

ENTREPRENEURSHIP EDUCATION: START-UP AS A TOOL FOR ACTUALIZING STUDENT'S PROFESSIONAL COMPETENCIES

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ABSTRACT

The aim of the article is to study the possibilities of using a start-up as a tool for actualizing the professional competencies of a student in the process of obtaining an entrepreneurship education.

A methodology for actualizing the professional competencies of students is developed on the basis of modelling the start-up project using Petri nets. The concept of a start-up is disclosed. The key stages of the implementation of start-up projects are identified; a list of actions that must be performed by the entrepreneur at each stage is formed. The conditions are clarified under which the transition from one stage of the start-up project to the next can be made. A graphical model of the implementation of a start-up project using the Petri net is presented. The study systematizes the list of professional entrepreneurial competencies that are actualized during the implementation of each stage of the start-up project. Entrepreneurial skills are identified that a student should master during an entrepreneurship education. The study proposes measures that are aimed at creating a favourable business environment that is conducive for students to apply acquired professional competencies.

The scientific value of the research results is in the development of the methodological foundations of entrepreneurship education. The study proposes ways to actualize the professional students' competencies based on modelling a start-up project using Petri nets. The practical value of the study concerns the following: identification of key stages of start-up projects; determination of the content of each stage; the clarification of the conditions for the transition from one stage to another; the formation of a list of professional competencies that are to be actualized at each stage of the implementation of a start-up project.

Keywords: Entrepreneurial University, Start-up Ecosystem, Entrepreneurial Network, Startup Factory, Crowdfunding Platform, Entrepreneurial Skills, Entrepreneurial Culture.

INTRODUCTION

The intensive development of communication technologies at the turn of the 20th and 21st centuries has greatly facilitated the dissemination of socially significant information. Thus, a

global information space is formed in which whole communities are involved (Syzdykova, 2014). The sphere of entrepreneurship is no exception.

The increased interest in entrepreneurial education in modern society is explained by the desire to master entrepreneurial competencies to create and successfully run private business. The state is also interested in ensuring the availability of entrepreneurial education, as this helps to unleash the entrepreneurial potential of young people (Achmad et al., 2016; Garcia-Rodriguez et al., 2017). The state also stimulates entrepreneurship development as the latter contributes to reducing unemployment in the country (Kautonen et al., 2015). In this regard, opinions are expressed that entrepreneurship education should be an obligatory part of higher education (Shamsudin et al., 2018). Entrepreneurial education courses should be taught not only in business schools, but also for students of non-economic specialties (Sun et al., 2017; Fomina et al., 2019).

This will help create an entrepreneurial culture of the population.

The development by universities of various entrepreneurial educational programs, on the one hand, is a response to the increased demand of applicants for such educational programs. On the other hand, this process can be referred to as a part of the institutional transformation of universities from traditional research institutions to entrepreneurial ones (Supriadi et al., 2017). At the same time, the methodological foundations of entrepreneurial education are constantly being improved through the development and implementation of new technologies for teaching entrepreneurship (Welsh et al., 2016). The need for this is due to the fact that a superficial familiarization with the theory of entrepreneurship does not prompt students to actively apply their knowledge to open their own business. Only practical consolidation of entrepreneurial competencies can stimulate students' interest in entrepreneurial activity (Olokundun et al., 2018). An innovative approach to actualizing the professional competencies of students is their involvement in the creation of start-ups based at universities. Namely, the creation of dynamically developing companies focused on making a profit from launching modernized or new commercial products on the market (Jain, 2016; Jiang et al., 2018). For instance, studies conducted at the Massachusetts Institute of Technology, at the Auburn University, and at the University of Colorado confirmed the improvement of professional skills during start-up development and launching (Swamidass, 2013; Klofsten et al., 2019). Other papers demonstrated that students having start-up experience are two time more likely to start a successful business than their predecessors (Wright et al., 2017). The experience of these universities confirms that the number of start-ups should be increased within the framework of university policy.

However, experience shows that creating a successful start-up is not an easy task. Therefore, it is very important even at the stage of developing a start-up project to perform detailed modelling of its implementation processes and determine the conditions under which such a project will become successful. Based on the foregoing, the aim of the study is to model the processes of implementing a start-up as a tool for actualizing students' professional competencies. The use of such a model will allow students to more effectively consolidate professional skills in the process of obtaining an entrepreneurial education.

LITERATURE REVIEW

Entrepreneurship is the process of identifying, evaluating and using dynamic opportunities for the modernization or creation of new goods and services for profit (Shane & Venkataraman, 2000; Krajcik & Formanek, 2015). The entrepreneur is distinguished by his/her

willingness to take risks with the expectation of overcoming obstacles to achieve the desired success (Hutagalung et al., 2017).

According to Hyder & Lussier (2016) and Minai et al. (2018), the presence of entrepreneurial education is an incentive and one of the key factors for the success of entrepreneurial activity. However, such an opinion contradicts the position of Oosterbeek et al. (2010), according to which, students (who study entrepreneurship) have a more realistic view of their own entrepreneurial abilities, which hinders them from starting their own business.

The process of learning entrepreneurship involves mastering entrepreneurial competencies (Supriadi et al., 2017). The presence of entrepreneurial competencies is a sustainable competitive advantage for university graduates with specialized entrepreneurial education (Supriadi et al., 2017; Minai et al., 2018). A number of researchers (Achmad et al., 2016; Hutagalung et al., 2017; Nabi et al., 2017), emphasize the importance of reinforcing entrepreneurial competencies in practice, which in the future will allow them to be applied in entrepreneurial activity.

Walter & Block (2016), Papagiannis (2018) consider that the extent to which the formed competencies can be realized in practice depends on the presence of an institutional environment that is favourable for entrepreneurship. In this regard, when training students in entrepreneurship, it is necessary to take into account the specifics of the business environment in a particular country. In the same time, Odili & Ona (2017) emphasize the importance of mentoring and business advice for entrepreneurship.

In order for universities to be able to effectively use such a tool to consolidate and actualize professional competencies of students as start-ups, a number of conditions must be observed (Ziyadin et al., 2019).

First, the university should take the initiative and become an integrator of the regional start-up ecosystem, which will help to establish interaction between the following subjects:

- Start-ups.
- Business incubators.
- Accelerators.
- Start-up studios.
- Technology parks.
- Technology transfer centres.
- Legal and accounting outsourcing companies.
- Business angels.
- Crowd funding platforms.
- Venture capital funds.
- Mentors.
- Businessmen.
- Other business entities (Krajcik & Formanek, 2015; Jain, 2016; Paschen, 2017; Koochi & Feizbakhsh, 2018).

Secondly, a university entrepreneurial network should be created. Entrepreneurial networks are digital platforms for building business relationships, identifying, developing or using economic opportunities, sharing information and finding potential business partners (Machirori & Fatoki, 2013; Abbas et al., 2019). These are business social networks that help entrepreneurs expand their business interests by forming mutually beneficial business relationships (Soda et al., 2004). Entrepreneurial networks are a valuable strategic intangible resource for implementing start-ups (Raza et al., 2018; Jiang et al., 2018).

Thirdly, it is necessary to organize a start-up factory. As ideas for the implementation of start-ups, developments obtained as a result of scientific research of the university can be used. The authors of the current study consider the point of view of Picken (2017) as rational, which calls for using the lean start-up concept developed by Ries (2011). This concept involves detailed preliminary modelling of all stages of the start-up project implementation in order to screen out projects in advance that might be economically inefficient. This approach will ensure the rational use of financial resources attracted by the university to create start-ups. There is a need for new approaches to modelling the stages of start-up projects, given that:

- The start-up factory is simultaneously implementing several start-up projects.
- The business environment (for implementing start-up projects) is highly dynamic and complex).

One of these approaches is the use of Petri nets (Wu & Zhou, 2010; Grobelna et al., 2017).

Due to the fact that the methods of entrepreneurial education (using start-up projects as a tool for actualizing students' professional competencies) remain underdeveloped, this actualizes the implementation of in-depth studies in this direction. The practical significance of this work is in building a model for implementing a start-up project using Petri nets, while defining each start-up stage and forming a list of conditions for the transition from one stage to another. The contribution of this study to world science is in the following:

- Developing the methodological foundations of entrepreneurial education.
- Improving the methodology for the actualization of students' professional competencies based on modeling of start-up stages, using Petri nets.

PROBLEM STATEMENT

The research is aimed at developing a methodology for actualizing students' professional competencies based on start-up processes modelling using Petri nets. The technique defines start-up stages, clarifies the conditions for the transition from one stage to another, and forms a list of professional competencies that are to be actualized at each stage of a start-up project.

The aim of this work is to study the possibilities of using a start-up as a tool for updating the professional competencies of a student in the process of obtaining an entrepreneurial education.

In order to achieve this goal, the following tasks have been formed:

- Identify the main stages of the implementation of start-up projects, disclose their contents, determine the list of actions that must be performed by the entrepreneur at each stage.
- Create a list of conditions under which a transition can be made from one stage of a start-up project to the next.
- Present in graphical form a model for implementing a start-up project using a Petri net.
- Systematize the list of professional entrepreneurial competencies that are actualized during the implementation of each stage of the start-up project.
- Identify personal and entrepreneurial skills that a student should master during an entrepreneurial education.
- Propose measures aimed at creating a favorable business environment that would facilitate the use by students of acquired professional competencies in business practice.

The object of this study is the entrepreneurship education; the subject is the methodological aspects of using start-up projects as a tool for actualizing professional competencies of students.

METHODS AND MATERIALS

This work uses the theory of Petri nets to model the start-up projects to consolidate and actualize students' professional competencies (Wu & Zhou, 2010; Grobelna et al., 2017). The advantage of Petri nets is the ability to simulate several parallel-sequential or asynchronous processes simultaneously. In our case, this will allow us to analyze the simultaneous implementation of several start-up projects by a university start-up factory. The disadvantage of Petri nets is that this theory does not describe the dynamics of the process under study.

In graphical form, the Petri net is a directed graph whose vertices are the so-called “positions” and “transitions” connected by arcs:

$$N = (P, T, *) \quad \dots\dots(1)$$

Where, N: Petri network—consisting of many vertices called positions and transitions; P: graph position; T: graph transition; *: arcs connecting the vertices of the graph.

$$P = \{p_1, p_2, \dots, p_i\}, \quad \dots\dots(2)$$

$$T = \{t_1, t_2, \dots, t_j\}. \quad \dots\dots(3)$$

In the Petri net, positions mean the execution of a set of actions and are indicated by a circle, transitions are the conditions under which actions are activated, they are indicated by a vertical line (Figure 1).

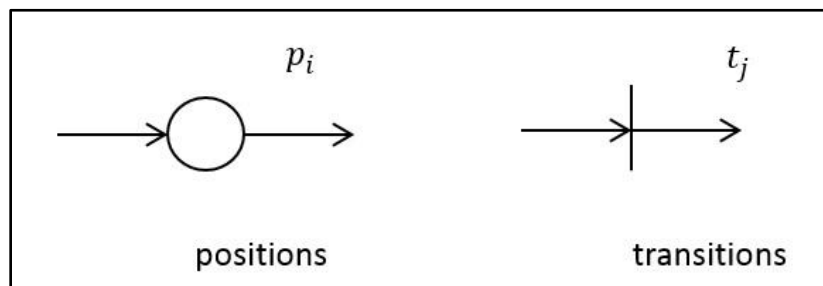


FIGURE 1
DESIGNATION OF VERTICES OF A DIRECTED GRAPH IN A PETRI NET

Petri net modelling is carried out in order to perform compositional analysis of the processes under study and optimize the structure of the model based on the results of such analysis.

The construction of a start-up project model in the form of a Petri net in this work is carried out in general form, by sequential implementation of the following actions:

- Firstly, the key stages of the start-up project are identified, their content and a list of actions that an entrepreneur must perform at each stage for the implementation of the project are disclosed.
- Secondly, the conditions are described under which there is a transition from one stage to another.

- Thirdly, the Petri net is built in the form of a directed graph of the processes of implementing a start-up project.

The following is a list of professional competencies that a student must master in order to complete each stage of a start-up project, as well as a general list of personal and social skills necessary for entrepreneurial activity.

At the end of the study, a list of measures has been developed to create a favorable entrepreneurial environment that will facilitate the use by students of acquired competencies in entrepreneurial practice.

The proposed methodology for modelling a start-up project using Petri nets will allow for:

- A more thorough selection of start-up projects for educational purposes.
- A comprehensive view on the totality of students' professional competencies necessary for entrepreneurial activities.

General recommendations regarding the use of this start-up model in the process of preparing students are its application under the guidance of experienced mentors.

RESULTS

A generalized model of the start-up processes is presented in Figure 2 in the form of a directed graph of a Petri net. This model allows performing a composite analysis of all start-up stages.

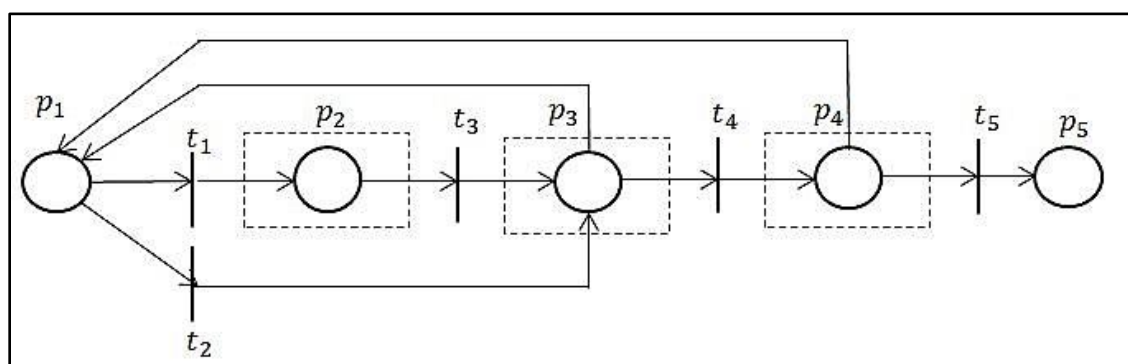


FIGURE 2
A GENERALIZED START-UP MODEL IN THE FORM OF A PETRI NET

Position p_1 of a Petri net shown in the Figure 2 is initial. In this position, a new start-up project is to be developed.

Transition t_1 to the position p_2 occurs when a suitable business idea is formed. Such a transition takes place if a positive preliminary assessment of the feasibility of a start-up project is obtained.

Position p_2 represents the seed stage of the start-up project, which includes:

- Formulation of a business idea.
- Assessment of the prospects of a business based on the selected idea.

- Development of a business concept.
- Identification of the target consumer of the product.
- Identification of consumer needs.
- Determination of partners, competitors, distributors.
- Selection of a business model.
- Development of a strategy for entering the market, sales channels.
- Preliminary assessment of product's value, the share of market sales that can be achieved, profit opportunities.
- Identifying financial resources, necessary for testing the product by potential consumers.
- Assessing the ways to attract resources.
- Preparation of a business plan.

Transition t_3 in position p_3 is possible in case of confirmation of the commercial attractiveness of the developed business model of the start-up project and the potential demand for the product on the market.

Position p_3 indicates the implementation of the start stage of the project, which involves the following actions:

- Registration of the enterprise.
- Selection of a management team and staff training.
- Formation of corporate culture.
- Improvement of the product prototype (production of a minimally viable product).
- Product validation by identifying product compliance with consumer needs.
- Product positioning on the market.
- Checking the willingness of consumers to purchase the product.
- Determining the optimal selling price of the product.
- Building a logistics system for production.
- Refinement of the business plan.

The seed phase of a start-up project may be skipped if it is decided to use a previously implemented start-up project that has confirmed its commercial attractiveness. In this case, a transition t_2 occurs in position p_3 , skipping the position p_2 .

Transition t_4 to a position p_4 occurs in case of stable profitability of the start-up project.

Position p_4 implies the stage of scaling up a start-up project, which requires the following:

- Attracting significant investment resources in business development.
- Developing additional products to form a comprehensive offer to consumers and improving the main product.
- Increasing production volumes, expanding sales channels, geographic market coverage.
- Improving customer support services.

- Achieving sustainable market leadership.

Position p_5 indicates a situation when a university is no longer engaged in a start-up project as it sells an enterprise, after which, university starts to seek new ideas for the implementation of new start-up projects.

The implementation of the described start-up stages is impossible without mastering by students the totality of professional competencies systematized in Table 1.

Stages of the implementation of start-up projects	Professional competencies of students
Seed stage of a start-up project	Marketing research; Pricing; Financial planning; Business planning; Business modeling.
Starting (launching) stage of a project	Company registration; Formation of organizational structure; Building a logistics system; Establishing sales of products and after-sales customer service; Budgeting; Accounting, tax management; Financial controlling.
Scaling stage of a start-up project	Corporate management Tax management Financial management Personnel management Risk management

A list of professional competencies (that are actualized during the implementation of each stage of a start-up) is presented above. The latter allows us to understand the set of entrepreneurial skills that a student must have after completing entrepreneurial education. An important part of such skills is the development of personal qualities inherent to an entrepreneur, such as:

- Perseverance.
- Creativity.
- Initiative.
- Self-confidence.
- Risk tolerance.
- Determination.
- Activity.
- Flexibility.
- Adaptability.
- Responsibility.
- Desire for personal development.
- Leadership.

No less important are social skills-the ability to work in a team and establish interpersonal communications.

In order for the students' professional competencies (acquired in the process of entrepreneurial education) to be put into practice, a government should provide for the following:

- Creating a favourable entrepreneurial environment.
- Maintaining macroeconomic stability.
- Establishing an attractive investment climate.
- Introducing a preferential tax regime for start-ups.
- Implementing support programs for small and medium-sized businesses.
- Improving the entrepreneurial culture of the population.

DISCUSSION

The study touches upon a number of debatable issues requiring deeper discussion in the scientific community. For example, it is debatable whether entrepreneurship can be defined as a collection of specific personality traits or a collection of skills that one can learn. In the authors' opinion, entrepreneurial skills can be mastered with the help of entrepreneurial education. This opinion is shared by Supriadi et al. (2017), who also believe that it is possible to learn entrepreneurial skills, since they do not relate to personality traits inherited from birth.

Oosterbeek et al. (2010) strongly disagree and conclude that entrepreneurial education can have a deterrent effect on the development of entrepreneurial activity. According to the authors of the current study, entrepreneurial education raises the level of entrepreneurial culture in society. The latter contributes to the establishment of a positive image of an entrepreneur as a socially responsible person, who:

- Promotes self-employment.
- Creates new jobs.
- Fills in the budget.
- Contributes to solving social problems.
- Supports the economic development of the state.

The authors believe that in order to achieve positive externalities of entrepreneurship, entrepreneurial education should be more accessible. Besides, individual entrepreneurship should also be supported by a government.

The next discussion question concerns the importance of practical mastery of an entrepreneur's professional competencies during his/her studies at the university. The authors' methodology for the actualization of students' professional competencies (based on Petri net start-up model) complements the research results of Achmad et al. (2016), Hutagalung et al. (2017), Nabi et al. (2017) that concern the search for methods of strengthening business competencies in practice.

It should be noted that the list of professional competencies of an entrepreneur does not remain unchanged, but is constantly supplemented with more and more competencies. While the latter is associated with the continuous technological progress of social production. The importance of maintaining the level of professional education at a high level makes it necessary to continue the education of a person throughout life.

It is also necessary to discuss in more detail an entrepreneur's external environment and the impact of the latter on the implementation of entrepreneurial skills. Namely, it is relevant to consider whether a favourable institutional environment can influence the development of entrepreneurship. The authors' position on this issue coincides with the opinions of Walter & Block (2016), Papagiannis (2018), who consider this influence to be decisive.

The results of modelling the start-up processes should be considered from the perspective of the concept of “*lean start-up*” (Ries, 2011; Picken, 2017). Since the use of the proposed model at the stage of preliminary selection of start-up projects will allow weeding out the unsuccessful ones. The latter will save investment resources without wasting them on the start-ups with low socio-economic efficiency.

The issues raised by Paschen (2017), Koochi & Feizbakhsh (2018), Abbas et al. (2019) are worthy of further attention. Namely, regarding the following:

- Participation of universities in the formation of effective regional start-up ecosystems.
- The creation of productive start-up factories.
- The development of entrepreneurial networks that encompass students and graduates of universities, which will allow them to maintain their entrepreneurial skills at a high level.

In particular, there is a need to generalize the experience of universities in addressing such issues.

Another urgent issue is the creation of a university's crowd funding platform that allows:

- Attracting investment resources for the implementation of the seed stages of start-up projects.
- The search for additional sources of financing for performing research at the university,
- The development of new entrepreneurial educational programs.

The authors also consider it promising to study the possibilities of differentiating the stages of start-up projects and the conditions for transition from one stage of project implementation to another. Such studies should take into account start-up types (for example, high-tech start-ups, social start-ups, Internet start-ups and others).

The unexplored part of the problem under study is the computer simulation of the start-up processes, using the construction of Petri nets. This problem can be solved in the future with the use of the digital platform PIPE2 (Platform Independent Petri net Editor 2). There is also a need for more detailed development of functional Petri net subnets in the presented generalized model for the implementation of start-up projects.

In general, it is expected that the following issues will remain of relevance:

- Ensuring the accessibility of entrepreneurial education;
- Actualizing the professional competencies of entrepreneurs.

However, the profile of professional competencies and skills will change, as the digital economy leads to the formation of a new type of entrepreneurship - digital entrepreneurship. In this regard, today it is necessary to prioritize the development of competencies in the field of e-commerce, which should be reflected in entrepreneurial education programs.

CONCLUSION

Entrepreneurship is the process of identifying, evaluating and using dynamic opportunities to modernize or create new goods and services for profit. The presence of entrepreneurial education is one of the factors for the success of entrepreneurial activity. Entrepreneurship education involves mastering professional competencies, the presence of which is a sustainable competitive advantage of an entrepreneur.

Start-ups can be used as a tool for actualizing students' professional competencies, but for this, it is necessary to observe a number of conditions. The university should take the initiative to create a regional start-up ecosystem, create a university entrepreneurial network that includes students and graduates, open its own crowd funding platform, and launch a start-up factory. The authors' method of actualizing students' professional competencies is based on modelling the start-up processes using Petri nets. It also involves identification of key stages of start-up implementation, clarification of the conditions for transition from one stage to another. The study establishes a list of professional competencies that are actualized during a start-up's implementation. The latter allows us to create a comprehensive picture of the set of entrepreneurial skills that a student must master during entrepreneurial education.

In order for students to be able to use acquired professional competencies in practice, a government should take the following measures:

- Create a favorable entrepreneurial environment.
- Maintain macroeconomic stability.
- Establish an attractive investment climate.
- Introduce a preferential tax regime for start-ups.
- Implement support programs for small and medium-sized businesses.
- Improve the entrepreneurial culture of the population.

The scientific value of the research results is in the development of methodological foundations of entrepreneurial education. Namely, the methodology for actualizing students' professional competencies is improved on the basis of modelling start-up stages and with the use of Petri nets. The practical value of the study is in the following:

- Identifying key stages of start-up project implementation.
- Determining the content of each stage.
- Determining the conditions for transition from one stage to another.
- Forming a list of actions that must be performed by an entrepreneur at each stage.
- Determining professional competencies that are to be actualized at each stage of a start-up project.

The developed methodology for actualizing students' professional competencies is based on modeling start-up processes using Petri nets. This methodology might be widely used in the activities of entrepreneurial universities.

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