

Accepted manuscript

Kulkov, I., Hellström, M. M. & Wikström, K. (2020). Identifying the role of business accelerators in the developing business ecosystem: the life science sector. *European Journal of Innovation Management*, 24(4), 1459-1479. <https://doi.org/10.1108/EJIM-04-2020-0139>

Published in: European Journal of Innovation Management

DOI: <https://doi.org/10.1108/EJIM-04-2020-0139>

AURA: <https://hdl.handle.net/11250/3106024>

Copyright: © 2020 Emerald Publishing Limited



Identifying the role of business accelerators in the developing business ecosystem: the life science sector

Journal:	<i>European Journal of Innovation Management</i>
Manuscript ID	EJIM-04-2020-0139.R1
Manuscript Type:	Original Article
Keywords:	business accelerator, industry transformation, regional development, business ecosystem, life science business

SCHOLARONE™
Manuscripts

Identifying the role of business accelerators in the developing business ecosystem: the life science sector

Abstract

Business accelerators have recently received increasing attention as important cogs in business ecosystem development. However, their exact role in the ecosystem is not yet well known, especially outside the IT sector. The purpose of this study, therefore, is twofold: to determine the position of life science accelerators in the business ecosystem and their attributes of support for companies and to identify the accelerators' key features that contribute to the change in business ecosystems. We offer an exploratory case study of five life science business accelerators. We analyze the main factors affecting the companies and the whole business ecosystem. We build upon the scarce literature on business accelerators and consider a new type of accelerator that specializes in life science projects. We study its role in the transformation and evolution of the life science industry. We have defined the role and key parameters of life science accelerators that influence the existing business ecosystems: (1) cooperation with other regions and countries, (2) development of entrepreneurial skills among participants of the business accelerator program, (3) and an on demand-based project. The key parameters of the life science accelerators allow us to concentrate our efforts on the activities that are most demanded by the market. Business accelerators can increase the created value for other program participants.

Keywords: business accelerator, industry transformation, regional development, business ecosystem, life science business

1. Introduction

Over the last few decades, the number of industrial business accelerators has rapidly grown as a form of support for small businesses (Caiazza, 2014; Wann *et al.*, 2017). Some European countries pay attention to the life science industry and achieve progress in it (Sandström, 2014). During the last decade, the interest of leading business journals in business accelerators has also grown significantly (Pauwels *et al.*, 2016; Kohler, 2016). However, the majority of business accelerator articles consider the IT industry as a model (Cohen and Hochberg, 2014). Other industries, such as life science, are much less researched. However, they significantly differ from IT, they have unique characteristics, and they contribute greatly to changing business ecosystems in different countries. Our research is dedicated to the key parameters of European life science business accelerators and how the industry develops.

Business accelerators contribute to business ecosystem development via consulting services for business promotion, mentorship, access to investments, and knowledge and expertise for companies, which help to overcome issues that arise (Hansen *et al.*, 2000; Price, 2004). In general, business accelerators assist in forming and strengthening teams, refining the business idea, and contributing to product development (Radojevich-Kelley and Hoffman, 2012). However, life science is associated with a large initial investment that is required for the focal business, including specific laboratories and physical resources for R&D and prototyping (Wann *et al.*, 2017). This has a significant impact on the development of the life science industry, the creation of value by companies, and the attractiveness for new participants.

Despite the existing experience in the creation and rapid development of different business accelerators, there are still very few theoretical studies about the process of formation, the stages of development, and efficiency (Pauwels *et al.*, 2016), especially in the area of life science. Still, the industry is rapidly developing and undergoing significant changes. Life science accelerators focus on technologies and health-related products. Moreover, life science accelerators are the regional centers that contribute to the rapid development of a medical product or service and how it is offered to the market. Key activities and characteristics of life science accelerators most likely vary in different markets, for example, in scouting companies, mentoring, and the duration of programs. However, the definition of key parameters, their transformation over time, and how they affect life science development should be researched.

It seems that other researchers have not studied the features of business accelerators in different industries. There is a gap in studies devoted to the analysis of life science accelerators because of their novelty. The majority of life science accelerators started their activity with the support of the European Regional Fund after 2015. Business accelerators offer a number of common services, such as mentoring, the provision of expertise, and reducing the cost of developing and manufacturing products. The position and contribution of business accelerators differ not only by the local parameters of the ecosystem but also by the stage of development, specialization, and level of collaboration with other countries. Our research contributes to the development of regional life science ecosystems, the success of companies, the development of entrepreneurship, and the efficiency of the use of funds. Life science accelerators are oriented to the development of the

1
2
3 **business ecosystems, they are supported by state funds, and they are not interested in obtaining a**
4 **share of participants. These parameters significantly distinguish them from accelerators in other**
5 **industries.**
6
7

8 The purpose of this study is to determine the position of life science accelerators in the business
9 ecosystem and their attributes of support for companies, as well as to identify key features of the life
10 science accelerators that contribute to the change in business ecosystems. Hence, our approach is
11 exploratory and phenomenon driven (Von Krogh *et al.*, 2012). We pose the following research question:
12 How do life science accelerators contribute to changing a business ecosystem? To answer this, we study
13 the key parameters of life science accelerators and research their roles in changing and increasing the
14 stability and attractiveness of the business ecosystem. The research is based on case studies from five
15 European countries. By defining key parameters, we present a theoretical basis to determine the
16 unique and common parameters of the focal programs with diversified incubators, the life science
17 incubators, and other accelerators.
18
19

20
21
22
23 The theoretical part of the paper starts with a literature review of the business accelerators and their
24 role in developing the regional markets. Furthermore, we clarify the differences between a business
25 accelerator and a business incubator, as there is a misunderstanding in the existing business literature.
26 In the findings chapter, we present the within- and cross-case analyses from the five life science
27 business accelerators. In the discussion, we consider the unique characteristics of life science
28 accelerators and their contributions to industry development, and we offer ways to develop and
29 increase the efficiency of public and private financing.
30
31

32
33
34 **Our article contributes to an increase in knowledge regarding the new concept of a business**
35 **accelerator considering industrial specifics: life science. We determine the key parameters of the life**
36 **science business accelerator, which form the value for the program participants and the entire**
37 **business ecosystem. These include (1) the transfer of expertise for the needs of participants from**
38 **other regions, countries, and industries in order to reduce costs; (2) the provision of training to**
39 **improve the business skills of the founders and managers of companies; and (3) the focus on the**
40 **specific needs of the teams participating in the business accelerator program. Also, unlike most other**
41 **industries, life science accelerators provide their services to participants free of charge, thereby**
42 **creating a new format of cooperation with a focus on regional or project development. We also**
43 **declare that assistance with entering the US market is an important niche factor that creates value**
44 **for participation in the program.**
45
46
47
48

49 2. Theoretical background

50 2.1. The position of accelerators in the business ecosystem

51
52
53
54 **A business system is a set of organizations that set the goal of offering a product or service through**
55 **cooperation or competition (Kandiah and Gossain, 1998; Iansiti and Levien, 2004). The business**
56 **ecosystem includes suppliers, manufacturers, customers, policy makers, and many others that**
57 **influence each other, create and change relationships in order to ensure the growth of the system**
58 **(Moore, 1993; Oh *et al.*, 2016). Moore (1993) stated that no participant should be considered**
59
60

1
2
3 individually, but rather only in cooperation with other participants in the business ecosystem,
4 including from other industries. The purpose of studying the business ecosystem is to determine the
5 optimal development strategy for participants and increase their contribution to overall
6 development (Pustovrh *et al.*, 2020). In our case, we are considering a new participant in the business
7 ecosystem—a business accelerator—which in most cases only forms a place in the existing business
8 ecosystem. Business accelerators become intermediaries between companies, often at the early
9 stage of development or at the R&D stage, which reduces the risk of failure based on their expertise
10 and network (Fishback *et al.*, 2007; Pauwels *et al.*, 2016). The management of business accelerators
11 mainly collaborates with key partners, for example, policy makers, universities, or managers of other
12 accelerators, and it is aimed at strategic development. In turn, the mentors of business accelerators
13 work with companies participating in the program, as well as alumni, investors, and businesses.

14
15
16
17
18
19 Over the last decade, the amount of research on accelerators has significantly increased. In numerous
20 business ecosystems, a new role is being given to business accelerators, which are also referred to as
21 “the start-up factories” (Brown *et al.*, 2019). The emergence of such programs could be regarded as the
22 development of classical incubation programs that mainly offer office space (Amezcuca *et al.*, 2013). The
23 main value of business accelerator programs is their provision of mentoring services, intensive business
24 support for a short period of time, and their provision of investments through a network of partners
25 (Pauwels *et al.*, 2016). An initial study found that researchers devoted a significant amount of work to
26 describe the parameters of business accelerators and their programs (Pauwels *et al.*, 2016; Miller and
27 Bound, 2011; Radojevich-Kelley and Hoffman, 2012). However, parameters such as the program
28 duration, the number of companies in one batch, and cooperation with investors are significantly
29 different from each other (Di Fatta *et al.*, 2018). Moreover, the role of the business accelerator may
30 differ depending on the maturity of the business ecosystem and its priority in the industry
31 development.

32
33
34
35
36
37
38 Carayannis and Von Zedwitz (2005) offered a virtual network analysis of incubators and accelerators
39 based on global–local positioning. The foundation, development, and future modes of expanding the
40 business incubation platform were studied by Mian *et al.* (2016), who demonstrates that the joint
41 creation of added value is critical to the formation of a high-tech business ecosystem. Mrkajic (2017)
42 studied the business model for incubators and the alternatives of transformation into accelerators
43 using the example of developing economies. This work also highlights the influence of the funding
44 source on the goals and objectives of various types of programs. In general, researchers note that
45 business accelerators are necessary for external project review, cost reduction in the research and
46 prototyping stages, and accelerating business development (Wallin and von Krogh, 2010; Pustovrh *et al.*,
47 2020). In turn, companies participating in acceleration programs rely on gaining new knowledge,
48 access to new markets, and testing their developments (Carlucci *et al.*, 2010).

49
50
51
52
53
54
55 However, there is also criticism of the development of innovation and business ecosystems, as well as
56 their participants (Oh *et al.*, 2016). There are many dangers for the development of regional markets
57 when much attention is given to market forces on participants and unacceptable analogies with natural
58 ecosystems are made. There are also opponents of accelerator and incubator program development
59 (Van Weele *et al.*, 2017). However, the majority of criticism could be decreased by separating functions
60

1
2
3 through the allocation of the accelerating support to a separate program, and a critical assessment of
4 companies could increase the impact of these programs.
5

6
7 Several authors provide business accelerator programs as a means for regional development and the
8 role of the business accelerator in this process (Wann et al., 2017; Isabelle, 2013). Carmel and Richman
9 (2013) explore the dynamic processes—the special characteristics of development—that occur under
10 the influence of business accelerators, accounting for the cultural benefits of the local market and the
11 interaction with international business. The authors emphasize success factors for business
12 accelerators through the lens of business models, highlighting company selection, support, and
13 networking (Clarysse and Yusubova, 2014). Other authors view accelerator and incubator programs as
14 single forms of supporting entrepreneurship (Miller and Bound, 2011; Cohen and Hochberg, 2014),
15 combining the characteristics of each of the programs. This approach could cause confusion among
16 start-up entrepreneurs, which will reduce the quality of the required support for the company's
17 founders and management. Rubin *et al.* (2015) examine and compare the incubation programs of
18 Australia and Israel. They find that cooperation between programs of different countries contributes to
19 the companies' attractiveness for investors, and they consider the platforms for developing new
20 products.
21

22
23 We agree with Pustovrh *et al.* (2020), who highlight that in the framework of a growing amount of
24 research on business ecosystems, authors pay little attention to the role of business accelerators in the
25 formation and development of emerging systems of entrepreneurship support in the regional market.
26 Moreover, there is no mission of local entrepreneurship support programs to analyze interactions
27 between participants within the business ecosystem, regardless of industry. In such cases, factors
28 contributing to business accelerator performance are not taken into account, thereby reducing the
29 possible impact of accelerators on the companies' development.
30

31
32 It seems that researchers have not studied the features of business accelerators in different industries.
33 There are no studies devoted to the analysis of life science accelerators because of their novelty. The
34 position and contribution of business accelerators differ not only by the local parameters of the
35 ecosystem but also by the stage of development, specialization, and level of collaboration with other
36 countries. Our research contributes to the development of regional life science ecosystems, the success
37 of companies, the development of entrepreneurship, and the efficiency of the use of funds. Life science
38 accelerators are oriented to the development of the business ecosystems, they are supported by state
39 funds, and they are not interested in obtaining a share of participants. These parameters significantly
40 distinguish them from accelerators in other industries.
41

42 43 44 45 46 47 48 49 50 51 **2.2. Operating models for accelerators**

52
53 Business accelerators have taken a relevant position in regional and global business ecosystems,
54 supporting start-ups and successful companies (Fishback *et al.*, 2007). However, the lack of peer-review
55 publications is associated with the business model concept. Moreover, most business accelerators are
56 private entities and do not strive to disclose information and share successful business models
57 (Dempwolf *et al.*, 2014).
58
59
60

1
2
3 The majority of studies on business models for accelerators are devoted to the IT industry (Hochberg,
4 2016; Dempwolf *et al.*, 2014). In addition to mentoring, providing office space, and exchanging equity
5 for small investments, companies gain access to global resources and marketing support. Researchers
6 consider how the IT accelerator influences changes in the regional business ecosystem and the
7 developmental trends that form under the influence of business accelerators.
8
9

10
11 Researchers also pay attention to the business models of corporate accelerators. For example, Onduygu
12 and Guven (2006) consider business accelerators based on a large company and their collaboration with
13 other participants of the business ecosystem, especially universities. However, corporate accelerators
14 are often limited to the needs of the company and its development strategy, which reduces the
15 likelihood of success, even for a promising start-up.
16
17

18
19 As operating models for business accelerators, Pauwels *et al.* (2016) offer an “ecosystem builder,” a
20 “deal-flow maker,” and a “welfare stimulator,” which vary depending on stakeholders and tasks.
21 However, the authors of the study emphasize that additional research is needed depending on the
22 region and industrial specialization. This focus offers an additional opportunity and need for research.
23 Therefore, our study strives to close this gap by studying the role of business accelerators in the life
24 science industry.
25
26

27
28 There are controversial studies regarding the financial parameters of a business accelerator. On the one
29 hand, the majority of researchers consider a typical business accelerator to be a private company, which
30 independently determines the cost of participation in the program and has the ability to finance
31 promising companies (Dempwolf *et al.*, 2014; Clarysse and Yusubova, 2014; Cohen and Hochberg, 2014;
32 Battistella *et al.*, 2017). On the other hand, there are many corporate and state-supported business
33 accelerators that offer free program participation and are not aimed at financing or acquiring company
34 shares (Pavlak and Petrů, 2018; Moschner *et al.*, 2019; Steiber and Alänge, 2020). In this case, business
35 accelerators are highly specialized programs, and they help develop the industry for the needs of a large
36 company, or they are based on the development priorities of the region (Kötting, 2019). The authors of
37 this study expected that the financial parameters would play a different role depending on the industry.
38 However, in our opinion, it is necessary to determine the development of business accelerators within
39 the framework of various financial policies or to compare accelerators from different countries to
40 determine the most effective business model.
41
42
43
44
45

46
47 Hallen *et al.* (2014) compare companies that have received business accelerator support with those
48 who did not participate in such a program. Participants increase capital and acquire new customers
49 faster. Moreover, previous entrepreneurial experience will not replace the experience, skills, and
50 network that entrepreneurs obtain in business accelerator programs (Regmi *et al.*, 2015). Researchers
51 also note that companies undergoing a business incubator program are more likely to exist than those
52 without this type of support (Del Sarto *et al.*, 2019). However, we want to draw attention to the fact
53 that one goal of the business accelerator is to support the raising of capital, including the merger of the
54 company. In this case, the program participant may cease to exist, but it will exist in another form (e.g.,
55 as part of another company).
56
57
58
59
60

1
2
3 Researchers do not consider the peculiarities of the creation and the development of the business
4 ecosystems, but they account for the characteristics of the industry. The authors assume that the
5 business model of an IT accelerator is not much different from, for example, a life science accelerator.
6 However, solutions for one industry may not work or may have a limited impact on another industry.
7
8

9 2.3. The distinction between a business incubator and a business accelerator

10
11 There seems to be some confusion about the difference between business accelerators and business
12 incubators; these concepts are often used interchangeably. However, there are a number of elements
13 that distinguish them from each other. The accelerator and incubator functions are also often similar,
14 which explains the confusion.
15
16

17 For instance, accelerators and incubators coach companies for growth by offering mentoring services,
18 but these services are organized in different ways and at different intervals in the development of the
19 company (Sepulveda, 2012). Incubators offer support at the earliest stage of the company's
20 development, providing an office area, training in business expertise, access to networks, and initial
21 funding. Accelerators, in turn, offer their services to companies that have passed their initial stages but
22 are not yet ready to manage long-term planning opportunities and business development. Companies
23 could lose the essence of their unique value in the daily routine of business operations. The majority of
24 incubators offer programs that include mentoring and support, which prepare businesses for
25 independent activities for several years. In contrast, business accelerator programs continue for up to
26 12 months; they focus on rapid growth and offer opportunities to overcome the company's strategic
27 problems. Thus, it is a more holistic consulting and managerial service designed for better-prepared
28 companies.
29
30
31
32
33
34

35 3. Method

36
37 An exploratory research approach is justified due to the lack of research on life science accelerators,
38 the increasing number of these programs during the last decade, and our research question. We chose
39 a multiple case study as a research strategy (Eisenhardt and Graebner, 2007; Yin, 2017). The study of
40 the existing phenomenon and the conditions under which it was developed are equally important.
41 Through interviews with representatives from five life science accelerators, we were able to collect data
42 on how the business models for the accelerators are being formed and changed.
43
44
45
46

47 The sample for this research consists of five life science business accelerator cases in Finland, Sweden,
48 Germany, Denmark, and Holland. These countries have chosen the life science industry as one of their
49 economic priorities (Sandström, 2014; Ernst and Young, 2013; Ernst and Young, 2014). **We have chosen**
50 **a life science business accelerator in Finland for our study because it is the only one that provides**
51 **such services in the country. In Sweden and Denmark, we sent interview requests to several life**
52 **science business accelerators, but only two of them responded by agreeing to an interview (one in**
53 **Sweden and one in Denmark). There are several key business accelerator programs in Germany.**
54 **However, their web sites are slightly different from each other. The focal accelerator was chosen**
55 **because of its close collaboration with the US market, which brought new insights for research. There**
56 **are many local accelerators and one network business accelerator with several offices throughout**
57 **the Netherlands. Such a network life science business accelerator was chosen for research. To answer**
58
59
60

1
2
3 the key question of this research, we conducted semi-structured interviews with participants of the
4 business accelerators and with advisers, mentors, and alumni, and we studied corporate websites of
5 the participants of focal ecosystems, industrial reports, and other available resources. **Interviews were**
6 **conducted in 2018.** The key characteristics of the studied life science accelerators are presented in
7 Table 1.
8
9

10 --- Insert Table 1 here ---
11

12 For our research, we sent out invitations to representatives of nine European life science accelerators,
13 five of whom answered with consent. Their business models could become a benchmark for new and
14 inexperienced business accelerators (Bhutta and Huq, 1999). We started by interviewing managers and
15 chief business advisers of the life science accelerators face-to-face, over the phone or through video
16 conferencing based on pre-scheduled appointments. Second, we conducted personal meetings with
17 business advisers and mentors, and we held individual and group discussions with the accelerators'
18 participants and alumni. All interviews were in English, they lasted 50–90 minutes, and they were later
19 transcribed verbatim. We observed the parameters of the accelerators' efficiency from the different
20 participants' points of view, as well as the contribution of the program to the further development of
21 participants and the changes that occur under the influence of the life science accelerators. The
22 questions in our interviews and meetings were both open-ended and closed. **In cases with managers,**
23 **we were more interested in the program background, the future development plans, the position of**
24 **the accelerator in the business ecosystem, cooperation with other participants of the life science**
25 **ecosystem, and so on. In the case of mentors, we talked about their experience, types of cooperation**
26 **with companies and alumni, cooperation with large businesses and investors, and so on. For more**
27 **details, see Appendix. We selected these interviewees because they are the main representatives of**
28 **business accelerators, they are experts at forming value for program participants, and they could**
29 **provide the contact information of these participants and alumni for further interviews. After that,**
30 **we also interviewed program participants and alumni to get their opinions on the importance of**
31 **business accelerator programs.**
32
33
34
35
36
37
38
39
40

41 We used within- and cross-case analyses (Eisenhardt, 1989) to explore the data. Within-case analysis
42 was carried out based on the collected data using an additional researcher who did not participate in
43 the interviews. Cross-case analysis was done to identify similarities and differences between the
44 studied cases and to theorize the results. We used quotes from the interviews, which were grouped by
45 key parameters. For the initial assessment of the results, we sent them to the interviewed managers
46 and mentors of business accelerators and company representatives for validation. After we received
47 their comments, we reduced the number of groups and left the key quotes that characterize the key
48 parameters (see details in section 5). Using an additional researcher and interviewees increased the
49 reliability of the study.
50
51
52
53
54
55
56
57
58
59
60

4. Within-case analysis

4.1. Life science accelerator in Finland

The life science accelerator in Finland was founded as part of a Science Park owned by the city. The lack of support after the incubator program ended, the request of local companies for further collaboration, and interest in promoting the life science industry in Finland created the preconditions for the formation of a new program. The program management developed a new approach to the selection of program participants. In the incubator program in Finland, participants can start at any convenient time. The accelerator participants are grouped into sets of 7–10 companies; this division creates additional opportunities for group meetings with private investors and the joint promotion of companies at the foreign markets using additional state support.

Initially, the project was co-financed by the European Regional Fund for two years. However, the achieved results allowed for continuing the work of the life science business accelerator without external funding. Finnish policy-makers decided to support the program with minor changes. The focal business accelerator refused to support direct consumer business and general health projects and focused instead on products or services within professional, regulated healthcare. This approach also fits into the framework of the national program to support the commercialization of academic medical innovations. Additional key project participants have become the chief national and regional hospitals offering expertise, assistance in product development, prototyping, and testing services.

At the initial stage of development, the business accelerator also focused on supporting projects that recently completed one of the business incubators in Finland. The transition from one support program to another was considered logical in business development. However, later management of the accelerator abandoned this practice and abolished the age limit for program participants. The business accelerator declares that companies at any stage of development can participate in the program; however, start-up companies are redirected to a business incubator. Moreover, the number of projects in one batch decreases over time, but the average amount of funds raised by each of the participants grows.

Life science accelerators provide an opportunity to exchange ideas and receive support for different projects from all cities throughout Finland, whereas previously, the cooperation was mainly performed within the framework of one city. If the first group of companies mainly consisted of projects from local universities, then the number of projects from other cities has already significantly increased for the second group.

The management and advisers of the accelerator agree on the importance of quickly developing the business skills of the participants, which was not offered before the start of the program. The plan is to have up to three parallel programs at the same time in Finland. In addition to common classes, mentors and teams individually select programs based on the needs of the specific team.

4.2. Life science accelerator in Sweden

The life science business accelerator became a logical continuation of the city's business ecosystem development: Medicon Village. Medicon Village is based on a local business park and university. The project initially focused on the association of graduates of the medical and engineering departments. Additional support is provided by national and Nordic organizations from the medical technology industry.

In addition to standard online and offline sessions, the business accelerator focuses on cooperation with Nordic medical companies, serial entrepreneurs, and investors. Such meetings are valuable even in the absence of companies' overlapping interests. The acquired skills and expertise usually support further development of the companies.

The business accelerator is not evaluated by indicators such as the amount of funding raised by its graduates. Unlike the Finnish project, the local life science business accelerator is focused more on the formation of a sustainable business ecosystem and the development of the regional value formation center. A similar approach has been formed for the selection of projects. The duration of the business accelerator program is only three months, so the number of projects that participate in the program is huge.

There are several life science accelerators in Sweden, leading to additional competition in the market. Consequently, the majority of participants are from local universities or large companies, which contributes to the creation, retention, and development of talented projects in the regional market. The life science accelerator logically continued programs that support the development of regional entrepreneurship. Its specialization includes different kinds of topics; however, biotechnology traditionally dominates in Sweden.

A short, intensive support program contributes to the rapid turnover of projects. All companies are totally involved in the program within three months, while other programs allow the participation of only some company representatives or the involvement of an incomplete team. Most founders of university spin-offs have little managerial experience, which decreases demand on the commercialization of research.

4.3. Life science accelerator in Germany

The business accelerator in Germany contributes to the expansion of local companies to the US market. Moreover, the Cambridge program's office supports access to the local business ecosystem. The management does not consider the company's relocation to another country to be an issue for the local economy. As a rule, the R&D center, as well as the center of the added value of the company, remains in Germany.

One of the features of this accelerator is the need to change the mentor during the project. It is also possible to change several mentors or return to the previous one. Representatives of the business accelerator encourage this by shifting the duration of the project, making possible changes to the

1
2
3 **company's goals during the program, and changing access to the network of contacts of several**
4 **mentors.**
5

6 One of the critical features of the accelerator program is the search for participants. Despite the
7 available standard applications on the website, more attention is paid to scouting companies. This
8 approach has the advantage of the condition of motivation, desire, and the network of scouts.
9 Participants are offered support for up to 18 months, combining the incubation and pre-incubation
10 programs. This accelerator demonstrates the most project-oriented approach, focusing on the
11 prospects of the project and not on the stage of development.
12
13
14

15
16 **German companies consider the US market as one of the most significant for business. However, non-**
17 **local companies consider the German market as one of the most attractive among the European ones.**
18 **Relocating an office for such companies to Germany may be one of the priorities. Therefore, the**
19 **search for promising projects from around the world is one of the primary tasks. Moreover, the web**
20 **portal of this business accelerator is the only one through which it is possible to submit an application**
21 **in five languages.**
22
23
24

25 4.4. Life science accelerator in Denmark

26
27 The business model of this accelerator allows for cooperation with a big business for the
28 commercialization of inventions. This collaboration supports the development of new projects that do
29 not fit into the mainstream of the big company but that have potential for the market.
30
31

32 The number of applications and the market position offer two programs for participants: biotechnology
33 and medical technology. However, part of the classes is held together because most of the participants'
34 needs are the same. Managers and advisers of the accelerator consider the markets of Sweden,
35 Norway, and Denmark to be one, which competes for promising ideas with other countries. This
36 approach allows the program to improve based on the needs of the participants and on current needs.
37 As a result, during recent years, the program has started offering support for the development of
38 companies through the US market.
39
40
41

42
43 **Like the Swedish business accelerator, this one also supports a sustainable and environmentally**
44 **friendly development direction. In turn, participating companies are invited to build lean business**
45 **models. Moreover, this is one of the few life science business accelerators where serial entrepreneurs**
46 **from lean companies work as mentors for medical and biotechnology companies. According to the**
47 **management of the life science business accelerator, the likelihood of a company existing after**
48 **participating in the program is higher than in any other accelerator in Europe.**
49
50
51

52 4.5. Life science accelerator in Holland

53
54 This program is nationwide and has several offices in Holland. During its initial stage of development,
55 the program had its own financial resources for investments. However, this approach was rejected
56 based on the results.
57
58
59
60

1
2
3 Management of the accelerator considers the creation of a Pan-European program for medical
4 inventions. In their opinion, the business ecosystem of the US offers more investors and developed
5 infrastructure compared with the EU. The Pan-European program could significantly transform the life
6 science industry within Europe, contribute to market growth, and attract new projects and investors.
7
8

9 Managers and advisers of the accelerator work on the principles of project management. In this case,
10 the common program for all participants is reduced to a minimum compared to other support
11 programs. Companies formulate several tasks that should be solved together with supervisors.
12 However, it usually requires solving a number of subtasks, for example, increasing the level of business
13 knowledge, hiring additional staff, or replacing some of the existing staff.
14
15
16

17 **The approach to the preparation and training of participants is somewhat different from the rest of**
18 **the considered business accelerators. Program participants train based on a series of bootcamps that**
19 **last several days each. According to the results of the bootcamps and presentations for investors and**
20 **large companies, participants can receive a prize of 25,000 euros.**
21
22

23 **The business accelerator offers expert classes for its graduates, which may include training in drug**
24 **manufacturing, licensing, health technology assessment, and others. Most of these classes are**
25 **tailored to the needs of a particular batch, but they are also available for future projects.**
26
27

28 **An additional feature of this business accelerator is the provision of support for the hiring of external**
29 **consultants for the needs of the project. The accelerator co-finances 50% (up to 10,000 euros) to**
30 **obtain expertise for highly specialized tasks of the company.**
31
32

33 5. Cross-case analysis

34
35

36 In the cross-case analysis, we identified a number of factors inherent to life science business
37 accelerators that impact the transformation of the focal business ecosystems. Table 2 presents a list of
38 these factors, key quotations, and the number of discussions about these factors with management,
39 supervisors, participants, and alumni of the programs.
40
41

42 --- Insert Table 2 here ---
43
44

45 It seems that the cases have three main factors in common: collaboration with other countries to obtain
46 additional expertise and business development; support and development of the business skills of the
47 program participants; and a project approach based on the needs of the companies. In the next section,
48 we analyze the main factors using cross-case analysis.
49
50

51 5.1. Collaboration with other countries

52

53 Mentors and their professional backgrounds are one of the key driving forces for the development of
54 business accelerators. The management of life science accelerators consider the supervisors'
55 experience with the middle positions in large companies and with the top positions in middle
56 companies as an advantage, as indicated by a manager from Sweden: "Our network after 20 years of
57 experience in transnational companies can be used to enter and work on new markets."
58
59
60

1
2
3 Experience in big companies contributes to the development of networking in the specialized industry,
4 which was mentioned by a supervisor in Finland: "Confidence for the start-up could be increased
5 through recommendations. We actively use the accumulated Nordic network in our projects."
6
7

8 However, most of the mentors have little experience being an entrepreneur; experience with start-ups
9 appears after the start of cooperation with business accelerators. The contribution of the supervisors
10 to the development of companies and business ecosystems could be higher if they had start-up
11 experience. Nevertheless, our interviews with the participants and alumni show that the lack of such
12 experience is not an obstacle for cooperation, and they believe that such experience increases the
13 network and contributes to investment searches. This was, for example, clearly the opinion of an alumni
14 program in Holland: "We were very pleased with our mentor. He forced us to think as representatives
15 of a global company from the very beginning. We did not limit ourselves to the local market but thought
16 about the future."
17
18
19
20

21 Life science accelerators do little to entice promising companies from abroad; however, they could
22 become transfer centers for talented ideas across the domestic markets. Managers of accelerators are
23 more focused on cooperation with local universities and laboratories, as indicated by one of the
24 supervisors we interviewed: "We sometimes receive applications from Eastern Europe, but this is not
25 our priority."
26
27
28

29 This possibility is also consonant with the idea of creating a Pan-European business accelerator, which
30 has had minimal attention thus far. However, the level of local support for entrepreneurs, the size of
31 the market, and prospects for development could be in demand for entrepreneurs from other
32 countries. On the one hand, mentors and advisers are satisfied with the quality of companies that
33 participate in accelerator programs. On the other hand, additional competition should positively affect
34 the sustainability of the business ecosystem.
35
36
37

38 5.2. Business skills development

39

40 Mentors and advisers contribute to the development of entrepreneurs' business skills. This impacts the
41 success of the companies and the desire of academic groups to commercialize their inventions, and it
42 creates fundamentals for serial entrepreneurship. These business development conditions were not
43 supported by other programs before the launch of accelerators, which contributed to the conservatism
44 of the ecosystem. The supervisor of the accelerator in Holland commented on the status of applications:
45 "During application selection and initial contacts with potential program participants, we often have to
46 deal with scientists. Most of them spent their life in academia; their business skills are rather low."
47
48
49
50

51 At the initial stage of company formation and concept development, scientific competencies are in
52 higher demand. However, with the growth of the company, business competencies start to prevail.
53 Nevertheless, the short-term business courses offered by the accelerators and other educational
54 programs give little opportunity to represent the business interests of the company, which in turn
55 reduces the chances for its success, as mentioned by a participant of the Finland program: "During the
56 meetings with potential partners and investors, we were often asked, 'Who is responsible for sales and
57
58
59
60

1
2
3 business development?’ We had to pay for advanced training in a prestigious European business school
4 and receive a certificate.”
5

6 7 5.3. Project on demand–based approach 8

9 The vast majority of participants and alumni of business accelerators positively assess their
10 participation in these programs. Moreover, participants feel that other companies and the level of their
11 development correspond to the goals and objectives of accelerators. Raising funds and entering a new
12 market are the main goals of the most active companies. In most cases, at least one of these goals is
13 achieved during or soon after participation in the accelerator program, as interpreted by an alumnus
14 of the program in Holland: “The main goal of our participation was to find financing. [...] We did not
15 receive any investment during the program. However, the received contacts helped us receive money
16 a little after.”
17
18
19

20
21 The specialization of the life science accelerators within the industry is a relatively flexible parameter
22 that contributes to the diversity of business ecosystems by supporting the competition. The accelerator
23 from Denmark offers two programs: biotechnology and medical technology. However, the difference
24 between the programs is not significant; program participants often work together. Accelerators either
25 declare a very general specialization or accept projects from undeclared areas of life science, as
26 highlighted by the manager from Sweden: “Our specialization is Medtech, but we are ready to consider
27 projects from other life science areas. The founders of the team are the most important parameter.”
28
29
30

31 6. Discussion and contribution 32

33
34 Our study is devoted to exploring the role of life science business accelerators in the context of a focal
35 business ecosystem. A new participant in the business ecosystem contributes to the development and
36 adoption of the industry in different countries in various ways. However, there are certain factors that
37 are typical of most business accelerators.
38
39

40 6.1. Conceptual model 41

42
43 **The study offers the opportunity to provide a conceptual model of life science business accelerators.**
44 **A key factor in the formation and development of the business accelerator concept is the focus on**
45 **developing a local business ecosystem or focusing on projects of specific companies. The first group**
46 **includes countries such as Holland, Sweden, Denmark, and partly Finland. The task of these business**
47 **accelerators is to maximize the coverage of life science projects and to provide a chance to**
48 **commercialize projects for most companies. Short and intensive programs last about three months**
49 **(at the initial stage, the Finnish accelerator offered a program lasting six months), meetings with**
50 **mentors are scheduled two to four times a month, and there is regular business skills training for**
51 **entrepreneurs. The short programs are implemented several times a year, including several batches**
52 **of training at the same time. These programs result in the acquisition of business skills and new**
53 **opportunities for entrepreneurs to develop the business by gaining access to a network of one or**
54 **more mentors. Such business accelerators have a pronounced connection with local universities**
55 **(Finland, Sweden, and Denmark); the first batches of participants are held within one region, but the**
56
57
58
59
60

1
2
3 **business accelerators quickly developed into national projects. If there are several life science**
4 **business accelerators in one country, there is often no competition but more cooperation between**
5 **programs. After completing participation in the program, project participants have access to mentors**
6 **and resources; however, they prefer to develop on their own. These business accelerators claim**
7 **different specializations in the field of life science. However, a promising project may participate in**
8 **the program that is not in the declared framework. It is also worth noting the role of the mentor in**
9 **assessing the success of the program for participants. If the goals of the participant, the mentor's**
10 **experience, and the network do not coincide, participants in the program may not achieve their goals.**
11 **Such a business accelerator model is characterized more by a recruiting campaign based on online**
12 **and offline marketing (Finland, Sweden, and Holland). The initial initiative to participate in the**
13 **business accelerator program comes from entrepreneurs who have learned about the opportunity**
14 **from previous batches or through university mailings. The second group of accelerators includes**
15 **more project-oriented programs, which often provide long-term programs and may partially coincide**
16 **with the program of business incubators (Finland and Germany). The scouts of these business**
17 **accelerators are actively searching for projects based on media, specialized industrial events, etc.**
18 **Companies can start participating at any time (Germany and Denmark). Business accelerators,**
19 **focused more on the development of specific companies rather than on business ecosystems, also**
20 **develop interaction with the US market (Germany and Denmark). This market is a priority for most**
21 **participating companies, so this opportunity is attractive to project participants, and it allows them**
22 **to find a niche in the market if there are several life science business accelerators in one country. This**
23 **is realized through participation in intensive field boot camps for one to three months.**

24
25
26
27
28
29
30
31
32
33 **Most business accelerators are aimed at developing local projects and, to a lesser extent, at attracting**
34 **projects from the outside. For example, one of the main requirements is the registration of a project**
35 **in the national zone. At the moment, there are no Pan-European life science business accelerators,**
36 **so it was not possible to assess their impact on the business ecosystems of different countries. It is**
37 **also worth noting that the current situation with the focal accelerators is largely based on free**
38 **participation in programs. Participating companies do not pay for participation either in money or in**
39 **company shares. However, they also do not receive guarantees to achieve the objectives of**
40 **participation. Small prizes and grants can be received by program participants rather as an exception**
41 **to the rule (Holland). Most of the representatives of the participants talk positively about**
42 **participation, saying that they have achieved their goals. Business accelerator managers stated**
43 **various criteria for evaluating the effectiveness of programs, for example, the number of participants,**
44 **the amount of funding raised after participation, the popularization of the life science industry, the**
45 **transfer of qualified personnel from the academy to the industry, and the retention of personnel**
46 **within the country. However, in most cases, the proposed estimates are blurred, and the level of**
47 **subjectivity in the decision to extend the program is high. It should be noted that the proposed**
48 **models of existence and development are intertwined, and there is no single approach or standard**
49 **development path. Even in countries with a single life science accelerator, there are various**
50 **entrepreneurship support programs; some companies may not see the benefits of participating or**
51 **may express a negative attitude after the end of participation.**
52
53
54
55
56
57
58
59
60

6.2. Theoretical contribution

We contribute to the emerging research on business accelerators and offer three key inputs and two additional ones.

First, based on the available literature on accelerators and our qualitative research, we determine the parameters of the business accelerators that contribute to the development of regional life science business ecosystems: (1) cooperation with other countries and regions in order to obtain additional expertise and contribute to business development for the companies that participate in the program; (2) development of business skills for the founders and managers of the companies; and (3) a project approach to solving the tasks with which companies participate in the program. We cover this gap by providing specific frameworks in a particular industry that influence transformation in different ways by interacting with other participants (Pauwels *et al.*, 2016). These parameters contribute to the determination of the role of life science accelerators, the development of the business ecosystem, and the creation value for partners.

Second, we develop research that suggests that studying business accelerators accounts for industrial or regional specifics (Pauwels *et al.*, 2016; Regmi *et al.*, 2015). We found specific key parameters of life science accelerators, which are caused by the industry. Researchers suggest that financing projects at an early stage, mentoring support, and networking are the most important criteria in IT (Radojevich-Kelley and Hoffman, 2012). However, in life science, it is important to teach company founders the right business skills. The vast majority of such managers come from universities with a specialization in life science and limited business experience. As the company develops, the necessity of scientific skills decreases, and the use of managerial skills increases. By training managers, business accelerators help reduce the likelihood of failure. Moreover, entering a new market, the vast majority of companies consider the US market a priority because it is attractive to companies involved in the acceleration process. The European market is more fragmented; there are fewer chances to raise funds or increase sales for these companies. In turn, the project approach to solving specific problems in acceleration programs is similar to the approaches of business accelerators from other industries. Most often, companies participating in business accelerators would like to solve a specific task—most commonly finding an investor or entering a new market—and they would like to evaluate success from participation as the degree to which a specific task was solved.

Third, we agree with the study by Cohen and Hochberg (2014) that business accelerators aim to support companies in the development of products and services and to identify the most promising market segments. However, we extend the knowledge of business accelerators and demonstrate that providing financial and human resources for companies may not be a priority for life science businesses. Life science business accelerators concentrate more on mentoring support, and companies are not motivated to seek additional staff, which are often formed in the university environment. As exceptions, marketing and sales personnel are worth noting. However, most often, company representatives are more likely to develop their own business skills.

1
2
3 In addition, researchers pay considerable attention to analyzing different ways of achieving success in
4 companies (Soenksen and Yazdi, 2017; Kirkpatrick, 2015; Belussi and Sedita, 2015). However, little
5 attention is given to the types of support for life science companies. With our research, we demonstrate
6 the possibility of developing certain skills that increase the efficiency and probability of success. For
7 example, the development of business skills in incubators critically affects the likelihood of success
8 (Rubin *et al.*, 2015). However, the need to continue developing business skills is still high after the end
9 of the program. The majority of life science start-ups receive business expertise based on their views
10 about how to develop a business or use commercial programs for business development. However, the
11 focal business accelerators are focused on training and the development of business skills. These
12 programs could increase their effectiveness in cooperation with universities. On the one hand, students
13 could get experience and the business development vision in companies. On the other hand, it could
14 be useful for entrepreneurs to obtain basic theoretical and practical knowledge in management.
15
16
17
18
19

20
21 We also assume that public support of the program, free participation for companies, and a focus on
22 the development of a regional business ecosystem affects the business model of the non-profit
23 programs (Dvouletý *et al.*, 2018). In this way, we complement the studies on incubators and
24 accelerators as profit programs (Battistella *et al.*, 2017; Amezcua *et al.*, 2013; Cohen and Hochberg,
25 2014). We agree that non-profit business accelerators are difficult to compare with the effectiveness
26 of private ones. However, for the future, we suggest that researchers continue our study and compare
27 performance parameters for private and public life science and other industrial accelerators.
28
29
30

31 6.3. Practical implications

32
33
34 Our study also has two key practical implications and several additional ones for participants of the life
35 science business ecosystems.
36

37 First, we offer parameters for creating and developing effective life science business accelerators that
38 can be demanded by policymakers. Business accelerators function as hubs that combine the available
39 resources of regional business ecosystems. Companies receive expertise, enhance business skills, and
40 overcome business challenges, and investors may consider business accelerators as a source of
41 promising projects (Dempwolf *et al.*, 2014). Business accelerators contribute to the transfer of
42 academic personnel to the industry, as well as to the retention of qualified personnel in the local market
43 (Hochberg, 2016). Policymakers should be interested in creating and developing specialized business
44 accelerators since they create the necessary links between participants in the business ecosystem and
45 contribute to the emergence and development of new projects on the market (Pustovrh *et al.*, 2020).
46 Business incubators affect the likelihood of research moving into a practical field or of forming new
47 companies. In turn, specialized business accelerators contribute to the acceleration of existing
48 companies and helping them enter new markets, as well as to the increase in sales volumes.
49
50
51
52
53

54
55 Second, we determine the position of the business accelerator in the business ecosystem, and we argue
56 that it is not a development of a business incubator model (Mrkajic, 2017) or a business incubator
57 generation (Bruneel *et al.*, 2012). A business accelerator is an independent participant in the ecosystem
58 with its own characteristics and individual tasks. Moreover, the model may change over time, beginning
59
60

1
2
3 with the start phase (regional level), moving to the second phase (national level), and gradually
4 transforming to the third phase (international level). Managers of business accelerators could use this
5 classification as a development strategy to increase the output of the programs. In turn, an increase in
6 the satisfaction of program participants will help increase the number of life science companies and the
7 sustainability of the business ecosystem.
8
9

10
11 Additionally, we expected that business accelerators could contribute to the development of serial
12 entrepreneurship. However, the alumni of the business accelerator programs see little value in
13 participating in new projects. The formed database of contacts and resources offered by mentors is
14 available for subsequent interaction. Companies communicate with mentors and may assist in the
15 development of business accelerators through guest lectures or joint projects. However, such activities
16 are slightly less.
17
18

19 20 7. Limitations

21
22 Our study has limitations that create an opportunity for further research. First, this study is dedicated
23 to business accelerators in five countries that consider the life science industry a priority. However, in
24 other regions, the support policies for life science may differ. Our results should be tested and
25 compared with similar programs, for example, in emerging markets. Second, it is necessary to analyze
26 and compare business accelerators in various industries and identify key performance indicators to
27 assess and compare results. This research could distribute successful practices that are collected from
28 different industries and could adapt the experience to the economies' priorities. Third, it would be
29 interesting to explore the success of companies that have participated in acceleration programs and
30 compare them with companies without experience or those who have participated in other public and
31 private support programs.
32
33
34
35
36

37 8. Conclusion

38
39 **During the last decade, life science as one of the knowledge-based industries has been undergoing**
40 **constant changes. One of these changes is the emergence of new participants in the business**
41 **ecosystem who find their place and, together with other companies, create value for all interested**
42 **parties. Our study is dedicated to a new concept: a life science business accelerator and its role in the**
43 **development of the industry. We declare that the key parameters of the life science business**
44 **accelerators are different from other business ecosystems. We emphasize that cooperation with**
45 **other markets, development of the entrepreneurial skills of program participants, and a project-**
46 **oriented approach are the key parameters for the success of a business accelerator. Most life science**
47 **accelerators exist on the basis of state support and are formed in cooperation with universities and**
48 **business technology parks. Our practical contribution is aimed at (1) policy-makers who are looking**
49 **for the opportunity to develop a knowledge-based economy in their country; (2) business incubator**
50 **managers who want to expand the offer for their customers; and (3) companies that already have**
51 **certain business skills but are looking for opportunities to implement their projects in conditions of**
52 **lack of resources or knowledge.**
53
54
55
56
57
58
59
60

9. Acknowledgment

The authors thank all mentors, advisers, management and participants of the programs and alumni who participated in the research.

References

Amezcuca, A.S., Grimes, M.G., Bradley, S.W. and Wiklund, J. (2013), "Organizational sponsorship and founding environments: a contingency view on the survival of business-incubated firms", 1994–2007. *Academy of Management Journal*, Vol. 56 No. 6, pp.1628-1654.

Battistella, C., De Toni, A.F. and Pessot, E. (2017), "Open accelerators for start-ups success: a case study", *European Journal of Innovation Management*, Vol. 20 No. 1, pp.80-111.

Belussi, F. and Sedita, S.R. (2015), "Going alone: the 'Entrepreneurial-Growth Model' in the life science industry in Italy", *European Planning Studies*, Vol. 23 No. 1, pp.188-210.

Bhutta, K.S. and Huq, F. (1999), "Benchmarking – best practices: an integrated approach", *Benchmarking: An International Journal*, Vol. 6 No. 3, pp.254-268.

Brown, R., Mawson, S., Lee, N. and Peterson, L. (2019), "Start-up factories, transnational entrepreneurs and entrepreneurial ecosystems: unpacking the lure of start-up accelerator programmes", *European Planning Studies*, Vol. 27 No. 5, pp.885-904.

Bruneel, J., Ratinho, T., Clarysse, B. and Groen, A. (2012), "The evolution of business incubators: comparing demand and supply of business incubation services across different incubator generations", *Technovation*, Vol. 32 No. 2, pp.110-121.

Caiazza, R. (2014), "Benchmarking of business incubators", *Benchmarking: An International Journal*, Vol. 21 No. 6, pp.1062-1069.

Carayannis, E.G. and 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 practices", *Technovation*, Vol. 25 No. 2, pp.95-110.

Carlucci, D., Lerro, A., Lazzarotti, V., Manzini, R. and Pellegrini, L. (2010), "Open innovation models adopted in practice: an extensive study in Italy", *Measuring Business Excellence*.

Carmel, E. and Richman, J. (2013), *Building International Social Capital at the Startup Chile Accelerator*.

Clarysse, B. and Yusubova, A. (2014), "Success factors of business accelerators", In *Technology Business Incubation Mechanisms and Sustainable Regional Development*.

Cohen, S. and Hochberg, Y. (2014), *Accelerating Startups: The Seed Accelerator Phenomenon*.

- 1
2
3 Del Sarto, N., Isabelle, D.A. and Di Minin, A. (2019), "The role of accelerators in firm survival: an fsQCA
4 analysis of Italian startups", *Technovation*, 102102.
5
6 Dempwolf, C.S., Auer, J. and D'Ippolito, M. (2014), "Innovation accelerators: defining characteristics
7 among startup assistance organizations", *Small Business Administration*.
8
9
10 Di Fatta, D., Caputo, F. and Dominici, G. (2018), "A relational view of start-up firms inside an incubator:
11 the case of the ARCA consortium", *European Journal of Innovation Management*.
12
13 Dvouletý, O., Longo, M.C., Blažková, I., Lukeš, M. and Andera, M. (2018), "Are publicly funded Czech
14 incubators effective? The comparison of performance of supported and non-supported firms",
15 *European Journal of Innovation Management*.
16
17
18 Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management*
19 *Review*, Vol. 14 No. 4, pp.532-550.
20
21
22 Eisenhardt, K.M. and Graebner, M.E. (2007), "Theory building from cases: opportunities and
23 challenges", *Academy of Management Journal*, Vol. 50 No. 1, pp.25-32.
24
25
26 Ernst and Young (2013), "Beyond Borders", *Biotechnology Industry Report 2013*.
27
28 Ernst and Young (2014). "Nordic Life Sciences", *Sector Study 2014*.
29
30 Fishback, B., Gulbranson, C., Litan, R., Mitchell, L. and Porzig, M. (2007), *Finding Business 'Idols': A New*
31 *Model to Accelerate Startups*, Kansas City, MO, Ewing Marion Kauffman Foundation.
32
33 Hallen, B.L., Bingham, C.B. and Cohen, S. (2014), "Do accelerators accelerate? A study of venture
34 accelerators as a path to success?" In *Academy of Management Proceedings* (Vol. 2014, No. 1, p.12955).
35 Briarcliff Manor, NY 10510, Academy of Management.
36
37
38 Hansen, M.T., Chesbrough, H.W., Nohria, N. and Sull, D.N. (2000), "Networked incubators", *Harvard*
39 *Business Review*, Vol. 78 No. 5, pp.74-84.
40
41
42 Hochberg, Y.V. (2016), "Accelerating entrepreneurs and ecosystems: the seed accelerator model",
43 *Innovation Policy and the Economy*, Vol. 16 No. 1, pp.25-51.
44
45
46 Iansiti, M. and Levien, R. (2004), "Creating value in your business ecosystem", *Harvard Business Review*,
47 Vol. 3, pp.68-78.
48
49
50 Isabelle, D.A. (2013), "Key factors affecting a technology entrepreneur's choice of incubator or
51 accelerator", *Technology Innovation Management Review*, Vol. 3 No. 2.
52
53
54 Kandiah, G. and Gossain, S. (1998), "Reinventing value: the new business ecosystem", *Strategy &*
55 *Leadership*.
56
57
58 Kirkpatrick, L. (2015), "Incubators for innovators", *Nature Biotechnology*, Vol. 33 No. 2, p.129.
59
60

- 1
2
3 Kohler, T. (2016), "Corporate accelerators: building bridges between corporations and startups",
4 *Business Horizons*, Vol. 59 No. 3, pp.347-357.
5
6
7 Kötting, M. (2019). "Corporate incubators as knowledge brokers between business units and
8 ventures", *European Journal of Innovation Management*.
9
10 Mian, S., Lamine, W. and Fayolle, A. (2016), "Technology business incubation: an overview of the state
11 of knowledge", *Technovation*, Vol. 50, pp.1-12.
12
13 Miller, P. and Bound, K. (2011), "The Startup Factories: The rise of accelerator programmes to support
14 new technology ventures", Nesta.
15
16 Moore, J.F. (1993), "Predators and prey: a new ecology of competition", *Harvard Business Review*, Vol.
17 71 No. 3, pp.75-86.
18
19
20 Moschner, S.L., Fink, A.A., Kurpjuweit, S., Wagner, S.M. and Herstatt, C. (2019), "Toward a better
21 understanding of corporate accelerator models", *Business Horizons*, Vol. 62 No. 5, pp.637-647.
22
23 Mrkajic, B. (2017), "Business incubation models and institutionally void environments", *Technovation*,
24 Vol. 68, pp.44-55.
25
26
27 Oh, D.S., Phillips, F., Park, S. and Lee, E. (2016), "Innovation ecosystems: a critical examination",
28 *Technovation*, Vol. 54, pp.1-6.
29
30 Onduygu, M.O. and Guven, S. (2006, July), "A corporate venturing case study in Turkey: SBA (Siemens
31 Business Accelerator)", In *Technology Management for the Global Future, 2006*. PICMET 2006 (Vol. 3,
32 pp.1102-1107), IEEE.
33
34
35 Pauwels, C., Clarysse, B., Wright, M. and Van Hove, J. (2016), "Understanding a new generation
36 incubation model: the accelerator", *Technovation*, Vol. 50, pp.13-24.
37
38
39 Price, R. (2004), "The role of service providers in establishing networked regional business accelerators
40 in Utah", *International Journal of Technology Management*, Vol. 27 No. 5, pp.465-474.
41
42 Radojevich-Kelley, N. and Hoffman, D.L. (2012), "Analysis of accelerator companies: an exploratory case
43 study of their programs, processes, and early results", *Small Business Institute Journal*, Vol. 8 No. 2,
44 pp.54-70.
45
46
47 Pavlak, M. and Petru, N. (2018), "Start-up ecosystem support in the Czech Republic", *Economic Studies*
48 *& Analyses/Acta VSFS*, Vol. 12 No. 2.
49
50 Regmi, K., Ahmed, S.A. and Quinn, M. (2015), "Data driven analysis of startup accelerators", *Universal*
51 *Journal of Industrial and Business Management*, Vol. 3 No. 2, pp.54-57.
52
53
54 Rubin, T.H., Aas, T.H. and Stead, A. (2015), "Knowledge flow in technological business incubators:
55 evidence from Australia and Israel", *Technovation*, Vol. 41, pp.11-24.
56
57
58 Pustovrh, A., Rangus, K. and Drnovšek, M. (2020), "The role of open innovation in developing an
59 entrepreneurial support ecosystem", *Technological Forecasting and Social Change*, 152, 119892.
60

- 1
2
3 Sandström, A. (2014), *Global trends with local effects. The Swedish Life Science Industry 1998–2012*,
4 (Vinnova Analysis VA 2014:03). Stockholm, VINNOVA.
5
6
7 Sepulveda, F. (2012), “The difference between a business accelerator and a business incubator?” *Inc.*
8 *Web*, Vol. 31, pp.1-14.
9
10 Soenksen, L.R. and Yazdi, Y. (2017), “Stage-gate process for life sciences and medical innovation
11 investment”, *Technovation*, Vol. 62, pp.14-21.
12
13 Steiber, A. and Alänge, S. (2020), “Corporate-startup collaboration: effects on large firms’ business
14 transformation”, *European Journal of Innovation Management*.
15
16 Van Weele, M., van Rijnsoever, F.J. and Nauta, F. (2017), “You can’t always get what you want: how
17 entrepreneur’s perceived resource needs affect the incubator’s assertiveness”, *Technovation*, Vol. 59,
18 pp.18-33.
19
20
21 Wallin, M.W. and Von Krogh, G. (2010), “Organizing for open innovation: focus on the integration of
22 knowledge”, *Organizational Dynamics*, Vol. 39 No. 2, pp.145-154.
23
24 Wann, J.W., Lu, T.J., Lozada, I. and Cangahuala, G. (2017), “University-based incubators’ performance
25 evaluation: a benchmarking approach”, *Benchmarking: An International Journal*, Vol. 24 No. 1, pp.34-
26 49.
27
28 Von Krogh, G., Rossi-Lamastra, C. and Haefliger, S. (2012), “Phenomenon-based research in
29 management and organisation science: when is it rigorous and does it matter?” *Long Range Planning*,
30 Vol. 45 No. 4, pp.277-298.
31
32
33 Yin, R.K. (2017), *Case Study Research and Applications: Design and Methods*, Sage Publications.
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Table 1. Key characteristics of life science accelerators involved in the study

Country	Finland	Sweden	Germany	Holland	Denmark
Source of financing	Public funding, European regional development fund	Public funding, European regional development fund	Public funding	Public funding	Public funding, European regional development fund, corporations, private
Specialization	Pharma, diagnostics, biomaterials	Medical and health technologies	Digital health, medical devices, diagnostics, therapeutics, and platform technologies	Life science	Two programs: life science and biotech; medtech and health care + mentorship program
Number of batches by 31.12.2017 (year of program launch)	2 (2017)	4 (2016)	No batches, rolling basis (2015)	n/a (2008)	n/a (2010)
Duration of the program, months	6+6	3	Up to 18 and more if needed	2.5	6
Own funds for investments	No	No	No	At an early stage of development	No
Recruiting companies	Online and offline marketing	Online and offline marketing	Scouting	Online and offline marketing	Online and offline marketing, scouting
Cost of participation (money, equity)	No	No	No	No	No
Key difference between the program and its analogues	Standard	<ul style="list-style-type: none"> Attention to stock market Swedish-Danish project 	<ul style="list-style-type: none"> Access to US market Preparation program 	Standard	<ul style="list-style-type: none"> Corporations as partners Creation of scalable business model Nordic collaboration, access to US
Boot camps	No	No	No	Yes	In US (3–4 days)

Table 2. Key factors of life science business accelerators that contribute to the transformation of the business ecosystem

Factors	Key quotations	Number of discussions during the meetings			Total number
		Management and supervisors	Participants	Alumni	
Collaboration with other countries for expertise and expansion	<p>“Each group comes with its task. Most of the teams want to find an investor. Some want to enter a new market, for example, Asia or USA.”</p> <p>“We consider the American market as one of the most interesting for our participants. Moreover, the experience of creating and developing an infrastructure for life science entrepreneurship in the US could help us improve the quality of services.”</p>	19	14	5	38
Business skills development	<p>“For a big step forward in the development of the start-up, it is necessary that business skills gradually begin to prevail over academic ones. Our goal is to train specialists in the commercialization of inventions.”</p> <p>“Our position is not to substitute the management courses. We provide special tools that allow companies to communicate</p>	14	9	4	27

	with, for example, investors.”				
Project-based approach	“We are concentrated on the fast support programs and project-based acceleration.”	15	9	2	26
Background of supervisors	“Most of our advisers worked in the international companies.” “Our mentor had very limited experience in start-ups; he worked in a big pharma company.”	8	3	2	13
Serial entrepreneurship	“I have no need to participate in the program with another project.” “We want to cover as many projects as possible.”	5	3	3	11
Specialization	“We decided to divide the program into two parts. Companies fall into their dependence on specialization. This is due to the number of quality projects that come to us in the program.” “We have a priority in our specialization, but the quality of the project is more interesting.”	4	3	1	8

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

European Journal of Innovation Management

Appendix. Interview Agenda

Company name:

Contact person(s), position(s):

Date of interview:

Online/offline:

Primary/Secondary Interview (date of the first interview):

Key questions for managers and mentors of business accelerators:

1. What is the role of the business accelerator in the local business ecosystem?
2. How do you search for, select, and mentor companies?
3. How do you collaborate with big businesses, universities, investors, and others?
4. How does your acceleration program evaluate in time?
5. How does your business accelerator contribute to the development of the life science business ecosystem and a particular start-up?
6. What other public and private programs are available that stimulate regional or national development of the life science business? Are they sufficient for all participants in the business ecosystem?
7. What are the business accelerator performance indicators?
8. How important is the reputation of a business accelerator in the market? How do local business accelerators compete for the most promising projects?
9. What experience should you have to become a mentor? What is the key value proposition of a mentor?
10. How do you collaborate with alumni?
11. What is the contribution of the business accelerator to the development of serial entrepreneurship in the region?
12. How satisfied are you with the quality of start-ups (teams, ideas, etc.)?
13. How do you collaborate with foreign start-ups?
14. What are the barriers that limit the number of life science companies at the regional and national levels?
15. Who are your competitors (organizations, markets, programs, etc.)?
16. Evaluate the level of participant's skills?

Participants and graduates:

1. What is the role of the business accelerator in the local business ecosystem?
2. How do you assess your participation in the program? Have you achieved your goal(s)?
3. How do you assess the contribution of your mentor to the development of the company?

- 1
- 2
- 3
- 4 4. How do you assess other companies participating in the same batch? How much did your
- 5 interests coincide?
- 6 5. What other tasks besides investments and/or access to a new market did you set for yourself
- 7 before and after participating in the business incubator program?
- 8 6. Can you assess the need for participation in the program with a new project?
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60