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### CONTRIBUTIONS OF SUSTAINABLE START-UP ECOSYSTEM TO DYNAMICS OF START-UP COMPANIES: THE CASE OF LITHUANIA

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**Abstract.** The purpose of the present study is to evaluate contributions of sustainable start-up ecosystems to the development and dynamics of start-up companies. To illustrate **how the sustainability of start-up ecosystems affects the development trends of start-up companies** the case of Lithuania is analysed. Lithuania is chosen because of its experience of dynamically transforming its start-up ecosystem; the case is useful for both further scientific analysis of start-up ecosystems and application of the Lithuanian experience to other countries. Cooperation and networking among companies have been important research topics for many decades. In the second half of the 20<sup>th</sup> century the network expansion evolved due to the development of social, economic, political and technological systems (Iansiti and Levien, 2004); however, companies faced new challenges in adapting to the rapidly changing environment, creating synergies from cooperation in ecosystems and sustainably strengthening their competitive advantage. In the early 1990s the term ‘business ecosystem’ was introduced into popular management parlance by James F. Moore (1993). Moore suggested an ecological approach to management, where modern business is viewed not only as a member of a single industry, but rather a part of a business ecosystem that crosses a variety of industries. The present research is centred on effects of this business ecosystem on the dynamics of start-ups. Given the multifactor and trans-disciplinary nature of start-up ecosystems, the triangulation method of combining the scientific literature overview, semi-structured qualitative interviews and quantitative survey method is chosen: the quantitative survey was designed to reveal the general profile of a start-up company and its’ approach towards start-up ecosystems, while qualitative semi-structured expert interviews were conducted to acknowledge why and how start-up ecosystem influences the development of companies. **The research question** is how sustainability of start-up ecosystems affects the development patterns of start-up companies. This should help other countries such as Georgia, Moldova, Bulgaria or Romania to avoid of possible mistakes in enhancing their own start-up ecosystems.

**Keywords:** sustainability, start-ups, start-up ecosystems, development and dynamics of start-ups.

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## 1. Introduction

Before starting to scrutinize effects of business ecosystems on the dynamics of start-ups, a clear description of a business ecosystem should be presented to better understand the context of this multi-factor phenomenon and to identify the main dimensions of the business ecosystem. Relying on Moore (1996, p. 26) a business ecosystem could be understood as ‘an economic community supported by a foundation of interacting organizations and individuals -- the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organizations also include suppliers, lead producers, competitors, and other stakeholders’. The author admits that over time they co-evolve their capabilities and roles, and tend to align themselves with the directions set by leading organizations. These organizations set common visions and strategies and focus on the synergy between various actors in terms of investments and mutual supportive roles (Moore1996).

Iansiti and Levien (2004) compare business ecosystems with biological ecosystems: being similar to business ecosystems, biological ecosystems are characterized by a large number of interconnected participants who depend on each other because of their common expectation of mutual effectiveness and survival. Authors acknowledge the difference between healthy and unhealthy ecosystems. Within a healthy ecosystem individuals thrive, while in the opposite case it might have a negative impact on each participant. Moore (2006) emphasizes the role of business ecosystems as a main driver of innovations via co-evolving innovative combinations of technologies that solve important consumer problems. It is in line with arguments of Cohen et al (2000) that business ecosystems are setting the pattern of launching new technologies that have emerged from Silicon Valley. According to Cohen et al (2000) Silicon Valley transformed itself into more than just an area of high-tech firms and scientific research. It has become the centre of a new kind of business ecosystem together merging social institutions, market institutions and ‘ultra-high-skilled’ people to form a bigger and better system.

Chesbrough (2003) emphasized the role of open innovation, as it posits efforts made by different kinds of interrelated parties. These efforts let smaller and younger companies compete with technologically and financially better established companies and introduce their products and services to markets in more efficient ways. According to Startup Genome Research (2012), Silicon Valley remains the leading ecosystem in the world, but there are new ecosystems being formed all over the world: such cities as Tel Aviv, Los Angeles, Seattle, London, Paris or Berlin are called start-up ecosystems due to a high ratio of new technology-based companies established there. To summarize the information, related to leading start-up ecosystems, there could be the model of start-up ecosystem dimensions developed, based on Cohen et al. (2000).

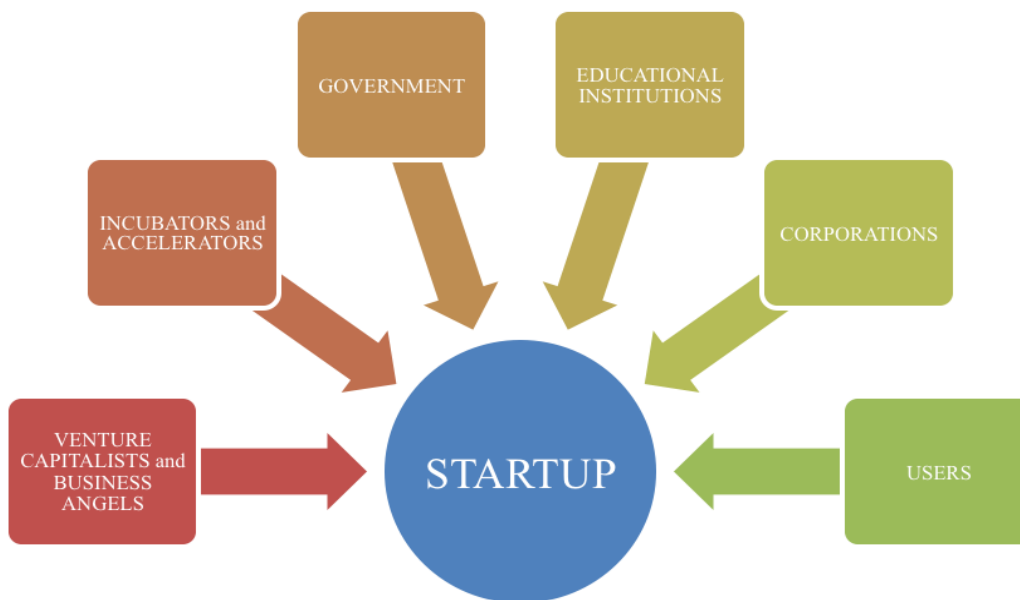


Fig. 1 Dimensions of start-up ecosystem

Having the model of start-up ecosystems designed, it is important to define the concept of a start-up company. Steve Blank (2012, p. xvii), serial-entrepreneur and academician suggests that: 'a start-up company is a temporary organization in search of a scalable, repeatable, profitable business model'. First of all, a start-up company is at its temporary stage. It is expected to move to the next phase: either to become a large, financially independent business, start selling shares publicly or to be acquired by larger corporations. Secondly, a start-up is at the search of a business model and is distinctively different from other small businesses that are operating in mature markets. According to Osterwalder *et al.* (2005), a business model includes 4 parts: the customer value proposition, the profit formula, key resources and key processes. Apart from focusing on what is a product?, who is a customer? and how to make money, new ventures often do not foresee real market opportunities or the best way to address them. They are forced to adapt and modify their original idea over time (McGrath and Macmillan 1995). According to a classic statement of Drucker (1985), even when a new venture does succeed, most of the time it is in a different market than it originally intended to be, with products and services that were not planned to produce and with different targeted customers. Finally, a start-up should seek to become scalable and repeatable.

Graham (2012) adds that in order to grow fast, start-up companies have to create what the market needs and then serve the targeted market. Scalability can be reached because, in general, such companies have a cost structure with a relatively high proportion of fixed cost and relatively low variable cost (Jullien 2006). Often, most of the costs arise from managing databases, while additional transactions within the capacity of database usually hardly cause any additional cost. Summing up, the definition of Steve Blank differentiates a start-up from traditional business in several areas, such as a very high potential growth rate, innovative business model and importance of technology.

Ries (2011, p. 17) states that a start-up is a human institution designed to deliver a new product or service under conditions of extreme uncertainty. Start-up companies are facing many bureaucratic, legal and other institutional processes such as hiring employees, coordinating their activities or fulfilling other legal requirements. Although most of the time start-up company has only one product, the value of it is created by people and all organizations that build it. In this way, the importance of a team in a start-up should be highlighted. Another important part that Ries (2010) adds to the definition is innovation. Ries (2010) claims that innovation is critical to a company's success, but having in mind that innovation is inherently risky, start-ups have to decide what degree of innovation they are capable of and willing to achieve. In general start-ups use already existing technologies in a new context, develop a new business model or bring a product or a service to new location or set of customers that was not addressed before. Finally, there is one last important part of Ries' (2010) definition: the context in which innovation happens. The author identifies that a start-up works under conditions of extreme uncertainty.

The establishment of a new business with its business model, pricing, target customer, and specific product may, under many circumstances, be an attractive economic investment as it mainly depends on decent execution. The success of such kind of business can be modelled. However, start-ups operate in situations that are not clear enough and the risk of a project is not known, so the possibility to get a financial loan from a bank is very low. There are other possibilities to finance a start-up such as venture capital investments and business angel investors. Start-ups that receive financial investment and become financially independent create globally well-known success stories, such as eBay, Amazon.com, Google or Facebook.

## **2. The role of Government in ecosystem**

One central stakeholder that can attempt to influence firms' development is government (Brooksbank 2008; Massey 2006; Tunčikienė, Drejeris 2015; Giriūnas, Mackevičius 2014). From the perspective of government, boosting economic development is one of the essential goals of every single government around the globe. In order to understand the need of governmental intervention in small and medium-sized enterprises, it was globally recognized that nearly 80% of economic growth in the world came from SMEs. In total 99% of all business in

North America and Europe belong to SMEs (Adam *et al.* 1999). However, SMEs do not all equally contribute to the growth of economies.

According to Birch (1987) and Acs (2008), the most significant contributions to the growth of economies are achieved by fast-growing firms, often referred as high-potential firms (Senyard *et al.* 2008). According to Shane (2009), within public funding more resources should be accorded to high-growth companies. In addition, Heirmand and Clarysse (2004) argue that governments take a stronger focus on supporting knowledge-intensive, research-based and high-technology-based start-ups. Such firms essentially contribute to bringing new technologies to the market (Chirstensen 1997). However, limited understanding remains surrounding how and which government programs and policies are most appropriate for supporting and promoting innovative and growth orientated start-ups (Audretsch 2004). Yet, not all governments struggle in understanding the most useful ways to support start-ups. According to Curran and Storey (2002), UK's government formatted direct government advice services and government subsidising existing sources of formal support in order to support new firms, to promote their growth in areas such as skills development in formal and non-formal educational institutions, obtaining resources, and identifying new business opportunities. Bennet and Robson (2003) identified areas where governments are able to support fresh businesses: business strategy, management organization, marketing and market research, public relations, product or service design, new technologies and computer services, personnel and recruitment, taxation, finance.

Governmental policies have increasingly focused on boosting entrepreneurship generally and firm growth-specifically (Huggins and Williams 2009; Mcquaid 2002). However, Bennet and Robson (2003) highlight, that as government provides business support equally to all firms, including competitors between each other, it is unlikely to provide them with resources that lead to ongoing competitive advantage. After understanding the need of support for small and new businesses, governments around the world developed various programs to contribute to the development of start-ups, e.g. the Small Business and Innovation Program in the USA, the Vinnova programs in Sweden, the Commercial Ready Program in Australia and the Multimedia Super Corridor in Malaysia (Kropp, Zolin 2005).

In general, less developed countries cannot afford the needed support for newly established firms. That is why the European Union prepared the JEREMIE Holding Fund (Joint European Resources for Micro to Medium Enterprises), which provides the opportunity for EU member states through their national or regional managing authorities to use part of their EU structural funds to finance small and medium-sized enterprises by means of equity, loans or guarantees. The JEREMIE Holding Fund provides various ways of support, such as guarantees, co-guarantees and counter guarantees, equity guarantees, loans, securitization, venture capital, Business Angel Matching Funds, and investments in technology transfer funds to financial intermediaries. As head of JEREMIE mandates & external vehicle Maria LEANDER states, this fund particularly provides the added-value in the lesser-developed regions, where there is the need for capacity-building initiatives and transfer of know-how between local institutions. For instance, Lithuania being held as one of the most promising countries within less-developed EU members, received the second biggest part of money provided by JEREMIE fund with the total 210 million of euros over 6 years starting from 2007 until 2013 (European Investment Fund 2007).

### **3. Research Methodology**

#### **3.1. Quantitative analysis**

The main objective of quantitative analysis was to find out what are the features of Lithuanian start-up companies, their CEOs' and start-ups' approach towards dimensions of the Lithuanian start-up ecosystem. The analysis is to help to identify characteristics of CEOs' start-up companies and to understand CEOs' approach towards dimensions of the Lithuanian start-up ecosystem regarding CEO gender; how start-up is funded; what is the location of start-up headquarter and the number of start-ups CEOs worked in before. It was decided to use a method of survey where most of the questions were closed-ended. However, to perceive an ingenious opinion from respondents about main pros and cons of the Lithuanian start-up ecosystem, open-ended questions were used. The collected close-ended answers were analysed with SPSS software, which helps to quickly and

beneficially process large amounts of data, while open-ended questions were analysed by highlighting main advantages and disadvantages stated by the respondents. The survey was conducted during a period of 3 weeks from the 10th of April 2014 to the 30th of April 2014. 63 CEOs fully completed the questionnaire. The survey was conducted online and the link was distributed directly via e-mail to respondents. The sample size reads 63, which was calculated using the formula provided below (Dikčius 2006):

$$n = \frac{p(1-p)}{\left(\frac{e}{z}\right)^2 + \frac{p(1-p)}{N}}$$

Variables in the formula stand for:

n – sample size

N – population size. According to the database of Lithuanian governmental institutions responsible for facilitating business development in Lithuania there are 170 start-up companies.

p – 0.5, as the proportion of population is not known.

e – Margin of error reads 8,5%.

z – z-score is 1,64 with 90% level of confidence.

The questionnaire was divided into three groups of questions: demographic, behavioural and scale questions. Firstly, respondents were asked to answer 8 demographic questions in order to understand the main characteristics of the CEO and features of the start-up company he/she is running. The first five questions were presented in order to find out the main characteristics of CEOs. Questions respectively starting from one to five were to identify CEOs' gender, age, educational background and the number of start-ups the CEOs had worked in before. The 1st, 3rd and 4th questions were composed using nominal scale, the 2nd and 5th – ordinal scale. The last three demographic questions were used to generalize the picture of start-ups that operate in the Lithuanian ecosystem. These questions included the number of team members in a start-up, the location of the main headquarters and the way start-up is funded. The 6th question was composed using ordinal scale, the 7th and 8th – nominal. The 9th question was formatted by using the ordinal scale, and was presented in order to understand the main reasons why an entrepreneur established a start-up. Questions 10-12 were developed by using the nominal scale to determine frequencies of CEOs' participation in start-ups-related events in Lithuania and foreign countries as well as to see the frequency of CEOs' communication within start-up community members. Questions 13-21 were developed using a seven-point Likert scale (one meaning 'strongly disagree', seven meaning 'strongly agree' and four - neutral); the chosen variables were provided to evaluate each start-up ecosystem's dimension. These statements were:

1. A great team is more important than a great idea.
2. Working in co-working spaces (Rupert, Innobase, HUB, others) are more beneficial than working alone.
3. Participation in different events for start-ups is beneficial for its development.
4. Participation in accelerators' programs (StartupHighway, Startup.lt, others) are beneficial for start-up development.
5. I am aware of possibilities to raise funding from investors (VC and Angels) in Lithuania.
6. I am familiar with possibilities to raise money using crow-funding platforms.
7. The preparation of start-up talents in educational institutions is satisfying needs of the market.
8. The Lithuanian mass community generally knows about start-ups.
9. Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing development of the Lithuanian Start-up Ecosystem.

Finally, questions 22 & 23 were open-ended to identify the main advantages and disadvantages of the Lithuanian start-up ecosystem from the perspective of each CEO.

### 3.2. Qualitative analysis

Using a qualitative research method, it was intended to find out how and why dimensions of the Lithuanian start-up ecosystem influence the development of a start-up company from the perspective of experts as well as to compare their opinion regarding essential issues in the start-up ecosystem (the role of a team in a start-up company; the preparation of start-up talents in Lithuania; the importance of external stakeholders' network, of external financing for a start-up, and of involvement in the ecosystem). A qualitative approach is appropriate to use in organizational research when the goal is to better understand complex issues and processes that would not be apparent in survey responses. Detailed qualitative data can only be obtained by getting physically and psychologically closer to the phenomenon through in-depth interviews. This conclusion was also confirmed after reviewing other studies made on the start-up ecosystem-related dimensions. In order to identify 'how' and 'why' the main dimensions of ecosystem influence the development of a start-up company, a semi-structured interview was developed.

This method is flexible, because there is always the possibility to change questions according the flow of interview and adapt to a situation. The questionnaire, prepared in advance, was used to collect the necessary data from respondents. However, respondents could talk freely and add anything they want to their answers without any interruption, and their anonymity was ensured. Experts were chosen with non-probability convenience sampling method. The main advantage of this method is an easier access and availability compared to probability sampling methods. Since, the amount of successful start-ups in the Lithuanian ecosystem is relatively small, a small sample was used: 5 experts were enough to represent successful start-ups in Lithuania. An expert is a status that is given to person by a researcher, according to the field of a study. An expert has a lot of knowledge and experience in the field, which is not available for everybody, he/she is able to share it and contribute to a study. He is the main source of information. Experts were chosen by several categories:

1. Experts are CEO's (Chief Executive Officers) of start-ups.
2. Experts have at least 4 years of experience in start-up ecosystems.
3. Experts have at least a Bachelor degree.

Five respondents, matching requirements of the expertise, were interviewed over a period of ten days, from 10th of April 2014 to 20th of April 2014. Two experts were questioned via email and three experts were asked to participate in face-to-face interviews.

The questionnaire contained 20 questions. All questions were open-ended in order to let experts talk freely and express their opinion as much as they wanted. Questions were provided in chronological order touching on all dimensions of a start-up ecosystem. The length of an interview was 20-50 minutes. Comparative analysis was used in order to summarize and compare results. The main goal of this type of analysis is to evaluate respondent's perception on the topic, according to his/her experience.

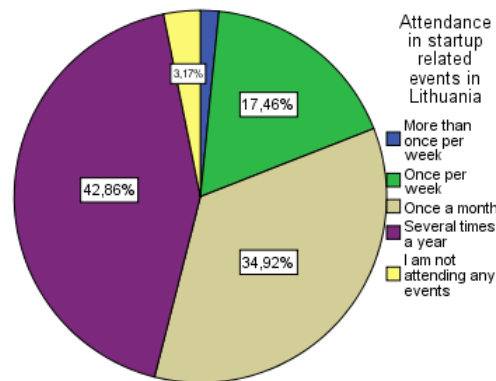
### 4. Results: Effects of the start-up ecosystem on the development of Lithuanian start-ups

To better interpret results of the present study, first of all the demographic data is explained. 82,5% of all start-ups' CEOs were males and 17,5% were females (the total number reads 63 respondents). Most of the CEOs belonged to the 28 to 30 year age range with 30,16% (n=19). Another two significant distribution groups referred to respondents of the age of 25-27 years with 23,81% (n=15), respondents belonging to the age group of 30 years and older (23,81%; n=15). 14,29% (n=9) of all correspondents were between 22 and 24 years old, while the rest of CEOs declared belonging to the 18-21 years age interval with 7,94% (n=5). The biggest part of all respondents had business or economics-based educational background 33,3% (n=21), following by IT & programming – 25,4% (n=16) and art, design and architecture – 15,9% (n=10). Other educational backgrounds that were stated by correspondents were engineering, law, computer science (respectively making 9,5% (n=6), 4,8% (n=3), 3,2% (n=2) and 7,9% (n=5)). 58,7% (n=37) of all respondents marked that it is their first start-up company, while 12% (n=8) stated that they had worked in 1 start-up company before. 20,6% (n=13) of all CEOs

had participated in 2 start-ups before becoming CEOs in the current company and 7.9% (n=5) of respondents indicated that they worked in 3 start-ups before. None of respondents marked that they had worked in 4 or more start-ups before.

While summarising respondents' individual characteristics it gets clearer that a typical start-up CEO is a male from the age interval of 28-30 years, who has an educational degree in the fields of business and/or economics or IT & programming and it is his first start-up where he is CEO. Out of 63 respondents, 54% (n=34) marked Vilnius as the location of their main headquarters. Other locations were in Kaunas, Klaipėda, Šiauliai, other Lithuanian cities and foreign countries, respectively reading 20,6% (n=13), 9.5% (n=6), 3.2% (n=2), 4.8% (n=3) and 7.9% (n=5) of total respondents. Answers regarding the number of team members a CEO has in his/her start-up company, 41.3% (n=26) of all respondents stated having from 1 to 3 employees; 36.5% (n=23) had from 4 to 7 team members; 12.7% (n=8) had from 8 to 11 employees and 9.5% (n=6) possessed more than 12 employees in their team. According to the survey, 60,3% (n=38) of all respondents noted that their start-up company was self-funded, the second most marked way of funding with 22.2% (n=14) was seed round/angel investment, while 7.9% (n=5) noted other funding ways; 6.3% (n=4) stated that they were funded by series 'A' and only 3.2% (n=2) indicated crowd-funded as their means of funding. A typical start-up company, according to observed characteristics, is located in Vilnius city, has from 1 to 7 members, and is self-funded.

A further analysis was carried out to understand general tendencies of start-up CEOs' participation in start-up related events and communication within the start-up network. Many respondents, 42,9% (n=27), stated that they attended start-up related events in Lithuania several times a year, while a bit lesser part of CEOs, 34,9% (n=22), noted that they participated in events once a month. 17,5% (n=11) of all respondents indicated that they took part in start-up related events once per week. Only 1,6% (n=1) mentioned that they participated more than once per week; 3,2% (n=2) claimed that they did not attend any start-up related events at all. Results are visible in the Figure below. According to the Pearson chi-square test it appears that there is a significant difference among CEOs whose start-up is located in different cities and attendance in start-up related events in Lithuania, because Sig. (2-tailed) = 0.006 and is less than 0.10. In addition, according to the same Pearson chi-square test, SPSS results showed that there was a significant difference among CEOs whose start-up was funded in a specific way and attendance in start-up related events in Lithuania, because Sig. (2-tailed) = 0.078 and is less than 0.10.

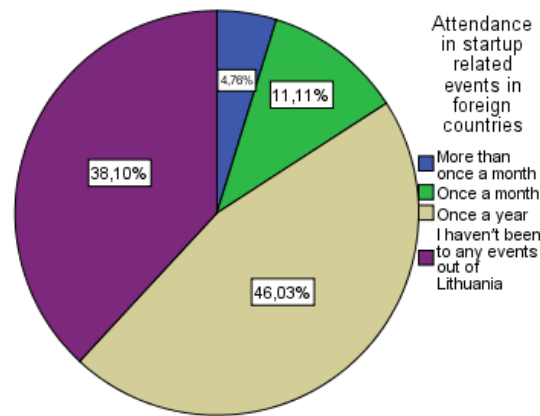


**Fig 2.** Division of respondents, based on the attendance in start-up related events in Lithuania

*Source: prepared by authors, according to research results*

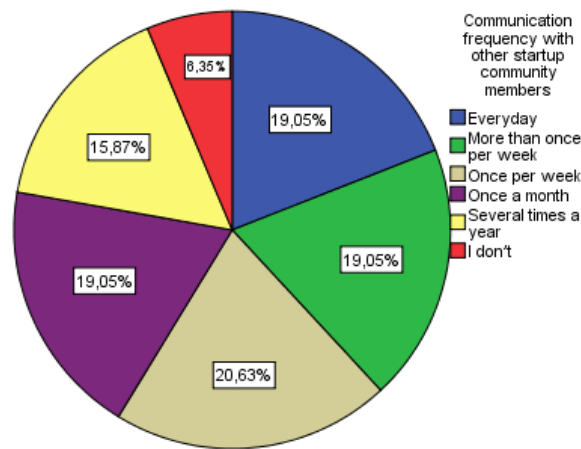
The analysis of participation in start-up related events in foreign countries shows that the biggest part of respondents, 46% (n=29), attend events in foreign countries once a year, while 38.1% (n=24) mentioned that they hadn't been to any start-up events outside Lithuania. A smaller group of respondents attended start-up events in foreign countries once a month – 11.1% (n=7) and, surprisingly, 4.8% (n=3) of all respondents stated, that they attended start-up related events more than once a month. Results are presented in the Figure 3. Furthermore, while using the Pearson chi-square test, results showed that there was a significant difference

regarding the attendance in start-up related events in foreign countries, based on the way CEOs start-ups were funded, because Sig. (2-tailed) = 0.013 and is lower than 0.10. In addition the Pearson chi-square test indicates that there is a significant difference among CEOs gender regarding the attendance in start-up related events in foreign country, because Sig. (2-tailed) = 0.062 and is lower than 0.10.



**Fig 3.** Division of respondents, based on the attendance in start-up related events in foreign countries  
*Source: prepared by authors, according to research results*

Apart from the understanding of start-up CEOs' intentions to participate in start-up related events, there is the need to understand the frequency of communication within start-up community members in order to find the coherence of the start-up network. There was no significant consensus among CEOs' choices. However, the biggest part, 20.6% (n=13), claimed that they communicated with other start-ups once per week, three sections – 'everyday', 'more than once per week' and 'once a month' were selected equally by 19% (n=12) respondents each. Less active members of the Lithuanian start-up community, 15.9% (n=10), marked that they communicated only several times a year, while only 6.3% (n=4) claimed that they did not communicate with other members at all. Results are visible in the Figure 4.



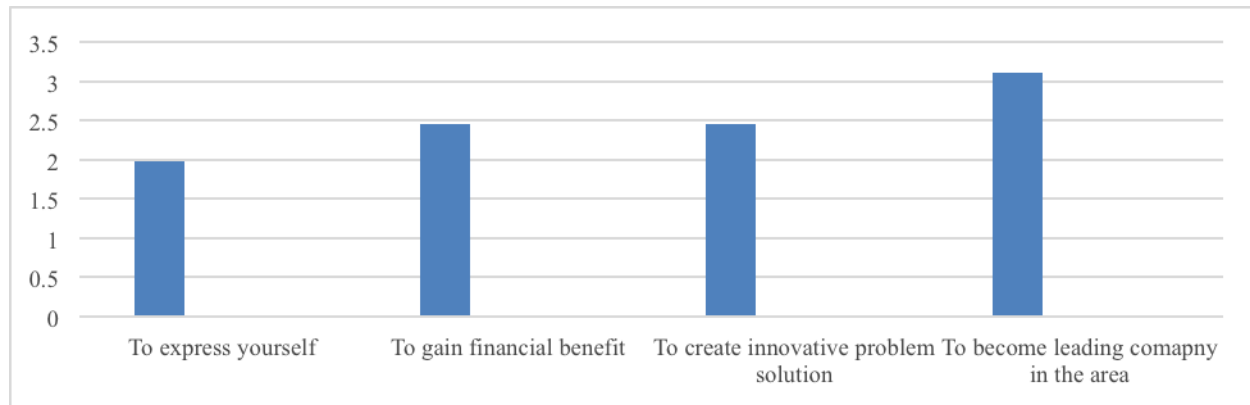
**Fig 4.** Division of respondents, based on the communication frequency with other star-up community members  
*Source: prepared by authors, according to research results*

According to the gathered and analysed data, there is a tendency among start-ups' CEOs to participate in start-up related events in Lithuania more frequently than several times per year. While taking higher costs of participating in start-up-related events abroad into account, the tendency to participate is slightly lower. However, more than half of all respondents tend to visit events outside Lithuania. Looking into the need of



communication with other start-up community members, it is safe to say, that only an insignificant part of CEOs tend to not communicate with other members, while more than 80% of all respondents support the need of communication with other start-up community members.

The further analysis was taken into consideration to perceive respondents' decision to establish a start-up company. The figure 5 represents motives of CEOs to start a company by their mean rank. The most popular reason of establishing company among CEOs was 'to create an innovative problem solution' with the highest average rank of 1.97. 'To express themselves' and 'to get financial benefits' were selected equally with the same average rank of 2.46. The least important motive for CEOs was 'to become a leading company in the area' with the average rank of 3.11.



**Fig 5.** Average ranks of motives to establish a start-up company

*Source: prepared by authors, according to research results*

The 7-point Likert scale was used in order to measure the respondents' opinion about main fields of the start-up ecosystem. As the observation shows, respondents' opinions matched statements: 'A great team is more important than a great idea' and 'Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing the development of the Lithuanian Start-up Ecosystem' where the means were 5.68 and 5.67 respectively. Furthermore, there was a general tendency among respondents regarding statements 'The development of start-up talents in educational institutions is satisfying the needs of the market' and 'the Lithuanian mass-community generally knows about start-ups', where the means read 3.00 and 3.49 respectively. According to the previously defined 7-point Likert scale's notations, where one stands for 'totally disagree' and seven for 'totally agree', respondents highlighted two main existing problems of the Lithuanian start-up ecosystem (Table 1).

**Table 1.** The means of statements to define the Lithuanian start-up ecosystem

Statement	Mean
A great team is more important than a great idea.	5,68
Working in co-working spaces (Rupert, Innobase, HUB, others) are more beneficial than working alone.	4,60
Participation in different events for start-ups is beneficial for start-up development	5,17
Participation in accelerators' programs (StartupHighway, Startup.It, others) is beneficial for start-up development	5,22
I am aware of possibilities to raise funds from investors (VC and Angels) in Lithuania.	5,13
I am familiar with possibilities to raise money using crow-funding platforms.	4,78
The preparation of start-up talents in educational institutions is satisfying needs of the market.	3,00
The Lithuanian mass-community generally knows about start-ups.	3,49
Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing the development of the Lithuanian Start-up Ecosystem	5,67

*Source: prepared by authors, according to research results*

The Spearman Test was applied in order to see possible correlations between the number of previous experiences of CEOs, while taking part in different start-ups, and different statements about the Lithuanian start-up ecosystem. The Spearman Test showed there was a weak negative correlation between the statement 'Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing the development of the Lithuanian Start-up Ecosystem' and the number of start-ups a CEO worked in before, because Sig. (2-tailed) was =0.057, which is less than 0.10. The correlation coefficient was = -0.241. In line with one-way ANOVA test, 4 tests were implemented as following: Bonferroni, Scheffe, Dunnett's T3 and Games-Howell. However, they showed that there were no differences regarding the number of start-ups a CEO worked in before and all the statements. Consequently, it is assumed that CEOs who worked in more than one start-up have less positive attitude regarding Lithuanian governmental institutions.

In later stages of the study it was intended to identify if there were any significant differences among CEOs' opinions about provided statements, according to the type of funding for their start-ups. The Pearson Chi-square test was implemented to check the difference. According to SPSS calculations there were no significant differences among the funding type of a start-up and opinions regarding all the statements. However, there was the need to implement Kendall tau-B correlation test, in order to see if there is any correlation within statements defining the Lithuanian start-up ecosystem's dynamics. The ranking data was transformed into ordinal data to be able to imply the correlation test.

As Kendall tau-B test showed there was a weak positive correlation between statements 'Great team is more important than a great idea' and statements respectively 'Participation in different events for start-ups is beneficial for its development', 'Participation in accelerators' programs (StartupHighway, Startup.lt, others) are beneficial for start-up development' and 'Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) positively influence the development of the Lithuanian Start-up Ecosystem', because Sig. (2-tailed) were respectively =0.037; =0.026 and =0.019 which are less than 0.10. Correlation coefficients were =0.264; =0.281 and =0.295. In addition, there was a medium positive correlation within statements 'A great team is more important than a great idea' and 'Working in co-working spaces (Rupert, Innobase, HUB, others) are more beneficial than working alone', because Sig. (2-tailed) was =0.00002 which are less than 0.10. The correlation coefficients was =0.556. It can be stated that CEOs who promoted the team's value more than a great idea were more positively disposed towards participation in start-up related events, acceleration programs, and especially appreciated the ability to work in co-working spaces.

When another statement 'Working in co-working spaces (Rupert, Innobase, HUB, others) is more beneficial than working alone' was correlated with the rest of statements by using Kendall Tau-b test, it was observed, that there was a weak positive correlation with statements 'Participation in different events for start-ups is beneficial for its development'; 'Participation in accelerators' programs (StartupHighway, Startup.lt, others) is beneficial for start-up development' and 'Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing the development of Lithuanian Start-up Ecosystem', because Sig. (2-tailed) were respectively =0.52; =0.017 and =0.005 which were lower than 0.10. Correlation coefficients were accordingly =0.246; =0.300 and =0.351. From this observation it is possible to say, that CEOs, who admire co-working abilities more, are positive-minded towards the participation in start-up related events and governmental institutions. In addition, it was observed that CEOs, who admire the collaboration more, have negative perceptions towards the statement that 'the Lithuanian mass-community is familiar with start-ups', because Kendall Tau-b test proved, that there was a weak negative correlation with these two statements, because Sig. (2-tailed) was =0.020, which is lower than 0.10 and the correlation coefficient was = -0.292.

Furthermore, the statement 'Participation in accelerators' programs (StartupHighway, Startup.lt, others) is beneficial for start-ups' development' had a weak positive correlation with statements 'I am aware of possibilities to raise funding from investors (VC and Angels) in Lithuania' and 'Governmental institutions (Enterprise Lithuania, Invest Lithuania, others) are positively influencing the development of Lithuanian Start-up Ecosystem', because Sig. (2-tailed) were respectively =0.035 and =0.003, which is less than 0.10. Correlation coefficients were =0.266 and =0.372. This observation leads to the conclusion that CEOs, who are participating in accelerators' programs, tend to know more about abilities to raise funds in Lithuania and admire the work

which is done by Lithuanian governmental institutions. Having all correlation tests done, it was necessary to check all the statements, which did not have any correlation, if they were significantly different. After doing one-way ANOVA test, 4 tests were implemented as following: Bonferroni, Scheffe, Dunnett's T3 and Games-Howell. Yet, no significant differences were detected regarding the statements.

Finally, respondents were asked to answer open-ended questions about main advantages and disadvantages of the Lithuanian start-up ecosystem. More than half (52%) of respondents provided answers and brought up some interesting insights about the ecosystem. First of all, 18 respondents pointed out that it is 'cheap' to work in Lithuania. The word 'cheap' was used in terms of labour cost, taxes and other business and living-related costs. Moreover, 6 respondents were satisfied with the quality of labour and claimed that although comparatively 'cheap' Lithuanians are skilled and hardworking. Also, the growth and development of the ecosystem was seen as an advantage, respondents noted the growing number of start-up-related events and their quality, good business conditions and atmosphere, where collaboration and help to each other was seen as a priority according to 7 respondents.

The geographical location, size of the country was evaluated controversially: 7 respondents considered it as an advantage (ease of travelling, close ties to other European Union members, easy to communicate with other ecosystem members not only online, but face-to-face as well). Furthermore, the small size of the country makes it a good place to test a product (5 respondents). For example, Vinted (former manodrabužiai.lt) has been developing their product and testing it in Lithuania for 5 years. After they developed a product, its' monetization model and understanding of who were their targeted customers helped Vinted launch their platform in 6 other countries, such as United Kingdom, USA and Germany. Other 5 respondents saw a small size of a country as negative factor, because of a small number of potential customers 'in-house'.

The lack of experience in the field of technology and especially in hardware technologies, small networks of experts and mentors were some of the mentioned disadvantages. Six respondents claimed that the labour market was not skilled enough: they faced a lack of good marketing specialists, IT developers. Two respondents noted that there was a lack of IT specialists with broader skills and knowledge. Although the collaboration among other start-ups or mentors was positively evaluated, three respondents said that corporations in Lithuania did not engage small start-up companies. The governmental role in ecosystems was evaluated both positively and negatively. Some stated that there was a lack of support for young entrepreneurs and their businesses, while others disagreed and upraised the benefits that it brought to the community.

### **The influence of dimensions of the Lithuanian start-up ecosystem on the development of a start-up company**

The second part of the research is a qualitative analysis, based on the model of dimensions of the Start-up ecosystem. The discussion is centred on: the role of a start-up team and the development of talents; benefits of intermediary organizations, such as incubators and accelerators; the collaboration between corporations, start-ups and educational institutions; the importance of external financing and the influence of governmental organizations; the development of the Lithuanian ecosystem.

### **The role of teams in a start-up company**

According to qualitative research results on the dynamics and development conditions of start-up companies within the Lithuanian start-up ecosystem, a team plays an essential role in the development of a start-up company. According to experts, three to four people are an optimal number for a start-up company in the early development stage. They should have complementing skills and personalities: as one of the experts stated, if there were three co-founders in a start-up, one should be a leader with good entrepreneurial, managerial and organizational skills, second one with the expertise in information and communication (or other) technologies, and the third one should have the expertise in the design, marketing area. Moreover, all five respondents noted that teams for current start-ups emerged from previous projects, businesses or other previous experience together. The team members that had faced difficult situations before could trust each other and work on new

ideas. What is more, all respondents agreed that without such a team, even a very good idea was not worth anything, admitting the fact that the initial idea had changed and developed a lot. Start-up companies are working under conditions of high uncertainty. To serve the future development and start-up growth, the number of team members usually increases. All respondents plan the expansion of teams in the period of one year or have already recently hired someone.

One respondent, who recently expanded the team beyond three male co-founders, hired two programmers and a female with a strong marketing background. He specifically looked for a female employee in order to start leveraging the gender ratio in his team. He explained that generally females have a different view on things than males: females are better in terms of social skills, they foster team relationships insensibly. In addition to that, females tend to have better communicational, organizational skills, so the role in marketing, sales and public relations fits better the organization.

Another respondent is planning to hire a marketing specialist in the period of one month and also considers hiring female because of their characteristics described above. Overall, respondents admit that the number of females in the technology industry is too small. First of all, females lack the knowledge about technology and start-ups more than men and they are generally less interested in the field. Second, there is a common understanding that females are not capable of working as information technology specialists. Due to these reasons just a small number of females decide to study information and communication technologies and even smaller numbers work in this sector. As one respondent (female CEO) admitted 'the 100% rate of female co-founders was truly an exception' in a start-up company. Currently, her start-up has 19 people and apart from three female co-founders, the rest of the team consists of 50% males and 50% females. She claims that the variety of genders in a team makes the best practice, and the rest of the experts confirm this opinion.

### **Development of start-up talents in Lithuania**

According to research results, the lack of skilled females is not the only problem of Lithuanian start-ups. All respondents agreed that overall the development of talented people in educational institutions does not meet the demands of the industry. 3 CEOs claimed that the preparation of information technology specialists was outdated and not sufficient. As one of them explained, this problem could be solved by the higher collaboration between educational institutions and businesses.

Taking into consideration the fact that educational programs are not flexible and easy to update, businesses could bring the knowledge and practical skills that are up-to-date and relevant. However, as one of the experts observed, there was no consistent strategy for such kind of collaboration. Although, they had been involved in numerous of events and projects that took place in schools or higher education institutions and had shared experience in non-formal events, most of them were one-time events. The respondent noted that such projects as business days in universities, where experts were gathered to share their experience, should be seen just as a first step towards the collaboration between business and educational institutions: 'it was not enough to present success story in 45 minutes presentation, students should be involved in building that success story'.

Another expert added to this idea: 'Educational programs should be directly linked to businesses, were students would have real tasks and projects to implement during the period of studies'. He admitted that it could bring mutual benefits for both students and companies. On the one hand, students would have a possibility to get the inside knowledge of businesses, no matter on what kind of projects they would be working: programming a product or creating marketing plan for it. On the other hand, businesses would get some tasks executed, they could get fresh, new ideas, opinions from students and potentially grow their future employees' base. This collaboration should be encouraged not only during formal internships, but throughout the whole period of studies. Start-up companies could be seen as a good option: the average age of team members is up to 30 years old, so communication is easier; also, there is a lot of freedom and potential to use the creativity of students. As a result, after finishing their studies, students would have tried themselves in different areas, would become more attractive for employers or would be more encouraged to start their own businesses.

## The importance of external experts' networks

Based on research results on the dynamics and development conditions of a start-up company within the Lithuanian start-up ecosystem, even if a team of a start-up is highly educated, the importance of constant learning is prominent. Compared to traditional businesses, start-up companies are working in the field of high uncertainty: in the beginning they do not know many things, starting from a product they are going to offer, finishing with their monetization plan. Moreover, the industry of technologies is rapidly changing, so external experts can help to define and mentor some activities and projects. According to respondents, these experts can be reached in accelerator programs. There are two accelerators in Lithuania: StartupHighway and Startup.lt. According to respondents, accelerators can bring tangible benefits to the development of a start-up company: within a short period of time (usually 2-3 months) a start-up company receives feedback and help from experts in different fields. They critically evaluate ideas, ask uncomfortable questions and help to develop or to kill ideas. One respondent, who participated in the StartupHighway program, stated: 'it accelerates your idea to success or to death in 3 months and that is good, because you do not want to waste 2 years thinking about that idea'.

Another respondent is considering applying for the accelerator's program mainly because of the knowledge, networks and financial support. In Lithuania, as in other countries, accelerators do not only provide the help of mentors, but also support start-up activities financially. For example, the Lithuanian accelerator StartupHighway gives up to €14,000 to each start-up in a program. In exchange for financial support and mentorship, a start-up company gives 7,5 % of their equity. One of the reasons why accelerators put so much effort into helping in start-up development is their interest in financial gains.

Nevertheless, 2 respondents note that the network of mentors in Lithuania is not developed enough and there is a lack of experts in certain areas. One of them remarks, there are no gaming industry professionals in Lithuania. Due to that reason, the start-up had to look for other opportunities provided by foreign accelerators with a wider network of mentors. Compared to the experience of these countries in formal educational institutions, it was the most efficient way to learn and develop their idea. Moreover, according to another respondent, accelerators are useful for those, who are first time entrepreneurs and do not have an established network of connections. Summing up, the external help for the start-up development is very important. For first-time start-ups, the most convenient way to receive mentorship is through accelerators, but the more advanced is the team of a start-up, the bigger network of experts it has (they are easy to reach without actual participation in the program).

## The importance of external financing for a start-up company

Based on the research on the dynamics and development conditions of start-up companies there is a natural order in terms of start-up financing. At first, start-ups are being financed by personal capital of co-founders or their friends and relatives; only when there is the need for external financing the upcoming stages are (pre-seed), seed, series 'A', series 'B' and etc. The summary of results is provided in the Table 2:

**Table 2.** Flow of financing in a start-up company in the Lithuanian Start-up Ecosystem

	Early stage	Pre-seed	Seed	Series A	Series B; C; D
Personal capital	X	X			
Accelerators		X	X		
Lithuanian business angels		X	X		
Lithuanian venture capitalists			X	X	
Foreign business angels			X		
Foreign venture capitalists			X	X	X

*Source: prepared by authors, according to research results*

The decision to either raise external finances or remain self-funded depends on the type of product and financial capabilities of co-founders. Three out of five start-ups are financed by personal capital while the other two have risen external funding. Three start-ups are considering raising capital from business angels or smaller size

venture capital fund (VC) and have already started looking for potential investors in Lithuania and abroad. In their cases, investment is necessary for the further development of a product: the prototype is already created, but a final product and other additional development and marketing efforts cannot be covered by personal funds.

Another start-up has considered raising money from venture capitalists, but angels or partner investments for their business model seem to be more appropriate: venture capitalists are looking for a high return rate, while partners or business angels are more likely to invest because of an idea itself. Two start-ups have already raised external financing. One received pre-seed investment from an accelerator and seed stage investment from a Lithuanian venture capital fund. In addition to that, the series 'A' round is planned to be raised in the period of one year. However, the respondent admits that Lithuanian venture capitalists are able to fund start-ups up to the series 'A' or participate in series 'A' funding together with foreign VC. Most of the Lithuanian venture capital is provided by the European Union initiative JEREMIE, and only one fund is backed by the private capital. Foreign venture capital funds accumulate more capital, so they are more attractive for start-ups, compared to Lithuanian VC funds.

In addition to that, another respondent emphasizes the importance of choosing the right investor. Investors are looking for medium to long-term investment returns and, in exchange for financial support, they get a part of a company's equity. Therefore, strong mutual relations have to be built among these two parties. First of all, it is important to like each other, because during the time a start-up gets investment, it also gets a new team member with decision-making power. Secondly, an investor should be an expert in the field of specific start-ups. This way he/she can truly help in the development process and, on top of that, he/she might have a network of other experts at hand. In the case of this respondent, Lithuanian venture capitalists are not advanced in the field of gaming: they do not know how to evaluate the product and do not have in-depth knowledge about the industry. Due to this reason, this start-up company would not consider raising investment from Lithuanian venture capitalists.

Summing up, the decision to have external financing for the company requires a lot of consideration and commitment. Experts agreed that if a company was capable of working and growing without, it should not consider external financing. Once the decision is made, an investor should be chosen not only according to the financial status, but also according to the expertise in the field and personality.

### **The importance of involvement in the ecosystem**

Overall, results of the study show that start-up companies are active or semi-active ecosystem members and interact with other start-ups or other ecosystem members, participate in different events and projects in order to build a network of connections, gain new knowledge and practice their skills. As one of the respondents notes: 'I am sure my involvement brings a very direct result in my start-up activities, both because of 'know-how' I gain from other members and due to finding resources, partners, financial opportunities, press attention'. CEOs that are located in Vilnius receive more advantages from the ecosystem and are more likely to participate in the community's life, because most of events are being organised in the capital city.

Although two experts are working in other cities of Lithuania, they attend at least several events per year in Vilnius. Another respondent admits: 'now, we see a higher need to participate in such kind of events, because this is the way to get an important knowledge and practice: how to pitch an idea, how to raise investment'. Many of those events are organised by governmental and non-governmental organisations, different initiatives. One of them, Enterprise Lithuania, plays an important role in the Lithuanian Start-up Ecosystem. Experts agree that it contributes to the ecosystem by encouraging establishment of new start-ups, supporting the development of already existing companies, by gathering the start-up community together and building the network in foreign countries. Although, as one of the experts admits, it is hard to measure the importance of this contribution, as it is a long-term process.

Finally, according to respondents, the Lithuanian start-up ecosystem has been developing noticeably during the recent 5 years: start-ups are being established, networks of mentors and experts in the field are expanding. Start-

up companies are working in different industries; creating different products for different customers, so there is no direct competition among each other. In addition to that, it is easy to get in touch with each other and as one of the respondents added: 'you do not get lost among 1000 start-ups'. However, respondents admit, that some of the dimensions in the ecosystem are underdeveloped. For example, the talent development in educational institutions lacks experts in some specific industries and the overall mass-community knowledge about start-ups and start-up-related issues. Taking into consideration the potential that Lithuanian start-up ecosystem has, these issues should be tackled with efforts of all ecosystem members.

## **Conclusions and recommendations**

Relying on the model of start-up ecosystem dimensions, developed by authors in order to summarize the main scientific insights and research regarding the dynamics of start-up ecosystems, a start-up ecosystem is a set of internal and external dimensions (internal – start-up, employees, community network; external – events, programs, investment funds, educational institutions, job centres, society and governmental institutions) which, in one way or another, contribute/ may contribute to the development of a start-up company. Entrepreneurs and people related to business should be able to detect the essence and the need of a healthy ecosystem with all the dimensions that affect ecosystems and how these dimensions could be developed in the future. The most appropriate way to efficiently analyse dimensions of start-up ecosystems' dimensions is by using the triangulation method while combining qualitative and quantitative research methods.

The analysis of research results led to the understanding of specific concerns related to the Lithuanian start-up ecosystem and raised proper conclusions and recommendations. The Lithuanian start-up ecosystem is in the early stage of development, so naturally it has been following well-developed ecosystems around the globe. Based on leading start-up ecosystems in the world, the start-up failure rate is lower in 'healthy' ecosystems, due to the fact that more advanced members of ecosystems, such as mentors, academics, venture capitalists and others, are positively influencing start-up companies.

Teams in a start-up have a significant impact on the development of ideas. According to qualitative research results, there are several key characteristics of start-up teams: there should be at least one leader in a team; a co-founding team has complementing skills and a solid value system, which can be based on the previous experience; gender diversity in teams leads to a more efficient performance. However, the research results showed that there was a lack of females in technology-based start-ups. Females could be attracted to technology-based businesses by renewing the image of technology industry as being innovative and diverse; by creating projects, where female entrepreneurs of this sector would share their experience; by encouraging females to choose studies related to technology sciences.

76% of start-ups are founded by young entrepreneurs who are younger than 30 years old, with an educational background of business or information technologies. Based on the research results, none of respondents have studied life sciences. Global trends show that the number of biotechnology, nanotechnology, clean-tech start-ups is increasing. Life-science-based start-ups could be encouraged with special programs and events, such as 'Life Sciences Baltics', building long-term cooperation strategies within higher education institutions (common projects for students from life sciences and business studies) and educational institutions and business companies. The research revealed that external mentorship had a sufficient influence on a start-up development. Accelerating programs create favourable conditions, where start-ups receive consultations from professionals, working space and possibilities to 'knit ties' with other community members. However, there is a lack of specialists in certain areas. In order to ensure higher added-value and the quality of Lithuanian accelerators, foreign experts should be involved in the process. Seminars and training should be organized in order to bring 'know-how' of developed start-up ecosystems to Lithuania.

Despite the fact that start-up CEOs are familiar with ways to receive funding from investors, venture capitalists and business angels, there is the lack of enumerated investors in Lithuania, who could help transform perspective ideas into realization. One of the ways to eliminate the gap is to attract foreign investors by doing start-up-related fairs and workshops. Another way to raise funds for start-ups is to spread their existence and essence of

their existence to the mass-community, where more people would consider the ability to invest their money into promising businesses and possibly to receive high returns on investment while using crowd funding platforms.

The analysis showed that the Lithuanian mass-community is not aware about start-up companies. This leads to the explanation why the growth of the Lithuanian start-up ecosystem is not reaching the potential it has. The mass-community could be introduced to this field by several methods: sharing success stories of Lithuanian start-ups in media; creating events for the mass-community, such as the technology conference 'Login', creating smaller-scale events and seminars for students in high schools and higher educational institutions. The present research raised issue surrounding the need for further analysis about start-up ecosystems, as the image of dimensions of start-up ecosystems and its role on development of a start-up company is still very fragmented and lacking conceptual models and integrative arguments.

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