Cognitive Modeling of the Startup Life Cycle

Labunskaya S. V., Prokopishyna O. V., Iermachenko Ie. V.

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Under conditions of turbulent development of the world market, which takes place based on modern high-tech industries and introduction of IT technologies into all business processes development of the global socio-economic system is impossible without the spread and intensification of activities of startups. Startup enterprises, despite the short period of their existence, play an important role in the processes of generating new knowledge, creating innovative projects and commercializing innovative ideas. Startups, as business units, constitute a separate subset of innovative enterprises, grouped according to scaling, using breakthrough innovative ideas, specific sources of financing and increased risk. Since the typical features of a successful startup are the rapid expansion of operations and high risks of financial and economic activity, a conditional time point at which both the risks and rates of growth in transaction volume are simultaneously reduced can be defined as the fluctuation point at which the startup ceases to exist. The results of applying mathematical methods to process statistical information on the dynamics of the market proved that the fluctuation point of the life cycle of startups in Ukraine takes place in the time interval of the first year of financial and economic activities of the enterprise. During this interval, startup enterprises are oriented towards one of two alternatives: scaling operations on the basis of attracting investments and a significant expansion of activities or gradual curtailment of an innovative project in which investors' financial resources could not be attracted. Both alternatives lead to the transmission of an enterprise from the class of startups to the class of large enterprises or the liquidation of the business. Startup enterprises in Ukraine have a high potential for innovation development and can become a driving force for the social and economic development of the country as a whole. In order to increase the positive effect of startup initiatives for the Ukrainian economy, it is necessary to solve a number of tasks, among which there are the expansion of information and financial support from the state, the formation of a favorable investment climate and infrastructure for the commercialization of innovative projects.

Keywords: cognitive modeling, enterprise life cycle, innovation, startup.

Fig.: 3. Tab.: 1. Bibl.: 23.

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Introduction. Under conditions of accelerated turbulent changes in the world economic environment based on modern high-tech solutions and wide implementation of IT technologies in business processes, the problem of implementation of risk projects, which form proactive strategy for the development of separate industries and technological progress in general, becomes extremely important. Recent scientific studies \[14\] prove that development of institutions and infrastructure, human capital, innovations as well as technology transfer are universal factors for ensuring stable economic growth, although each country uses its own competitive advantages and resources.

Nowadays the innovative development of global socio-economic environment is impossible without the spread and activation of startups. Mainly startup companies test and implement the latest technology and commercial solutions in all areas of business and then scale up breakthrough projects. As noted by leading scholars \[2–4; 15\], the startup flow is, in es-
ence, the process of developing and implementing innovative breakthrough technologies that shape the further development of mankind.

An American scientist-innovator Steve Blanc was the first in formulating new approach to determining peculiarities of business organization on the principle of startups and he defined startup company as a temporary venture aimed at search of iterative business model [1, p. 43]. The interpretation of the term “startup” in the context of limbic perception of its origin justifies its understanding as a new project that is elaborated under uncertainty and involves development of new products or services and is at the stage of searching for the best business ideas and funding [2].

O. Kulynych [6] persuades that a startup is a partnership of two or more people to create an innovative product or service that is at the early stage of business activity with limited resources and requires additional venture capital.

The concept of startup is often associated with limited resources for implementation of a new idea or a plan for market advancement. That is, a startup company is a venture that offers completely (revolutionary) new products (services), introduces new technologies or completely new channels for product promotion. Innovation activity is the main foundation and necessary (but insufficient) condition for creating of a startup.

In general, startup companies are innovative companies, whose activities in Ukraine are regulated by the Law “On Innovation Activity” [9, art. 16]. This document states that “an enterprise (or association of enterprises) of any form of ownership is recognized as an innovative enterprise if more than 70 % of the volume of its output (in monetary terms) for the referenced period are innovative products”. In turn, innovative product is a product created in the result of an innovative project or produced in Ukraine for the first time, or has essentially new technical and economic features in comparison with other similar products [9].

The innovative development stimulates the creation of new industries, leads to lower-cost production and increases the greening of production, so it is the main instrument for attracting foreign investment. The rapid and broad distribution of innovations ensures stable positions of leading countries on the global markets. The United States, as the world leader in the economy, according to the data of OECD [19] allocates the largest funds to research and development: more than USD460 billion a year (2.74 % of GDP). China takes the second position and invests to scientific research activities about USD338 billion a year (2.1 % of GDP). Japan's annual spending on R&D is USD160 billion (3.67 %). In Ukraine, the share of expenditures on R&D in the GDP in 2017 was 0.45 %, including the budget ones (0.16 %). Ukraine is the 76th in the world by total spending on innovations. At the same time, the total GDP growth due to the introduction of new technologies in Ukraine is 0.7 %, while in developed countries this rate reaches 60-90 % [19]. Thus, we may conclude that the national economy needs a radical upsurge in the level of innovation, and here startups can assist essentially.

Examples of the most successful startups are Google, PayPal, Wikipedia, Instagram, YouTube, Facebook, which eventually turned into powerful corporations. Nowadays, the scientific literature lacks a well-defined concept of startup. Some researchers understand startup as any small newly created innovative business. Thus, the statistics regarding the number and dynamics of startups that are presented on various websites, both foreign [10; 11] and domestic [7; 13], vary significantly.

According to the Inn Mind Center, at the beginning of 2016 there were about 305 million of startups worldwide, nearly 472 million of entrepreneurs participated in startup companies or startup projects, and over the past years 100 million of new startups have been launched annually, including 1.35 million of technology ones [7].

The Startup Ranking, based on the analysis of the number of startups in 186 countries, demonstrates that in 2017 Ukraine ranked 42nd, rising by 5 positions from the previous year and outperforming the Philippines, Romania and Greece. This position was obtained due to 216 startups operating in Ukraine. The first place in the rating was taken by the United States (45 251 startups), the second place – by India (5 318 startups) and the third one – by the UK (4 726 startups as of 1st June, 2018) [11]. The most internationally well-known Ukrainian startups are: DepositPhotos, IT-company Terrasoft, TemplateMonster, Petcube, Grammarly [5].

It should be noted that no startup companies were registered in Ukraine before 2005, but some startup projects were implemented on the principles of outsourcing with foreign startup companies [11]. The majority of Ukrainian startup companies are registered in Kyiv region (88 %) and the city of Kyiv (6 %). According to the information of the Startup Ranking, since 2014, the startup movement extends to different regions of Ukraine: startup companies were created in Lviv region (4 companies), Dnipropetrovsk and Ternopil region (2 companies in each), as well as in Kharkiv, Zaporizhzhya, and Zakarpattya region (1 company in each).

The purpose of this scientific research is to reveal the essence of the concept of “startup company”, its differences from other types of business activity, as well as analyze the theoretical and methodological backgrounds for the development of startup companies.

A well-known American researcher Eric Ries believes that a startup is any business organization designed to create and promote a new innovation product under conditions of extreme uncertainty [17]. According to him, doing business under conditions of extreme uncertainty and, as a consequence, of an increased risk is a distinctive feature of these enterprises from others.

Paul Graham, the founder of Yahoo, highlights the feature of startup companies (projects) as assumption of rapid growth in a short period of time [18]. The short or limited time of the startup business existence is emphasized also in scientific works of N. Sytnik, D. Ponomarev, and others [8; 12].

Experts from the American financial and economic magazine Forbes determine the startup by the following distinctive features: it was founded not more than a year ago; it represents a new innovation product under conditions of extreme uncertainty and involves development of new products or services and is at the stage of searching for the best business ideas and funding [2].

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Experts from the American financial and economic magazine Forbes determine the startup by the following distinctive features: it was founded not more than a year ago; it represents an innovative business that destroys traditional ideas about its sector; it is a business with a real business plan and projected sales that do not exceed average sales for startups; it is not a property of large corporations [16].

Thus, the main features of a startup as a newly created business are:

• novelty of the product offered by the startup;
Business angels, innovative funds, venture funds, middle risk, minor risk, very high risk, considerable risk.

Innovative small and medium business (it is included into their totality), the basis of scalability, use of breakthrough innovative ideas, specific sources of funding, and increased riskiness. Based on characteristics given in Table 1, it can be proposed to consider a startup company in general as a small innovative company that is at the startup phase of its development. While the startup phase may be defined as a period in the life cycle of an innovative business during which the company operates in high risk environment, introduces crucial innovations, grows fast and attracts external funding for success.

Since the highlights of a startup are fast scalability of operations and high riskiness of business, the conditional time point, at which risks decrease and transactions grow simultaneously, can be defined as the fluctuation point of the end of the startup phase and transition of a startup business to the phase of the mature business, as shown in Figure 1.

Autio and Rannikko [15] suggest that the stand-up, startup and scaleup phases of business development can be divided into two sub-phases.

Thus, the stand-up phase includes:
- ideating – a period of the life cycle of a business when one person or a vague team reveals a problem in consumption or market and expresses entrepreneurial ambition to create a scalable product or service;
- concepting – a period of the life cycle of a business when two or three entrepreneurial core co-founders with complementary skills and ownership plan define business mission and vision aimed at fast growing performance based on radical innovations.

The startup phase includes:
- committing – a period of the life cycle of a business when co-founding team with shared vision, values and attitude dedicate financial and material resources to develop and launch a new product or service;

<table>
<thead>
<tr>
<th>Feature</th>
<th>Startup business</th>
<th>Innovative small and medium business</th>
</tr>
</thead>
<tbody>
<tr>
<td>The degree of innovation</td>
<td>An absolutely new “breakthrough” idea for production and sale of a product that does not exist on the market; enrichment of the existing product with completely new features; application of unique new technologies; development of unique channels for sales and product promotion</td>
<td>Implementation of new or existing in other areas ideas for a particular company, industry or product market; use of improved technologies; application of production technologies or methods for promoting goods (products, works, or services) implemented in other industries, companies or markets</td>
</tr>
<tr>
<td>The rate of growth and return on investments</td>
<td>High (within 1-3 years) rate of growth and return on investments</td>
<td>Comparatively low (over 3 years) rate of growth and return on investments</td>
</tr>
<tr>
<td>Scalability and impact on the development of certain industries or technologies</td>
<td>High scalability, due to breakthrough technologies</td>
<td>Low scalability, because the impact of innovative products is limited by the company, industry or region.</td>
</tr>
<tr>
<td>Ability to predict performance</td>
<td>Hardly forecasted results due to wide fluctuation of changes of environmental factors, uncertainty of market response</td>
<td>Relatively high degree of predictability, since already known introductions are made</td>
</tr>
<tr>
<td>The degree of risk</td>
<td>Very high risk</td>
<td>Middle risk</td>
</tr>
<tr>
<td>Organizational forms and infrastructure centers</td>
<td>Startup companies (private companies, limited liability companies), startup projects, business incubators, business accelerators, techno parks, etc.</td>
<td>Small and medium companies (private companies, limited liability companies), business centers, business incubators, business accelerators, technology parks, investment and innovation funds, etc.</td>
</tr>
<tr>
<td>Sources of funding</td>
<td>Business angels, innovative funds, venture funds, crowdfunding, lending institutions</td>
<td>Own funds, lending institutions, innovation funds, venture funds, public associations of business entities</td>
</tr>
<tr>
<td>Influence on the market</td>
<td>Considerable</td>
<td>Minor</td>
</tr>
</tbody>
</table>

Source: developed by the authors based on [2; 5; 6; 12; 13; 15; 21; 22]
validating – a period of the life cycle of a business when the management team of a new business entity tests assumptions for validated solution to achieve initial growth of revenue and in majority cases tries to attract additional resources via investments or loans for equity to increase business transactions and sales.

The scaleup phase includes:
- scaling – a period of the life cycle of a business when a professional management team improves the quality of the launched product or service and achieves measurable growth in a big or fast growing market based on significant funding attracted;
- establishing – a period of the life cycle of a business when a professional management team expects the achieved great business growth to continue, easily attracts resources, expands the market to the international level and often tries to culturally continue “like a startup; initial founders or investors make exit(s) or continue with the company.

Figure 1 demonstrates the life cycle of a successful startup company, however the carried out statistical analysis of startups confirms that their implicit nature of a highly risky business in most cases leads to discontinuation of their functioning, as shown in Figure 2.

The international advanced study of entrepreneurship The Global Entrepreneurship Monitor [17] defines nascent entrepreneurs and a new business as early-stage entrepreneurial activity that lasts less than 3.5 years, but this quantitative limit undoubtedly needs to be justified.

Petersburg Business Incubator in research of startups in the Russian Federation estimated the share of startups closed during the first year at 40 %, and 30 % more cease to exist within another two years [13].

Observation results of CB Insights on the development of startups in the US [11] show that more than a third of the startup companies exit the market during their first year in business, and almost the same quantity – in the next year, so about 75 % of the startups discontinue their business in 2 years from the moment of their launching. The average lifetime of a startup in the US is about 20 months [7] (Fig. 3).

Demographic analysis of startup companies in Ukraine, as well as in other countries, is complicated by the limited st-
The analysis of investments revealed that 50% of financed startup companies (of the 20 most successful in Ukraine) attracted investments in the amount of UAD1 million and over. Since fast recoupment is the essence of startups, it can be forecast that the income of such companies on average exceeded USD13.1 million, the share of companies that received investments among the 40 best companies fell to 37.5%, among the 60 best companies was 30%, among the 80 best companies was only 27.5%. Thus, it is possible to conclude that startup companies that failed to attract investments did not have the capacity to scale up their operations and expand their activities and thus were forced to discontinue their business. This conclusion is also confirmed by the results of numerous studies of reasons for liquidation of startups [11], which determine the inaccessibility of funding as the biggest problem for the development of small innovative businesses.

Conclusions. The fluctuation point of the life cycle of startups in Ukraine takes place in the time period of the first year of the financial and economic activity of a company. During this interval, the startup company is guided by one of two alternatives: 1) scaling up its operations based on attracting investment and significant expansion or 2) gradual curtailment of the innovative project that failed to attract financial resources of investors. Both alternatives lead to the transmission of the business from the class of startups to the class of large companies or to the liquidation of the business. Thus, a short life cycle is a characteristic feature of startup companies, which is proved by monographic analysis and by the results of application of mathematical methods for processing statistical information on market dynamics. Despite the short time of existence, startup companies play an important role in processes of generating new knowledge, creating innovative projects and commercializing innovative ideas. A startup company is a forerunner of innovation development and a driving force of socio-economic development of a country.

In order to increase the positive effect of startup initiatives for the Ukrainian economy, it is necessary to solve a number of tasks, including the expansion of information and financial support from the state, formation of favorable investment climate and infrastructure for the commercialization of innovation projects, i.e., the theoretical justification of which is a promising area for further research.

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