

# BUSINESS INCUBATION ANALYSIS WITH THE HELP OF REAL OPTION THEORY<sup>1</sup>

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## ABSTRACT

The start-up companies' evaluation needs to start with the analysis of the business incubation process. Business incubation has the potential to apply real options that support the identification and exploitation of possible new businesses and can be the new start-ups' source of success. The incubator could be described as an entrepreneurial firm that creates real options by selecting new, young or emerging ventures and it could exercise these real options by monitoring and coaching the participants through different development stages. The business incubators' intensive business support activities are comparable to the realization of investment projects characterized by a high degree of uncertainty and decision-making flexibility, which are carried out by companies operating in a dynamic market environment. The aims of the paper are to systematically review the literature on business incubation and its process and to find the real options that can generate value creation and higher efficiency through exploring and analyzing the activities, programs and incubation process of selected Hungarian incubators.

**KEY WORDS:** real option theory, business incubation, flexibility, uncertainty.

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## 1. INTRODUCTION

Most of the ventures fail during the early stages of their development (Watson et al., 1998; Zacharakis et al., 1999) and it can derive from the entrepreneurial process (Berger, 2015; Eftekhari, 2014) or the lack of management expertise and under-capitalization (Roure – Keeley, 1990). According to the academic literature, business incubators can help to decrease the number of venture failures and increase the survival rates (Ryan - Wright, 2009; Klostermann – Kraus, 2010, Ayatse et al., 2016). The business incubators provide a physical office space with business advice for the entrepreneurs and offer an incubation program that leads them through the incubation process (Munkongsujarit, 2016). The business incubator's main goal is to stimulate business creation (Bruneel et al., 2012), support entrepreneurs and small companies in creating new businesses, workplaces and establish an entrepreneurial society (Mian, 1996; Colombo – Delmastro, 2002; Aerts et al., 2007; McAdam – McAdam, 2008; Salem, 2014). In many cases, the business incubation process is in the focus of the research but we can only see few cases when real option theory gets in the picture. Hackett – Dilts (2004b, 2008) showed how to see the incubation process through the lens of real option theory. According to their research, this article connects the business incubation process and real option theory and identifies real options in the business incubation process.

The first section reviews the literature of the business incubation and incubation process models. In the following section, I introduce the real option theory with its main characteristics and advantages. In the third section, the connection between business incubation and real option theory is showed with the help of different types of real options because my perception is that using real option theory is one of the best approaches to understand and evaluate the business incubation process. In the fourth section, the Hungarian business incubators' business incubation programs and their selection are analyzed. The last section concludes the paper with a discussion of the results.

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## 2. THE BUSINESS INCUBATION

The majority of business incubators are considered on one hand as a tool of economic development, the economic situation of a particular region (Mian, 1997; Thierstein - Wilhelm, 2001; Klostermann - Kraus, 2010), as an instrument for innovation, job creation (Carree - Thurik, 2010), urban regeneration, and the placing of university innovation on a business basis. On the other hand, they are considered as an organization for incubating new, fast-growing companies (Hackett - Dilts, 2004). The responsibility of the business incubator is to develop a collaboration that supports incubators in accessing information, thereby contributing to the development of competencies through the learning process. The ultimate goal of the incubation process is to develop the survival of the incubated and turn the business idea into a successful business (Bergek - Norrman, 2008).

The business incubation literature can be divided into two major groups (Akcomak, 2009). One of them deals with the theory and models of the business incubators and seeks answers to questions such as how they are created, their purpose or how they are managed (Smilor - Gill, 1986; Allen - McCluskey, 1990; Nowak - Grantham, 2000; Grimaldi - Grandi, 2005; Aernoudt, 2004; Lelebici - Shah, 2004; Becker - Gassmann, 2006). The other major group focuses on evaluating incubators, including factors that can be described as characteristics of a successful business incubator (Mian, 1996; Colombo - Delmastro, 2002; Aerts et al., 2007; McAdam - Mcadam, 2008).

Several authors attempted to define business incubators from different aspects. According to Hannon (2003), the business incubation process supports the recognition and exploitation of the creation of new businesses and must first consider the environment where the new entrepreneurial idea and the business itself can be developed with the help of business support resources. According to Al-Mubarak and Busler (2013), business incubation can be defined as an economic and social program that provides intensive support to start-up companies, preparing them for business creation and accelerating their development and success through their business support program. Moreover, Ayatse et al. (2017) see it as a unique institutional agreement that focuses on the development of entrepreneurial culture within a community.

Many authors believe that incubators also contribute to reducing the risk of corporate failure (Klostermann - Kraus, 2010). They are also recognized as one of the start-up companies' main sponsors (Smilor - Gill, 1986), attributing a network mediation role between incubated and surrounding environment (Bergek - Norrman, 2008). In many cases, we encounter start-up success stories, but most start-ups are unable to take full advantage of their potential. Founders often lack the managerial skills or the resources to make their innovations viable (Bøllingtoft - Ullhøi, 2005). This niche was filled by business incubators with providing a supportive environment for new businesses. In addition to financial support, incubators also provide additional services to the business, such as networking and entrepreneurial support, which differentiate the incubator concept from a simple start-up investor (Carayannis - Von Zedtwitz, 2005). The literature differentiates four types of incubator such as for-profit, non-profit, university and corporate private incubators from different aspects (Kuratko - LaFollette, 1987; Allen - McCluskey, 1990; Grimaldi - Grandi, 2005). The business incubator typology is one approach of mechanism of the business incubators and the business incubation models are also in the middle of the business incubation research that is introduced in the following section.

### 2.1. Business incubation process and models

The business incubation models and the process itself influence the activity of incubators as well as incubatees and this complex structure should be analyzed to ensure the effective and efficient management and value creation.

There are several examples of modeling business incubation in the literature (Campbell et al., 1985; Smilor, 1987; Nowak - Grantham, 2000; Lalkaka, 2000; Bergek-Norman, 2008). They follow different aspects and show diverse specifications of the business incubation process. The business incubation models are differently specified and some of them illustrate the whole business incubation process, while others highlight only some parts of the process, not going into details. From another point of view several models focus on the structure of the business model (Smilor, 1987; Nowak - Grantham, 2000), others put the emphasis on the process of the model (Campbell et al., 1985; Lalkaka, 2000; Hackett - Dilts, 2004; Bergek - Norrman, 2008). In my paper, I show three incubation models. At first, the process-oriented model of Campbell et al. (1985) is reviewed because it is the baseline of the other two analyzed business incubation models. After that, they are followed by Smilor's (1987)'s structural model and finally Hackett - Dilts's (2004) model because of its real option focus.

Campbell et al. (1985) created the first business incubation process model that supports the transformation of ideas and proposals into a viable company through various activities in the business incubator. The model describes four value-creating activities that can contribute to the performance of participating companies. Value-creating activities include assessing business needs, selection and monitored the application of business services, funding, and access to the incubator social network. The disadvantage of the model can be that it does not take into account the lack of skills of potential entrepreneurs and environmental constraints, which may come to the fore during the incubation process and prevent the creation of a

viable business (Moreira - Carvalho, 2012; Ayatse, et al., 2017). It also does not include the criteria required for participation in the incubation process (Moreira - Carvalho, 2012). To eliminate the problem of selection, Merrifield (1987) established a set of criteria based on the three issues to be decided, which tried to filter out potential businesses in a simple way. In the subsequent literature, Bergek - Norrman (2008) distinguishes two important variables that are necessary for a successful business: the business idea and the entrepreneur when applying the selection strategy.

Smilor (1987) extended the Campbell model, which already includes an external approach. In his incubator model, he looked at the process as a system that provides the incubation of the new company, structure and credibility, and key resources to the incubatees. Besides internal support systems join to the private sector, to universities, to government and non-profit organizations appears in the model as a value-creating activity, which, according to Smilor (1987), shows the incubator as a transformation mechanism. The aim of these two support systems for businesses is to become companies that generate profits, contribute to economic development, create jobs and successful products through the incubator. External factors were also emphasized by Bergek - Norrman (2008), who also incorporated mediation in the process as a way to connect the external environment with the incubation. Hackett - Dilts (2004b) also developed the model of Campbell (1985) in their holistic incubation model. Their approach also focuses on the results applying the so-called "black box" approach. The "black box" reveals the features seen by external observers but ignores internal details.

The incubation process starts with the selection of candidates, followed by a checking phase and supporting resources until they go through the various stages of development (Moreira - Carvalho, 2012; Ayatse, et al., 2017). During the analysis, the incubation process model is traced back to the incubators' aims. According to Aernoudt (2004), the main purpose of incubation is to create successful companies that leave the incubator as viable economic actors standing on their own feet within a reasonable time. The purpose of the incubator is to formulate the output requirement expected by the incubators.

The incubation model that is shown in Figure 1 is intended to illustrate the business incubation process that starts with the analysis of the potential incubatees in the so-called pre-incubation phase. Then the incubation process is presented, in which inputs are collected that are involved in the incubation process and help the incubatees to reach the post-incubation phase. In the next chapter, the real option theory and the different types of real options are applied to analyze the different stages of the incubation process, which looks at the incubator as a set of projects.

**Figure 1.** Business incubation process model



Source: own construction

The pre-incubator does not only appear as a phase of the process but, according to the literature, appears as a facility that offers an opportunity for early-stage start-up companies that did not formulate their business plan yet to set up a prototype development and an entrepreneurial team. The difference between a pre-incubation incubator and a business incubator is determined by the level of development of the incubated business. The business incubator has already established a service for start-up companies that are still in their early stages (Kirby, 2004). According to Deutschmann (2007), the similarity between the pre-incubator and the business incubator is providing the participants physical infrastructure, consultation, and training, but the difference is that the participants of the business pre-incubator are in the planning phase and are offered free services.

Colombo - Delmastro (2002) pointed out that the process of selecting incubatees influences the quality of candidates. It was found that the selection of the candidates on the basis of their educational attainment and previous work experience attracted companies into Italian science parks with better human capital compared to other companies.

Pre-incubation support helps to strengthen the business plan, business model and team before a company enters the incubation process. Pre-incubation programs also serve as a filter for the selection process of incubators and help entrepreneurs to reduce risk and make an informed decision to start a new business and prevent future failure (CIE, 2014). The pre-incubation phase begins with an innovative idea and the business incubator analyzes, evaluates and filters these ideas in order to proactively identify potential entrepreneurs (Zhang et al., 2014). At this stage, managerial skills, desirable goals, financing, the business idea, the recognized opportunities, and the available technology are at the forefront.

After successful selection, the start-up company will get into the incubation process and it will have recourse to different services. These services include physical infrastructure, facilitation-based services, participation in training, business consulting, administrative services, access to financial support and access to the incubator's expert network. Eventually, through these services, business incubator can transform a business proposal into a successful and viable enterprise.

In the post-incubation phase, the incubator determines specific output requirements and, on this basis, it evaluates the results achieved during the incubation process, i.e. the possible marketability and success of the ideas and young enterprises. According to some literature sources, the output requirements of the post-incubation phase include profitability; economic development, contribution to the development of the region; job creation; product success; visible and viable business; industry competitiveness; global networks and product / process development (Wiggins - Gibson, 2003; Stephens - Onofrei, 2012). According to Virtanen - Kiuru (2013) the selection process (pre-incubation) should also be taken into consideration in the analysis of the performance in the post-incubation phase since those enterprises that were expected to grow in the future tend to perform well after the development process.

It is important to emphasize that the post-incubation phase is not part of business incubation, it would rather mean a range of services provided by the incubator, such as monitoring, access to mass production, managerial capacity expansion and the possibility of network development (Kusuma et al., 2015).

The business incubation process models help the business incubator and its stakeholders to understand the complex process and to identify the value-creating activities but in my opinion, they do not put emphasis on the optimal order or timing of different services. Considering flexibility can indicate a better way of service utilization and business development. With real option theory, the incubator and its participants can also exploit the embedded uncertainty of the business incubation process.

### 3. THE REAL OPTION THEORY

When defining real options it is important to clarify what we mean by 'option' and by 'real'. The option means in this context more than a simple alternative or possibility. The real option is a right, but not an obligation, to buy or sell the underlying asset for a prescribed price at a predetermined time (Copeland - Antikarov, 2001). The term "real option" was used at first by Myers (1977), who geared the corporate value to the company's investment strategy, and for that, he differentiated two groups: the real assets and the real options. He called the market values irrespectively of the company's investment strategy real assets, and those kinds of options that enable them to obtain real assets under favorable conditions real options. According to Kogut and Kulatilaka (2001), "the real option is an investment in physical assets, human resources and organizational capabilities, which provides an opportunity to respond to possible future events." (Kogut - Kulatilaka 2001, p. 3). In this definition, the authors emphasize the value creation ability of real options alongside investment opportunities. This definition suggests that certain real options are specific for the company since both human resources and organizational capabilities bring the uniqueness of the company to the fore.

Real option theory deals with the management of uncertainty through the challenges of today's economic environment and the rapidly changing business environment (Dixit - Pindyck, 1994). In the world of real options, uncertainty has a value in terms of managerial skills (Boyer et al., 2003). Many strategic investments create new, feasible options that can be seen as a combination of a cash flow series and an option set (Amram - Kulatilaka, 1999). When discussing real options, one has to start with recognizing that the future investment decision is characterized by asymmetry, because it only happens if it is favorable for the decision-maker.

The right embodied in the option can be created in different ways, like with contracts, such as patents, or with preferential access to investment opportunities, for example through equity investment. Rights can be created also based on company-specific knowledge, for example through a learning by doing process or through research and development. Optional decision-making asymmetry including the right to act without obligation appears also in company outputs in the presence of uncertainty. For example, the owner of an option to buy an investment can access top-side options, upholding the buy-in or upside potential, while limiting the downside losses without enforcing the downside loss option at a disadvantage (Trigeorgis - Reuer, 2017).

Unlike the traditional view that insecurity retains investments, according to the real option theory decision-makers respond proactively to uncertainty. Real options specifically allow companies to delay or change future investment decisions when market conditions change, enable the company to limit losses and seek benefits in the event of positive developments resulting from uncertainty (Bowman - Hurry, 1993; McGrath, 1997, Trigeorgis, 1996). In the case of uncertainty, the inherent managerial deliberation and the resulting asymmetry in corporate payouts move the option value, lower downside losses, and improve corporate performance.

The basic assumption of real option theory is that the future uncertainty of corporate risk or corporate return will influence investment decisions in strategic assets. Greater uncertainty encourages the company to create more options that provide flexible solutions or time-shift potential for the company (Bhattacharya et al., 2014).

The critical factor in the application of real options is information security, which is a unique feature of the related markets. Dynamic effects, often unforeseen events and conditions characterize the market of information security (Petratos, 2008).

The real option theory has appeared in different areas of management and decision-making, and the focus has shifted from a clean assessment process to decision-making and optimization. The purpose of applying the real option approach is to create value in corporate decision-making by capturing the full value of company potential (Boyer et al., 2003). Investments discussed in the real option approach are related to sequential investment decisions (Dixit - Pindyck, 1994). In the literature, we can see a number of sectors and areas where real option theory is applied, such as natural resources, research and development, and information technology. In contrast, there are only a few cases where the business incubation process and start-up companies were at the center of real option analysis.

### 3.1. Typology of real options

Many real option typologies can be found in the literature (Trigeorgis, 1996; Copeland - Keenan, 1998; Amram - Kulatilaka, 1999; Amram - Kulatilaka, 1999; Hommel - Pritsch (1999); De Neufville, 2004) and I would highlight Trigeorgis's (1996) categorization as a basis for several subsequent typologies, which distinguishes option to defer, staged investment options, option to alter, option to switch, growth options, option to abandon, multiple interacting options.

The value of the option to defer arises from providing the opportunity to shift the investment decision over time in order to obtain additional information that can correct or reduce the existing uncertainty. The option to abandon is the abandonment of a whole or a part of the project, the final rejection of the investment if the market situation becomes less favorable (Rózsa, 2004). Some options can be applied in case of persistent or significant improvement or deterioration in market conditions. The option to expand may mean expanding the capacity of the project or extending key competencies to new products, services, distribution channels. Option to expand may be valuable in industries where the volatility of market demand is high. It is common in natural resources, consumer goods, and facilitation planning. As for the option to contract the flexibility lies in that capacity or its focus can be reduced in adverse market conditions. In the case of a staged investment option investments or decision-making are carried out in stages, which may reduce the existence of upside potential, but protects against downside risks. Each stage of the project will be evaluated afterward, and the management of the company can decide posteriorly on the continuation or rejection of the project. The staging option can be evaluated as a multiple interacting option. Staging options are in R&D intensive industries such as biotechnology, the pharmaceutical industry, and capital intensive industries that require high uncertainty and long-term development, such as power generation plants and venture capital financing (Scialdone, 2007).

The growth option allows keeping early-stage investments open for future growth opportunities. The growth option is similar to the option to expand, but the difference between the two lies in the position within the corporate strategy. Growth options provide project-wide flexibility, while the option to expand and staged investment options appear as an option within the project. Growth options are found in all industries, typically in the case of infrastructure-based high-return projects, such as R&D and strategic acquisitions (Scialdone, 2007). Shut down and restart options can be considered as insurance options, so that management can decide to stop production under unfavorable market conditions, but does not rule out the possibility of rebooting (Csapi, 2018). Multiply interacting options include the combinations of the above described. These options can be independent of each other but can also be in close contact. In this case, the option value is also embedded in the underlying asset (Takács, 2008).

## 4. THE APPLICATION OF REAL OPTION THEORY IN THE BUSINESS INCUBATION PROCESS

The activities of incubators are comparable to investment projects of companies that operate in a dynamic market environment. Companies can also have a project portfolio with a high degree of uncertainty, which may at the same time contribute to the company's value creation (Kuratko - LaFollette, 1987). Dimpfel et al. (2002) suggest that real options can be applied in case of flexibility, uncertainty, and irreversibility. According to Moreira - Carvalho (2012), there are two questions about Hackett - Dilts (2004b) incubation model that the real option theory answers: which factors should be taken into account when selecting possible incubatees and whether predefined criteria contribute to the economic results of incubation? According to Hackett - Dilts (2004b), the incubator's performance depends on the incubator's ability to create options and the selection performance typifies the capacity of the incubator.

Consequently, the operation of incubators is in line with the methodology of the real option theory. Therefore identifying and applying real options can also have great potential for incubators.

As mentioned above real options are valuable in case of a high degree of uncertainty, which clearly shows that it is the most significant in the first stage of the corporate life cycle (Kuratko - LaFollette, 1987). Selecting companies with high growth potential are already in itself an uncertain process (Dee, 2011).

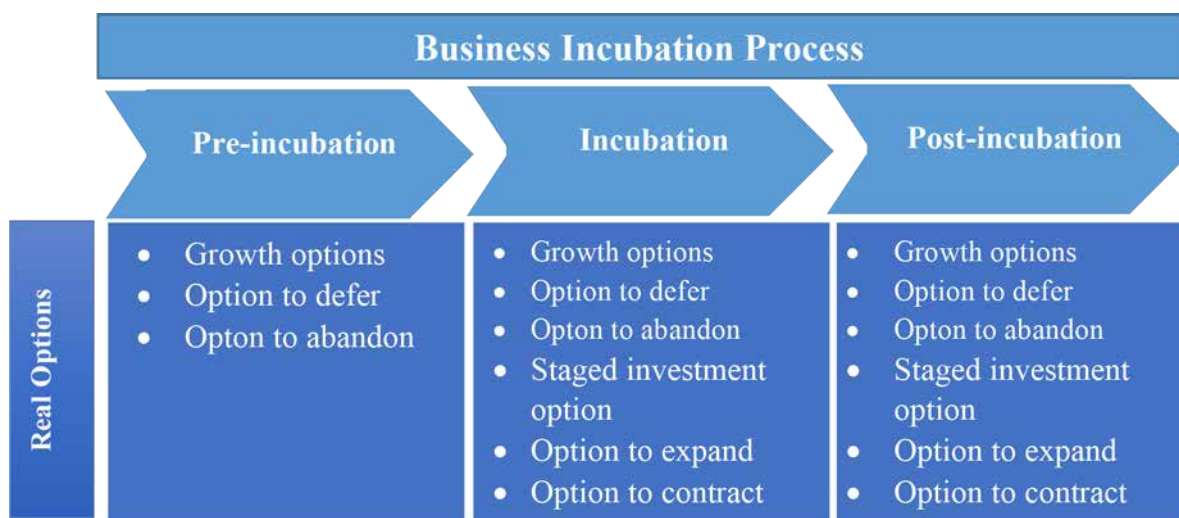
The business incubation process through the lens of real option theory defines the incubator as an enterprise that creates real options through the systematic selection of new, young businesses for entering the incubator, and then exercises these real options in the course of controlling and mentoring these incubatees at different stages of development while providing resources to them. Each decision node in the incubation process modifies the chance to the survival of the incubatees, depending on how the option was exercised (Hackett, 2004). This approach of the incubation process resembles sequential processes, which are common in pharmaceutical and venture capital investments. In the business incubation process, stages should also be used to determine certain decision nodes.

The first decision node evolves at the selection of potential participants. An option arises whether to involve a company in the incubation process or not. The previously defined variables can be used to examine the option. Once a company gets in the decision-making process, the idea or business moves through a series of stages. Each decision point should cohere to the output requirements so that the final decision stage could end in market launch or rejection.

The real option theory, like other theories, does not take full account of the process-oriented nature of incubation. For that reason, the “black box” approach of incubators was developed (Ahmad, 2014). Many authors, such as Bergek - Norrman (2008) reject black-box incubation models that focus exclusively on results. In addition, the mediation capacity in their incubation process model appears as a way to put incubatees on the market, which is also necessary to reduce uncertainty.

Based on the business incubation process model presented in the previous chapter, the types of real options are identified inherent in the business incubation process that could be exercised by the incubator (Figure 2). The complete business incubation process can be interpreted as a staging option in which the business incubator can decide to continue or to reject the project after the completion of each stage.

**Figure 2.** Real options in the business incubation process



Source: own construction

In the pre-incubation phase, companies are selected for the incubation process, the incubator has to decide on the incubation or rejection of the given business based on the available information and the selection criteria. In some cases the incubator can use an option to defer, i.e. postpone decision making, thereby reducing the risk of making a decision based on incomplete information and thus by chance suffer loss. Entry into the incubation process may include a strategic growth opportunity for the company, a growth option that can be the starting point for projects and future growth opportunities. Furthermore, when analyzing entry into the business incubator, under unfavorable circumstances it can decide to reject the project, to exercise the option to abandon.

During the business incubation process, the various services and facilities include options to defer, discard options, which can be exercised at each decision node. The use of services that support the development of a particular business idea depends on the advancement or needs of the incubatee. Real options are available to the incubatees as well, they can also choose from the services offered to them, and to decide to exercise, reject or even postpone these options. Nevertheless, it is also possible to use staging options that provide decision flexibility after each stage of the business incubation process. In the business incubation stage, real options may appear that offer the incubatees the opportunity also to contract/expand or grow. With response to market demand, they can stop projects and then reactivate them in case of favorable conditions or even decide to expand or contract them.

In the post-incubation phase similar real options, that were mentioned in the incubation process, can be identified, exercised or rejected as well. In addition to evaluating the outputs as for the incubator staging options and options to defer may emerge.

## 5. ANALYSIS OF THE HUNGARIAN BUSINESS INCUBATORS BUSINESS INCUBATION PROCESS

In this study, I examined the activities of Hungarian incubators with the help of secondary research. With collecting information available also to potential participants my aim was to get a comprehensive view of the business incubation process of the Hungarian incubators, primarily focusing on selection and offered services. I analyzed eight business incubation programs based on the information disclosed on their websites. I would have liked to involve such business incubators in the analysis that are currently accepting candidates, offering complex service portfolios, funding and social network for their participants. The information provided on the websites is different in point of quality and quantity, but this can be related to the size and experience of the business incubator.

Similarly to other countries, more and more business incubators and accelerators have been established in the past few years in Hungary due to the growing number of startups and state subsidies. Significant growth has been observed across the country for both for-profits, non-profit and university incubators. In addition to business incubators, potential entrepreneurs can already apply for incubation and accelerator programs offered by banks as well (e.g. OTP Bank Startup Program, MKB Fintechlab, Start it @K&H).

Most of the selected incubators are specialized in one or a few industries. The most common areas are the IT sector, infocommunications, and life sciences but there are business incubators with general focus as well. If we examine the geographical focus, almost all incubators designate a target market (international market or/and domestic market) and we can find business, non-profit and university incubators not only in Budapest but in many other cities of the country (e.g. Szeged, Debrecen, Győr, Miskolc, Pécs). All of the analyzed business incubators have a capital investor background, and some incubators are able to provide startup related state funds to their supported project. Generally, each incubator accepts 10-20 projects a year. In addition, several business incubators have a connection with university incubators that also can contribute to the development.

In the case of the Hungarian incubators, we can differentiate three groups based on their strategic direction according to BDO (2014) report. The first group of incubators selects their participants with lengthy, multiple round selection process because with this method they want to ensure that successful companies leave the business incubator at the end of the incubation process. Business incubators belonging to the second group are looking for motivated potential participants with high growth potential, in this case, a broad spectrum of knowledge and social network is typical. The third group builds on the potential of the project and personal contact significantly matters by the admission to the incubator. Therefore the selection is less formalized and confidence is much more important.

According to the secondary research the business incubators select projects in a multi-stage process that starts with filling out an application form or handing in a one-pager and that is followed by interviews and presentations. The selection takes a few weeks, but it is more common to reach an agreement in 2-3 months. The project evaluation criteria include generally the existing team and professional background, motivation, product or service competitiveness, business model, project scheduling, milestones, business plan, and resource requirements. If the project meets the minimum requirements set by the business incubator, the project owner can enter into the business incubation program, where one of the first steps is to prepare a business incubation plan that includes goals, operational tasks, customized services, project schedule, milestones, financial plan and conditions for capital investments and depending on the business concept and its maturity the services chosen by the participants. In the case of an analyzed incubator, even a change of plan can be requested by the participants. According to BDO (2014), the team and its preparedness are much more important than the idea itself and motivation plays a major role in the selection process.

The services offered by the business incubators are different and vary from each other but mentoring, funding, social networking and providing infrastructure are common. In addition, business modeling, back-office services, participation in educational programs, training and workshops, investments and financial consultancy and coaching are also available in certain incubation programs.

As for a summary of business incubators in Hungary are conducting a well-considered selection process and offering a wide range of services to participants that support the development of the business concept. They could be more interesting to applicants if they provided more information about their incubation process and the relation between their output requirements and the selection process.

## 6. CONCLUSION

Business incubation is one of the most important mechanisms to help supporting start-up companies to survival and growth in the competitive business environment. There is a growing interest in business incubators among start-ups due to their promise of high growth potential and opportunity for success. The successful business incubation process can lead to well-performing start-up companies that can react to the market demand and manage the challenges of the rapidly changing business environment. Through the analysis of the business incubation process (and in the pre-incubation stage), the participants can identify their business strengths and weaknesses and find the appropriate services that can contribute to business development.

The real option approach can help to identify the main decision points and challenges of start-up businesses. In my study, I tried to identify the real options that can be found in each stage of the business incubation process, how they can be exercised or rejected by both the incubator and the incubatees in order to give an adequate response to the progress opportunities at decision nodes. The topic has many further analytical opportunities, including qualitative assessment, the possibility of quantitative analysis, its applicability through practical examples, and its ability to create value through the processes of business incubators. In my future research, I would also like to identify the value-added activities with the help of primer research from the perspective of real option theory.

## LITERATURE

- Aernoudt, R. (2004) Incubators: Tool for entrepreneurship? *Small Business Economics*, 23, pp. 127–135. DOI: 10.1023/b:sbej.0000027665.54173.23.
- Aerts, K., Matthyssens & P., Vandenbempt, K. (2007) Critical role and screening practices of European business incubators. *Technovation*, 27(5), pp. 254-267. DOI: 10.2139/ssrn.870244.
- Ahmad, A. J. (2014) A mechanisms-driven theory of business incubation. *International Journal of Entrepreneurial Behaviour & Research*, 20, pp. 375–405. DOI: 10.1108/IJEBR-11-2012-0133.
- Akomak, S. (2009) *Incubators as tools for entrepreneurship promotion in developing countries. UNU-MERIT Working Paper Series*, No. 054, UNU-MERIT, Maastricht Economic and Social Research and Training Centre on Innovation and Technology, Maastricht.
- Allen, D.N., McCluskey, R. (1990) Structure, policy, services, and performance in the business incubator industry. *Entrepreneurship: Theory and Practice*, 15(2), pp.61-77.
- Al-Mubarak, H.A. & Busler, M. (2013) Business Incubation as an economic development strategy: A literature review. *International Journal of Management*, 30(1), pp. 362-372.
- Amram, M. & Kulatilaka, N. (1999) *Real options: managing strategic investment in an uncertain world*. Boston: Harvard Business School Press.
- Ayatse, F.A., Kwahar, N. & Iyortsuun, A.S. (2017) Business incubation process and firm performance: an empirical review. *Journal of Entrepreneurship Research*, 7(2), pp. 1-17. DOI:10.1186/s40497-016-0059-6.
- Becker, B. & Gassmann, O. (2006) Gaining leverage effects from knowledge modes within corporate incubators. *R and D Management* 36, pp. 1–16. DOI: 10.1111/j.1467-9310.2005.00411.x.
- Bergek, A. & Norrman, C. (2008) Incubator best practice: a framework. *Technovation*, 28(1-2), pp. 20-28. DOI:10.1016/j.technovation.2007.07.008.
- Bhattacharya, M. & Wright P. M. (2004) Managing human assets in an uncertain world: Applying real options theory to HRM. *The International Journal of Human Resource Management*, 16(6), pp. 929-948. DOI: 10.1080/09585190500120574.
- Bøllingtoft, A. Ulhøj, J. P. (2005) The networked business incubator – Leveraging entrepreneurial agency? *Journal of Business Venturing*, 20(2), pp. 265–290. DOI:10.1016/j.jbusvent.2003.12.005.
- Bowman, E. H. & Hurry, D. (1993) Strategy through the option lens: Are integrated of resource investments and the incremental-choice process. *Academy of Management Review*, 18(4), pp. 760-782. DOI:10.2307/258597.
- Boyer, M., Christoffersen, P., Lassere, P. & Davlov, A. D. (2003) Burgundy report: Value creation, risk management, and real options. *Centre for interuniversity research and analysis on organisations*. Available at: [https://www.researchgate.net/publication/4816345\\_Value\\_creation\\_risk\\_management\\_and\\_real\\_options](https://www.researchgate.net/publication/4816345_Value_creation_risk_management_and_real_options). [Accessed 10-2-2018].
- Bruneel, J., Ratinho, T., Clarysse, B. & Groen, A. (2012) The evolution of business incubators: comparing demand and supply of business incubator services across different incubator generations. *Technovation*, 32(2), pp.110-121. DOI: 10.1016/j.technovation.2011.11.003.
- Campbell, C., Kendrick, R. C. & Samuelson, D.C. (1985) Stalking the latent entrepreneur: Business incubators and economic development. *Economic Development Review*, 3(2), pp. 43-49.
- Carayannis, E. G., von Zedtwitz, M. (2005) Architecting GloCal (global-local), real-virtual incubator networks (G-RVINS) as Catalysts and accelerators of entrepreneurship in transitioning and developing economies: Lessons Learned and best practices from current development and business incubation. *Technovation* 25, pp. 95–110. DOI:10.1016/S0166-4972(03)00072-5.
- Carree, M. & Thurik, A. (2010) The Impact of Entrepreneurship on Economic Growth. In: Acs, Z. & Audretsch, D. (eds.) *International Handbook of Entrepreneurship Research*. 2nd edition. London: Springer, pp. 557-594. DOI:10.1007/0-387-24519-7\_17.
- Cleantech Incubation Europe (CIE) (2014) *Cleantech Incubation Policy and Practice*. Available at: <http://cleantechincubation.eu/wp-content/uploads/2012/07/CleantechIncubation-Practice-and-Practice-Handbook-June-2014.pdf>. [Accessed 22-3-2018].
- Colombo, M.G., & Delmastro, M. (2002) The effective are technology incubators? Evidence from Italy. *Research Policy*, 31(7), pp. 1103-1122. DOI:10.1016/S0048-7333(01)00178-0.
- Copeland, T. E. & Antikarov, V. (2001) *Real options: A practitioner's guide*. Knutsford: Texere.
- Copeland, T. E. & Keenan, P. T. (1998) How much is flexibility worth? *Mckinsey Quarterly*, 1(2), pp. 38-49.
- Csapi, V. (2018) A reálopciók első 40 éve. *Budapest Management Review*, 49(9), pp. 34-45.
- De Neufville, R. (2004) *Uncertainty Management for Engineering Systems Planning and Design: Monograph draft for Engineering Systems Division* [online]. Available at [http://web.mit.edu/deweck/www/PDF\\_archive/4%20Other%20Major%20Pubs/4\\_6\\_ESD2004\\_uncertainty.pdf](http://web.mit.edu/deweck/www/PDF_archive/4%20Other%20Major%20Pubs/4_6_ESD2004_uncertainty.pdf). [Accessed 12-10-2018].
- Dee, N.J., Livesey, F. & Gill, D., Minshall, T. (2011) *Incubation for growth: A review of the impact of business incubation on new ventures with high growth potential* [online]. London: NESTA. Available at: [www.nesta.org.uk/library/documents/Incubationfor-Growthv11.pdf](http://www.nesta.org.uk/library/documents/Incubationfor-Growthv11.pdf).
- Deutschmann, M. (2007) What difference a pre makes: University business preincubators in Germany. *A National Survey. Working Paper*, Report No. 5, Leuphana University Lüneburg.
- Dimpfel, M., Habann, F. & Algesheimer, R. (2002) Real options theory, flexibility, and the media industry. *The International Journal on Media Management*, 4(4), pp. 261-272. DOI:10.1080/14241270209390007.
- Dixit, A. & Pindyck, R. (1994) *Investment under uncertainty*. Princeton: Princeton University Press.
- Eftekhari, S. (2014) Entrepreneurial failure: Distinct perceptions among founders, employees, and investors [online]. Available at: [https://www.ike.aau.dk/digitalAssets/230/230890\\_perception\\_of\\_failure.pdf](https://www.ike.aau.dk/digitalAssets/230/230890_perception_of_failure.pdf). [Accessed 19-10-2018].
- Grimaldi, R. & Grandi, A. (2005) Business Incubators and New Venture Creation: An Assessment of Incubating Models. *Technovation*, 25(2), pp. 111-121. DOI:10.1016/S0166-4972(03)00076-2.
- Hackett, S. M. (2004) *Real OPTIONS and the option to incubate: An exploratory study of the process of business incubation*. Dissertation executive summary. Available at: <http://ssrn.com/abstract=1260438>. [Accessed 16-10-2018].
- Hackett, S. M. & Dilts, D. M. (2004a) A real option-driven theory of business incubation. *Journal of Technology Transfer*, 29, pp. 41–54. DOI: 10.1023/b:bjot.0000011180.19370.36.
- Hackett, S. M. & Dilts, D. M. (2004b) A systematic review of business incubation research, *Journal of Technology Transfer*, 29(1), pp. 55–82. DOI:



- 10.1023/b:jott.0000011181.11952.0f.
34. Hannon, P. D. (2003) A conceptual development framework for management and leadership learning in the UK incubator sector. *Education Training*, 45(8/9), pp. 449-460. DOI: 10.1108/00400910310508847.
  35. Hommel, U. & Pritsch G. (1999) Marktorientierte Investitionsbewertung mit dem Realoptionsansatz. *Finanzmarkt und Portfoliomanagement*, 13(2), pp. 121-144.
  36. Kirby, A. D. (2004), Creating Entrepreneurial Universities in the UK: Applying Entrepreneurship Theory to Practice. *Journal of Technology Transfer*, 31(5), 599-603. DOI: 10.1007/s10961-006-9061-4
  37. Klostermann, L. & Kraus, S. (2010) *Der Erfolg von Inkubatoren/ Technologie- und Gründerzentren in Deutschland und den USA*. Wertschöpfungsmanagement im Mittelstand: Tagungsband des Forums der Deutschen Mittelstandsforschung, pp. 217-238, Gabler, Wiesbaden. DOI: 10.1007/978-3-8349-8638-2\_12.
  38. Kogut, B. & Kulatilaka, N. (2001) Capabilities as real options. *Organization Science*, 12(6), pp. 744-758. DOI:10.1287/orsc.12.6.744.10082.
  39. Kuratko, D. F. & LaFollette, W. R. (1987) Small Business Incubator for Local Economic Development. *Economic Development Review*, 5(2), pp. 49-55.
  40. Kusuma, C., Sutopo, W., Yuniaristanto, H. S. & Nizam, M. (2015) Incubation scheme of the university spin-off to commercialize the invention in Sebelas Maret University. In: *Proceedings of the International MultiConference of Engineers and Computer Scientists*, Vol. 2., IMECS 2015, March 18-20, Hong Kong.
  41. Lalkaka, R. (2000) *Manual on Technology Business Incubators*. Paris: United Nations Educational, Scientific & Cultural Organization.
  42. Leblebici, H. & Shah, N. (2004) The birth, transformation and regeneration of business incubators as new organisational forms: Understanding the interplay between organisational history and organisational theory. *Business History*, 46(3), pp. 353-380. DOI: 10.1080/007679042000219175.
  43. McAdam, M. & McAdam, R. (2008) High Tech start-ups in university science park incubators: The relationship between the start-up's lifecycle progression and use of the incubator's resources. *Technovation*, 28, pp. 277-290. DOI: 10.1016/j.technovation.2007.07.012.
  44. McGrath, R. (1997) A real options logic for initiating technology positioning investments. *Academy of Management Review*, 22(4), pp. 974-996. DOI:10.5465/amr.1997.9711022113.
  45. Mian, S. A. (1996) Assessing value-added contributions of university technology business incubators to tenant firms. *Research Policy*, 25(3), pp. 325-335. DOI:10.1016/0048-7333(95)00828-4.
  46. Mian, S. A. (1997) Assessing and managing the university technology business incubator: An integrative framework. *Journal of Business Venturing*, 12(4), pp. 251-285. DOI:10.1016/s0883-9026(96)00063-8.
  47. Moreira, A.C. & Carvalho, M.F.S. (2012) Incubation of new ideas: Extending incubation models to less-favored regions. In: Burger & Helmchen, T. (2012) *Entrepreneurship – creativity and innovative business models*. Rijeka: InTech. DOI:10.5772/36705.
  48. Munkongsujarit, S. (2016) Business incubation model for startup company and SME in developing economy: A case of Thailand. In: *Proceeding of PICMET'16: Technology Management for Social Innovation*. pp. 74-81.
  49. Myers, S. C. (1977) Determinants of Corporate Borrowing. *Journal of Financial Economics*, 5(2), pp. 147-175. DOI:10.1016/0304-405x(77)90015-0.
  50. Nowak, M. J. & Grantham, C. E. (2000) The virtual incubator: Managing human capital in the software industry. *Research Policy*, 29(2), pp. 125-134. DOI: 10.1016/S0048-7333(99)00054-2.
  51. Petratos, P. (2008) Real option applications to information security. *Communications & Strategies*, 70, pp. 15-25.
  52. Roure, J. B. & Keeley, R. H. (1990) Predictors of success in new technology based ventures. *Journal of Business Venturing*, 5(4), pp. 201-220. DOI: 10.1016/0883-9026(90)90017-N.
  53. Rózsá, A. (2004). Stratégiai beruházások reálopciók megközelítése. *Budapest Management Review*, 35(2) pp. 53-61.
  54. Ryan, F. & Wright, A. (2009) An examination of the experiences of campus incubation companies in Irish institutes of technology. *Irish Business Journal*, 5(2), pp. 71-86.
  55. Salem, M. I. (2014) The role of business incubators in the economic development of Saudi Arabia. *International Business & Economics Research Journal*, 13(4), pp. 853-860. DOI: 10.19030/iber.v13i4.8694.
  56. Scialdone, P. (2007), *Valuing managerial flexibility: Challenges and Opportunities of the real option approach in practice*. Göttingen: Cuvillier Verlag.
  57. Smilor, R. W. & M. D. Gill Jr. (1986) *The new business incubator: Linking Talent, technology, capital and know-how*. Lexington: Lexington Books.
  58. Smilor, R. W. (1987) Commercializing technology through new business incubators. *Research Management*, 30(5), pp. 36-41. DOI:10.1080/00345334.1987.11757061.
  59. Stephens, S. & Onofrei, G. (2012) Measuring business incubation outcomes. *Entrepreneurship, and Innovation*, 14(4), pp. 277-285. DOI:10.5367/ijei.2012.0094.
  60. Takács A. (2008) Reálopciók: a jövőbeli lehetőségek értékelése. *Közgazdász Fórum*, 11(12), pp. 47-55.
  61. Thierstein, A. & Wilhelm, B. (2001) Incubator, Technology, and innovation centres in Switzerland: Features and policy implications. *Entrepreneurship & Regional Development*, 13(4), pp. 315-331.
  62. Trigeorgis, L. (1996) *Real Options: Managerial Flexibility and Strategy in Resource Allocation*, Cambridge: Mass.: MIT Press.
  63. Trigerorgis, L. & Reuer, J. J. (2017) Real options theory in strategic management. *Strategic Management Journal*, 38, pp. 42-63. DOI: 10.1016/S0742-3322(07)24001-X.
  64. Virtanen, M. & Kiuru, P. (2013) Post-incubation performance – Are the post-incubation firms high impact firms? In: *8th International Council for Small Business World Conference*, June 20-23, 2013, Ponce, Puerto Rico, At Ponce, Puerto Rico.
  65. Watson, K., Hogarth-Scott, S. & Wilson, N. (1998) Small business start-ups: Success factors and support implications. *International Journal of Entrepreneurial Behavior & Research*, 4(3), pp. 217-238.
  66. Wiggins, J. & Gibson, D. V. (2003) Overview of US incubators and the case of the Austin Technology Incubator. *International Journal of Entrepreneurship and Innovation Management*, 3(1-2), pp. 56-66.
  67. Zacharakis, A. L., Meyer, G. D. & DeCastro, J. (1999) Differing perceptions of new venture failure: A matched exploratory study of venture capitalists and entrepreneurs. *Journal of Small Business Management*, 37(3), pp. 1-14.
  68. Zhang, L., Wang, F., Sahlí, H. & Cornelis, J. (2014) *Incubators collaboration models*. Brussels: ETRO-Vrije Universiteit Brussel.

## ANALIZA POSLOVNE INKUBACIJE POMOĆU TEORIJE STVARNIH OPCIJA

### SAŽETAK

Evaluacija startup poduzeća, tj. poduzeća u razvoju mora početi s analizom procesa poslovne inkubacije. Poslovna (poduzetnička) inkubacija sadrži potencijal za implementiranjem stvarnih opcija koje podržavaju identifikaciju i iskorištavanje mogućih novih poslovanja i može biti novi izvor uspjeha startup poduzeća. Inkubatora se može opisati kao poduzetničku tvrtku koja kreira stvarne opcije putem selekcije novih, mladih poduzeća i poduzeća u nastajanju i može upotrebljavati te stvarne opcije putem praćenja i podučavanja sudionika tijekom raznih faza razvoja. Aktivnosti potpore u poslovanju od strane poslovnih inkubatora se mogu usporediti s realizacijom investicijskih projekata koji su okarakterizirani visokim stupnjem nesigurnosti i fleksibilnosti donošenja odluka, koje poduzimaju poduzeća koja djeluju u dinamičkom tržišnom okruženju. Ciljevi ovog članka su sistematički razmotriti i procijeniti literaturu o poslovnoj inkubaciji i njenom procesu, kao i doći do stvarnih opcija koje generiraju stvaranje vrijednosti i veću efikasnost pomoću istraživanja i analize aktivnosti, programa i inkubacijskog procesa odabranih Mađarskih inkubatora.

**KLJUČNE RIJEČI:** teorija stvarnih opcija, poslovna inkubacija, fleksibilnost, nesigurnost.