technology entrepreneurship state explicitly various outcomes including value creation (Bailetti, 2012; Petti & Zhang, 2011), value capture (Bailetti, 2012), enhancing the quality of life (Mirchev & Dicheva, 2013), satisfaction of newly originated needs (Mirchev & Dicheva, 2013), creation of new resource combinations (Burgelman et al., 2004), creation of new technology-based firms (Gans & Stern, 2003; Antoncic & Prodan, 2008; Colovic & Lamotte, 2015), creation of (new/innovative) products, services or processes (Spiegel & Marxt, 2011; Pathak et al., 2013). There are different levels of analysis in technology entrepreneurship (Spiegel & Marxt, 2011; Burgelman et al., 2004; Phan & Foo, 2004). Burgelman et al. (2004:3) emphasize that technology entrepreneurship "can involve one individual (*individual entrepreneurship*) or the combined activities of multiple participants in an organization (*corporate entrepreneurship*)". Phan & Foo (2004:2) outline the following levels of analysis:

- Individual level: scientists/entrepreneurs, venture capitalists, and other individuals that contribute to technology entrepreneurship;
- Organizational level: technological teams, structures, processes, and interorganizational linkages influencing value creation;
- Systems level: players in the ecology of value creation (governing factors, industry standards, and the economics of geographical locations).

Spiegel & Marxt (2011) also identify three levels of analysis related to product / service, business / firm, and the system as a whole and distinguish between new entrants and existing firms. They argue that both new technology-based firms and incumbent technology-based firms play a significant role for the commercialization of new technologies, but different issues in technology entrepreneurship may receive a different focus in new and existing technology-based firms (Spiegel & Marxt, 2011).

Several authors have attempted to identify distinctive characteristics of technology entrepreneurship. Beckman et al. (2012) argues that technology entrepreneurship emerges between two major fields: entrepreneurship and technology-based innovation. According to Beckman et al. (2012) technology entrepreneurship may be distinguished from mainstream entrepreneurship because it is concerned with new opportunities stemming particularly from innovation in science and engineering. Bailetti (2012:10) identifies several differentiating aspects of technology entrepreneurship relative to economics, entrepreneurship and management which require particular attention:

- the interdependence between scientific and technological change and the selection and development of new products, assets, and their attributes;
- the application of technology entrepreneurship to both new and established firms as well as to both small and large firms;
- conceptualization of technology entrepreneurship as an investment in a project;
- the interdependence between technology entrepreneurship and the resource-based view of sustainable competitive advantage;
- the interdependence between technology entrepreneurship and the theory of the firm.

Hsu (2008) emphasizes that technology entrepreneurship, by its nature, is an innovation-based, which can be interpreted as a barrier to entry and therefore technology entrepreneurship may be differentiated from other forms of entrepreneurial entry. Barr et al. (2009) distinguishes between teaching general entrepreneurship and teaching high technology-focused entrepreneurship. They stress that technology entrepreneurship education creates specific challenges stemming from its greater reliance on existing and emerging technologies as a learning base.

As technology entrepreneurship research is growing in volume, breadth and diversity, several studies tried to review technology entrepreneurship research in terms of terminology, structure and content and to identify directions for future research (Ratinho et al., 2015; Ferreira et al., 2015; Bailetti, 2012; Spiegel & Marxt, 2011). Examining various definitions of technology entrepreneurship proposed in the literature, Bailetti (2012:9) concludes that technology entrepreneurship is about:

- operating small business owned by engineers or scientists;
- finding problems or applications for a particular technology;
- launching new ventures, introducing new applications, or exploiting opportunities that rely on scientific and technical knowledge; and
- working with others to produce technology change.

Bailetti (2012) demonstrates that themes in technology entrepreneurship research may be organized in three clusters focusing on technology venture formation, small technology firms, and mid-sized and large firms. Based on a categorized bibliometric analysis, Ferreira et al. (2015) found three different approaches in technology entrepreneurship research (institutional approach, governmental and financial approach, and environmental approach) which reflect the conditions contributing to the development of technology entrepreneurship. Institutional approach highlights that the key factors for the development of technology entrepreneurship are the existence of institutions and the support for research that they can provide. The governmental and financial approach suggests that the existence of governmental supporting

policies depends on the development of high-tech companies. The environmental approach posits that environments with unique characteristics stimulate the growth of technology entrepreneurship.

Spiegel & Marxt (2011) develop a comprehensive framework which describes the scope of technology entrepreneurship and identifies research topics and research questions specific to the field of technology entrepreneurship. At the product and service level, the main research interests are related to creativity and idea management, development of products and services, and life cycle and technological trajectory management. At the business/ firm level the main research themes include opportunity recognition, business model creation, operations, program and project management, organizational learning and knowledge management, strategic renewal, and business model innovation. At the system level, research investigates how technology-based firms are embedded in the environment and the necessary conditions for their success. Therefore, topics such as science, technology, and innovation policy, technology transfer, innovation initiative implementation, innovation monitoring, and trend recognition are addressed as part of technology entrepreneurship.

3. RESEARCH METHODOLOGY

This study utilizes a cross-sectional survey among science and engineering students in Bulgarian universities. The survey was administrated to students in science or engineering majors in 15 Bulgarian public universities in 2015 and 2016. A quota sampling technique was adopted for data collection. The sample includes 1061 students and it has the same proportions of science and engineering students from the different universities as the entire population of science and engineering students in the selected 15 universities. The students included in the sample are enrolled in various professional files.[1] The questionnaire used in the study included questions, which requested a broad array of information related to demographic characteristics of respondents, personality attributes, motives for start-up, entrepreneurial intentions, attitudes toward entrepreneurship, entrepreneurial behavior, the presence of entrepreneurial role models, social network support, entrepreneurship education, perceptions of university environment, perceptions of entrepreneurship and environment. A pilot study was conducted among 15 students (8 males and 7 females) in order to pre-test the initial version of the questionnaire. Due to comments from some students, minor changes were introduced in some questions. With the approval and cooperation of rectors, deans, department heads and lecturers in 15 Bulgarian universities, a questionnaire was distributed during class sessions. Students were informed that the participation in the survey was voluntary.

In the instructions to respondents with regard to filling procedure they were advised that the instrument should be completed anonymously and that it was important to answer all questions. In order to secure a high response rate, to monitor respondents while they were answering the questionnaire, and to be able to answer further questions from respondents, the author was present during the data collection. If missing information was identified when the respondents were submitting the filled questionnaires, the respondents were politely asked to complete it. The sample for this study is composed of only 52 science and engineering students, who are nascent technology entrepreneurs (30 students) or intrapreneurs (22 students). Technology entrepreneurship is defined as the creation of a new technology-based business while technology-based business is described as a business whose products or services depend largely on the application of scientific or technological knowledge (Allen, 1992). Nascent technology entrepreneurs are people, who alone or with others are currently trying to start a new technology business. Nascent technology intrapreneurs are people who alone or with others are currently trying to start a new technology business (such as establishing a new outlet or subsidiary, or launching new products and new product-market combinations) or a new technology venture for their employer as part of their normal work.

4. EMPIRICAL FINDINGS

Table 1 reveals the frequency of start-up activities of nascent technology entrepreneurs. Students who alone or with others are currently trying to start a new technology business are most frequently involved in searching tangible and intangible resources, organizing a team, market research, product and service development, money saving and developing a business plan. Start-up activities less frequently reported by the respondents include acquisition of tangible and intangible resources, contacts with external environment (suppliers, distributors, clients, public administration, etc.), investment of financial resources, applying for patents and licenses, applying for finance, obtaining finance.

[1] The sample includes students enrolled in the following professional fields: communication and computer equipment, informatics and computer sciences, biotechnologies, electrical engineering, electronics and automation, power engineering, transport, navigation and aviation, general engineering, biological sciences, chemical sciences, chemical technologies, architecture, construction and geodesy, earth sciences, minerals prospecting, extraction and processing, mechanics, energetics, food technologies.

Table 1. Start-up activities of nascent technology entrepreneurs

Start-up activities	N
Searching tangible and intangible resources	23
Organizing a team	21
Market research	19
Product and service development	13
Money saving	13
Developing a business plan	12
Acquisition of tangible and intangible resources	11
Contacts with external environment (suppliers, distributors, clients, public administration, etc.)	9
Investment of financial resources	7
Applying for patents and licenses	6
Applying for finance	5
Obtaining finance	5

Source: Created by author

The nascent technology entrepreneurs included in the study perceive various barriers to their entrepreneurial activities (Table 2). The most frequently cited barriers include the complex legislation, strong competition, lack of financial resources, and lack of tangible and intangible resources. Other less frequently cited barriers are the lack of partner, lack of qualified personnel, finding a partner, and lack of entrepreneurial skills.

Table 2. Barriers perceived by the nascent technology entrepreneurs in the study

Start-up activities	N
Finding a business idea	14
Lack of partner	12
Lack of financial resources	20
Lack of qualified personnel	13
Lack of tangible resources	17
Lack of intangible resources	17
Lack of entrepreneurial skills	11
Complex legislation	22
Strong competition	20

Source: Created by author

Table 3 reports the career motives of the nascent technology entrepreneurs in the study. The respondents exhibit diverse career motives including economic opportunity, challenging job, autonomy, authority, self-realization, participation in the whole process.

Table 3. Career motives of the nascent technology entrepreneurs in the study

Start-up activities	N
Economic opportunity	22
Challenging job	23
Autonomy	21
Authority	22
Self-realization	22
Participation in the whole process	19

Source: Created by author

The frequency of various start-up activities undertaken by the nascent technology intrapreneurs is reported in Table 4. The studied nascent technology intrapreneurs are most frequently involved in searching tangible and intangible resources, organizing a team, market research, product and service development, and money saving. Start-up activities less frequently mentioned by the respondents include developing a business plan, acquisition of tangible and intangible resources, contacts with external environment (suppliers, distributors, clients, public administration, etc.), investment of financial resources, applying for patents and licenses, applying for finance, obtaining finance. These findings are similar to the findings about the studied nascent technology entrepreneurs (Table 1).

Table 4. Start-up activities of the nascent technology intrapreneurs in the study

Start-up activities	N
Searching tangible and intangible resources	17
Organizing a team	18
Market research	14
Product and service development	16
Money saving	13
Developing a business plan	6
Acquisition of tangible and intangible resources	11
Contacts with external environment (suppliers, distributors, clients, public administration, etc.)	10
Investment of financial resources	7
Applying for patents and licenses	0
Applying for finance	3
Obtaining finance	2

Source: Created by author

Table 5 reveals the frequency of the barriers to entrepreneurial activities perceived by the nascent technology intrapreneurs. The most frequently mentioned barriers include the complex legislation, strong competition, lack of financial resources, and lack of tangible and intangible resources. the lack of partner, lack of qualified personnel, finding a partner. Other less frequently cited barriers are the lack of entrepreneurial skills and lack of support by top management. The studies nascent technology intrapreneurs tend to consider less frequently the lack of entrepreneurial skills as a barrier to their entrepreneurial activities than the nascent technology entrepreneurs included in the study.

Table 5. Barriers perceived by the nascent technology intrapreneurs in the study

Start-up activities	N
Finding a business idea	6
Lack of support by top management	5
Lack of partner	8
Lack of financial resources	8
Lack of qualified personnel	10
Lack of tangible resources	7
Lack of intangible resources	7
Lack of entrepreneurial skills	2
Complex legislation	10
Strong competition	17

Source: Created by author

The studied nascent technology intrapreneurs exhibit diverse career motives for undertaking entrepreneurial activities (Table 6). The most frequently cited career motives include economic opportunity, challenging job, autonomy, and participation in the whole process. Authority and self-realization are reported as career motives less often than other career motives, which is a major difference in the frequency of the reported career motives between the studied nascent technology intrapreneurs and entrepreneurs (Table 3).

Table 6. Career motives of the nascent technology intrapreneurs in the study

Start-up activities	N
Economic opportunity	18
Challenging job	20
Autonomy	19
Authority	13
Self-realization	10
Participation in the whole process	18

Source: Created by author

5. CONCLUSIONS

It was acknowledged that knowledge-based entrepreneurship is an engine for economic growth, employment generation and competitiveness in an entrepreneurial society (Audtersch, 2009). Increasing interest by academics and policy makers is devoted particularly to technology entrepreneurship for its significant contribution to economic progress (Mosey et al., 2017). Universities need to operate more entrepreneurially and to create favourable conditions for entrepreneurship among students and academics (Kirby, 2006). This study examines the motives, perceptions of barriers and start-up activies of Bulgarian nascent student technopreneurs. The study distinguishes between students, who alone or with others are currently trying to start a new technology business (nascent technology entrepreneurs) and students who alone or with others are currently trying to start a new technology business (such as establishing a new outlet or subsidiary, or launching new products and new product-market combinations) or a new technology venture for their employer as part of their normal work (nascent technology intrapreneurs). The study identifies only 52 science and engineering students, who are nascent technology entrepreneurs (30 students) or intrapreneurs (22 students) in a sample of 1061 science and engineering students included in the research. This may be explained with the low quality and inefficiency of entrepreneurship support services and initiatives in the studied universities. Bulgarian universities not only exhibit narrow understanding of the concept of innovative and entrepreneurial university, but also do not recognize entrepreneurship promotion as a strategic goal (OECD, 2014). The research findings reveal the most important motives, most frequently performed startup activities and the perceived barriers to nascent student technopreneurship. There are differences in the motives, startup activities and perceptions of barriers between Bulgarian nascent student entrepreneurs and intrapreneurs.

The reported empirical findings open several new directions for future research. First future research should provide greater understanding of the impact of various educational variables related to entrepreneurship education such as teaching methods, learning outcomes, educator teaching beliefs, etc. on nascent technopreneurship. Second, future studies need to identify effective entrepreneurship support services and activities that stimulate nascent technopreneurship. Future research with longitudinal design is necessary to provide insights about university-related factors at individual and organizational levels that contribute to nascent tecnopreneurship.

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BUGARSKI STUDENTI TEHNOPODUTENICI: MOTIVI, PERCEPCIJA BARIJERA I STARTUP AKTIVNOSTI

SAŽETAK

Cilj istraživanja je identificirati motive, startup aktivnosti i percepciju barijera novih bugarskih tehno-poduzetnika. Ovo istraživanje koristi bazu podataka o tehnološkom poduzetništvu prikupljenu presječnim istraživanjem među studentima znanstvenih i tehničkih usmjerenja na 15 bugarskih sveučilišta. Tehnološko poduzetništvo definira se kao stvaranje novog poslovanja temeljenog na tehnologiji, dok se poslovanje temeljeno na tehnologiji opisuje kao posao čiji proizvodi ili usluge uvelike ovise o primjeni znanstvenog ili tehnološkog znanja (Allen, 1992.). Za ovo istraživanje korišten je uzorak iz baze podataka, a čine ga studenti znanstvenih i tehničkih usmjerenja koji su uključeni u novonastalo tehnološko poduzetništvo. Rezultati istraživanja pokazuju najvažnije motive, najčešće izvođene startup aktivnosti i uočene prepreke za novonastalo studentsko tehnopoduzetništvo. Postoje razlike u motivima, startup aktivnostima i percepcijama barijera između bugarskih studentskih poduzetnika u nastajanju i ostalih poduzetnika. Studija daje preporuke za buduća istraživanja.

KLJUČNE RIJEČI: novonastali tehnopoduzetnici, motivacija, startup aktivnosti, prepreke