Entrepreneurial Ecosystem influence through the Start-up life cycle

a comparative study between Delft and Vilnius

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EXECUTIVE SUMMARY

An entrepreneurial ecosystem has become a paradigm between policy makers, regional developers as well as profit seeking organizations to spur start-up establishment and growth rates. Numerous studies have focused on conceptualization of an entrepreneurial ecosystem and the potential benefits that may be accrued regionally by effectively developing a bedrock for start-ups – a yet another Silicon Valley. Nevertheless, on a firm-level the actual support a start-up receives from an entrepreneurial ecosystem may look completely different than it was expected from the facilitators point of view. The complex nature of conjoining a firm-level approach with a macro-level concept becomes even more detailed when regional context is considered in order to realistically asses the entrepreneurial ecosystem influence on start-up life cycle. This study is one of the first to compare two technically oriented regions, to find insights into intricate relationship between entrepreneurial supportive ecosystem and start-up growth from firm-level point of view. The data for this study was collected in Delft, The Netherlands, and Vilnius, Lithuania, to see the effect of these entrepreneurial supportive ecosystems when contextual factors are taken into consideration.

A literature review was conducted to understand the macro-level perspective of an entrepreneurial ecosystem and the firm-level critical junctures during the development process of these high-tech start-ups. The entrepreneurial ecosystem conceptualized the phenomenon in multiple ways, so a compiled model was created to highlight the most important support factors – financial, market, infrastructural, legal, network, coaching & mentoring. Start-up life cycle literature showed numerous perspectives that can be taken as a foundation to study firm-level behaviour. Considering the differences between these models, scope of the study and the qualities of the regions in focus, a simplified start-up life cycle model is presented, which considers the most important critical junctures. The inclusion of presumable contextual differences in these regions, lead to the development of a conceptual model depicting interaction between entrepreneurial ecosystem, its context and start-up life cycle.

The literature on venture creation has been churned to describe key business activities at every start-up stage and validated by experts. These activities were used as the main variables to develop a survey in order to gauge inhabitant start-up perceptions. 18 respondents from Delft and 16 respondents from Vilnius have showed different business activity and ecosystem support evaluations. Through desk research, the contextual dimensions of Delft and Vilnius were discussed in detail and used to interpret occurring phenomena. An independent T-test, a correlation analysis and mean ranking were used to analyse the data and support conclusive remarks.

It was found that start-ups in Vilnius mostly occupy IT Service, Fintech and Hardware industries, while Delft start-ups operate in deep-tech/high-tech, hardware and Med-Tech industries. These differences in combination with contextual interpretations explain some of the differences occurring in entrepreneurial ecosystem support evaluations.

Vilnius is inhabited by more start-ups that are in later stages of growth than Delft is. Such difference has an effect on perceived importance of key business activities and entrepreneurial ecosystem support in later stages.

Furthermore, the results show that the entrepreneurial ecosystem is most supportive in the early stages of start-up growth with diminishing effects on later stages. The key business activities that start-ups in both regions considered important are very similar overall growth stages. Raising financing capital has been found to be highly supported by entrepreneurial ecosystems in both regions, even though start-ups did not perceive this activity as very important in neither of growth stages. Research and Development support in both regions was perceived as average from founders in both regions. Considering that Delft bolsters a high-quality university which should induce R&D activities, the support is cancelled out by the differences in occupied industries and their respective competitiveness. This means that more R&D support is needed for start-ups in Delft. Moreover, legal support has been found to be higher in Delft and attributed to a more robust regulatory system in The Netherlands.

Lastly, it was found that considering important business activities at growth stages, start-ups mostly rely on internal capabilities to grow in later stages. The ecosystem support was found to be focused on capabilities that require external resources, or external capabilities, explaining the decline in effective entrepreneurial ecosystem support in later stages. Thus, entrepreneurial ecosystem support facilitators should consider the start-up requirements for internal capabilities and shift their support for later stage start-ups towards enhancing internal capabilities.

This thesis report contributes to paving way for the conjunction of entrepreneurial ecosystem and start-up life cycle academic research field using a firm-level and holistic approaches. The study and its results should provide insights for entrepreneurial ecosystem facilitators, such as incubators or accelerators, and start-up founders alike. Entrepreneurial ecosystem support strength changes from early to latter stages shows facilitators the need to closely study start-up requirements to navigate stage-contingent critical junctures in order to provide effective support. Founders should gain insight into the important key business activities to overcome stage-contingent barriers and the entrepreneurial ecosystem support they may rely on at any growth stage.

Keywords: *Entrepreneurial Ecosystem, Start-up Life Cycle, Start-up Growth, Comparative study, Start-up Activities, Entrepreneurial Ecosystem support, Entrepreneurial Context*

Acknowledgment

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Julius Gliaubertas,

Delft, September 2019

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1. INTRODUCTION & PROBLEM DEFINITION

The economic growth of a country, region or a city depends on various factors that vary widely from one region to another. It may be nation held resources that other countries demand, beautiful beaches and golden sands that help to produce that next big followed Instagram photo on your next holiday trip, a robust group of highly respected education institutions that contribute to the wealth of high-tech and R&D focused individuals, a vast long-term government investment in labour productivity through automation and so forth. Either of these scenarios is a result of entrepreneurial activity that stands behind the supply of products/services (such as hotels or high-tech companies that focus on robotics) and more recently demand generation through advertising and behavioural change.

Entrepreneurship[1] is an array of activities of managing a business in order to gain profit by taking up financial risk. If all entrepreneurs take up some sort of financial risk, even though it may be varying, the differentiating factor is the activities through which a profit is achieved. Hence there are a multitude types of entrepreneurship – small businesses, corporates, scalable start-ups, non-profit organizations and so forth. No matter how a business entity comes about its business, it generates supply of products & services to the economy, demand of labour, motivates individuals to grow professionally and contributes to a working societal system. In addition to entrepreneurial activity, on a more holistic view, the state of the country (rich vs. poor) or a region and the infrastructure also influences the magnitude of economic growth (Stam & Stel, 2009).

The governing bodies, whether it is a mayor of a city, a parliament or a European Commission, do realize importance of spurring entrepreneurial activity to stimulate economic growth and therefore have started various initiatives on entrepreneurial education (Pittaway & Cope, 2007). These programs trickle down to help various supporting institutions to emerge – incubators, accelerators, technology transfer offices, local communities and so on. However, a well-established and clear policy does not necessarily ensure a well operating entrepreneurial environment but may help to grow a more active community. Here the notion of environment depicts the networked nature of entrepreneurship which is referred in academic literature and beyond as entrepreneurial ecosystem – an array of actors and environmental factors that dynamically shape the incubating environment to facilitate entrepreneurship (Feld, 2012). As an entrepreneurial activity may focus on a particular industry – a cluster in Silicon Valley focusing on community infrastructure services[2] or a cluster in London around ICT services[3]– the ecosystem that supports entrepreneurial activity of said industry also differs to some degree and is unique to a specific region. In the information age activity of one entrepreneurship type has had profound impacts on societal change and has become a focal discussion point of various governmental initiatives. Start-ups mostly focus their efforts on completely innovative

[1] See Oxford Dictionary at - https://www.oxfordlearnersdictionaries.com/definition/english/entrepreneurship

[2] See Silicon Valley Indicators based on US Bureau of Labor Statistics at - https://siliconvalleyindicators.org/data/economy/employment/major-areas-of-economic-activity/employment-by-industry-share-of-total-employment-silicon-valley/

[3] See CBRE reports at - https://news.cbre.co.uk/london-tops-ranking-for-largest-tech-clusters-in-new-cbre-study/

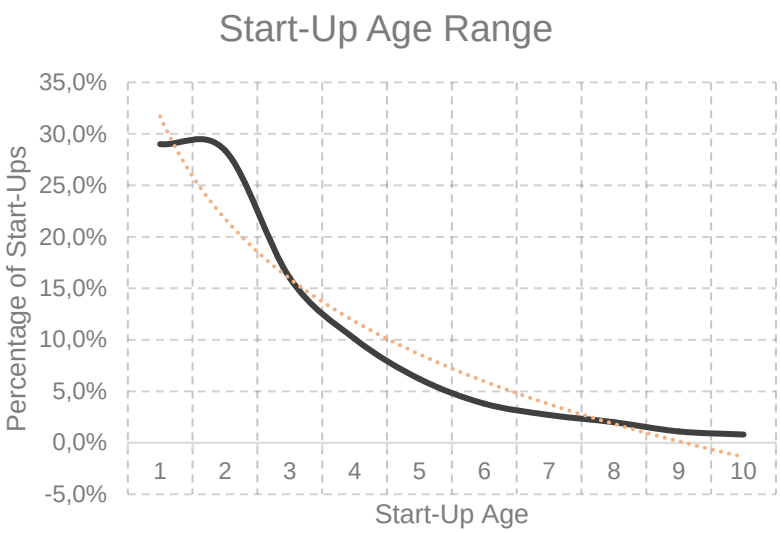
solutions, mostly through high-tech, to tackle various challenges and uncentered needs basing their operation on a scalable and a repeatable business model.

A lot of start-up companies struggle to grow and mature towards profitable entities as their business models are often built on network effects, so an effectively working ecosystem may help to elevate a success rate either through easier access to financial resources, human capital or just pure mentorship options. However, some caution must be advised. Start-ups traverse several growth phases that are interlaced with critical junctures resembling challenges. Numerous issues may arise and hamper potential growth of a start-up – lack of financial options, poor product delivery, lack of talented personnel or motivation, a wrong targeted market, poor cost optimization or under executed strategy and many much more. It is hard to not underemphasize the complexity of a start-up ecosystem, since the sheer number of unique actors, economic differences and the individuality of every company attracts vagueness in order to provide understanding. In the past decade there has been an uptick in entrepreneurial ecosystem research as paramount towards start-up success rate growth, although, it is unclear to what extent an entrepreneurial ecosystem realistically affects start-up growth stages from a firm-level view or which ecosystem elements, contextual matters considering, play the most important role at any given start-up lifecycle stage.

1.1. Start-Ups & Growth Stages

There are multiple shapes entrepreneurship can take, from individually providing a specific service to corporate level, but in a technological background a start-up is often the object of focus. In this case a start-up is a newly established business that sometimes does not even have a well-defined value proposition or is on a conceptual basis and seeks a scalable and repeatable business model (Blank, 2010). This definition seems quite vague, but it captures the essence of managing a start-up – the uncertainty and continuous iterations to achieve a marketable and ultimately a profitable product. The profound qualities of a start-up – radical uncertainty, novel product/service idea, lack of experience, lack of resources, undeveloped organizational structure, poor operation efficiency, non-existent profitable model and many others – denote the difficulties to achieve said scalability and maturity in general. Considering the numerous difficulties, a start-up may face, a question arises – why bother at all? The answer lies in societal development and technological development. As mentioned, the recent decades have been stamped as an informational age – an economy is based on high-tech advancement and information technology. In 2018 there were 1.56 billion smartphones connected worldwide with an accumulated 49% of all internet traffic going through mobile and the 2019 smartphone numbers jumped to 2.7 billion[4]. It may seem that there is a large gap between the importance of start-ups and the number of smartphones in the world today. Nevertheless, an average person gains tremendous benefits from owning a smartphone daily and the internet is almost a necessity. One of the facilitating drivers to have a smartphone is Facebook, currently one of the largest companies in the world that focuses on advertising, which was a college student idea to connect people in his campus and ultimately around the world. It once was a dorm room start-up that now connects billions of people and has profound effect on how we communicate. If not for the availability of capital

[4] See Statista accumulated global data at - https://www.statista.com/statistics/277125/share-of-website-traffic-coming-from-mobile-devices/



1Start-Up Age Range (Kollmann, Stockmann, Lincstaedt & Kensbock, 2015)

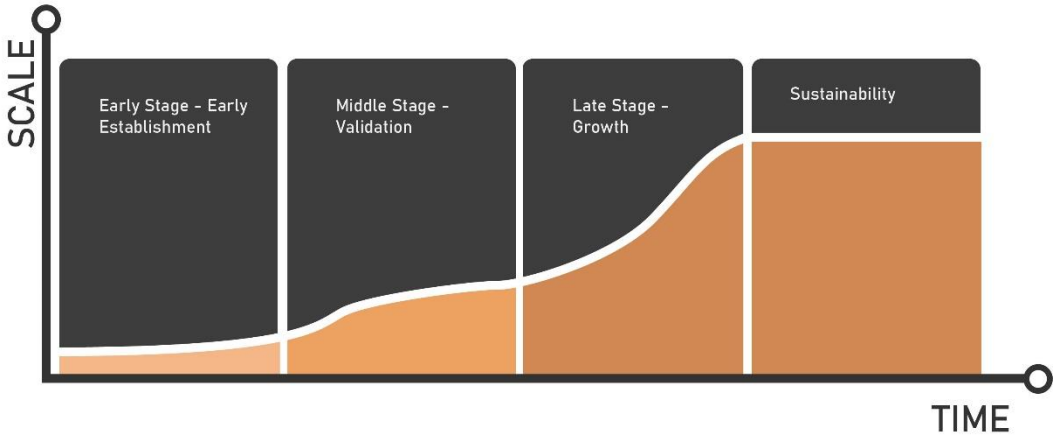
and a vibrant Stanford community, Facebook may not have been a global success. Similarly, Google has evolved into advertisement and mobile OS giant by starting up in a garage as a search engine developer to make internet more accessible. Now basically any human gathered knowledge can be accessed through a handheld device with a simple search inquiry. If not for the early investors and an ability to find a compatible founder, we may not have Google dominating the online advertisement business. It is slightly hyperbolized as there have been a number of other influences that shaped our tech-driven society, but it is impossible to dismiss the importance of high-tech start-ups to spur up technological development and implied societal development.

Even though start-ups are quite important for economic development in a technology driven society, the complexity of their situation is paramount to understand in order to proceed into academic research. Statistically, according to Kollmann, T. et al. (2015) at European Start-Up Monitor, [5]only 16.5% of start-ups are older than 4 years and is often stated that less than 1% survive 10 years or grow to a full fledge company. Therefore, it is quite easy to understand why there are so many programs to help start-ups grow and why an entire industry of incubators, accelerators and venture capitalists developed around it, especially when a single unicorn can fetch an insurmountable amount of profit on an IPO. Nevertheless, as the context changes from region to region, the network of supportive actors also changes. In addition to this, a start-up is a business entity that exists through several stages defined by a lifecycle. As every stage is quite unique in its challenges and requirements, the support needed at every stage differs. This additional dimension of context, to start-up and entrepreneurial ecosystem understanding, adds another layer of complexity.

Start-ups are generally affiliated with disruptive technologies or novel approaches to create value for the customer. An example would be Airbnb platform between supply and demand side in short-term rent that disrupted the entire hotel industry, or an AI focused digital visualisation (simulation) company SenSat that seeks to improve decision making of other companies. These companies have started as an idea of a nascent entrepreneur that in some cases has been developed into a prototype in a neighbourhood garage such as Google (Google, 2018). Start-ups as any other companies fall within a stage growth or a complexity pattern depicting their rise from conceptual grounds towards a potential IPO or an acquisition even with such a large failure rate. Multiple researchers have tackled the stage growth

[5] See European Start-up Monitor, survey based report - https://europeanstartupmonitor.com/esm/esm-2015/

topic in a holistic manner (Churchill, 1983), (Galbraith, 1982), (Kazanjian, 1990), (Tsai & Lan, 2019) depicting it in a generalizable way for any business. However, through more specialized lenses, Vahora, Wright & Lockett(2004) have identified 5 growth phases that relate to university spin out – a potential or existing venture that aspires to commercialize an innovative solution developed within a university. Even though the growth phases by Vahora et al. (2004) are not specific for start-ups it is a good indication that a more specialized and detail view on the challenges start-ups face may yield insightful results.

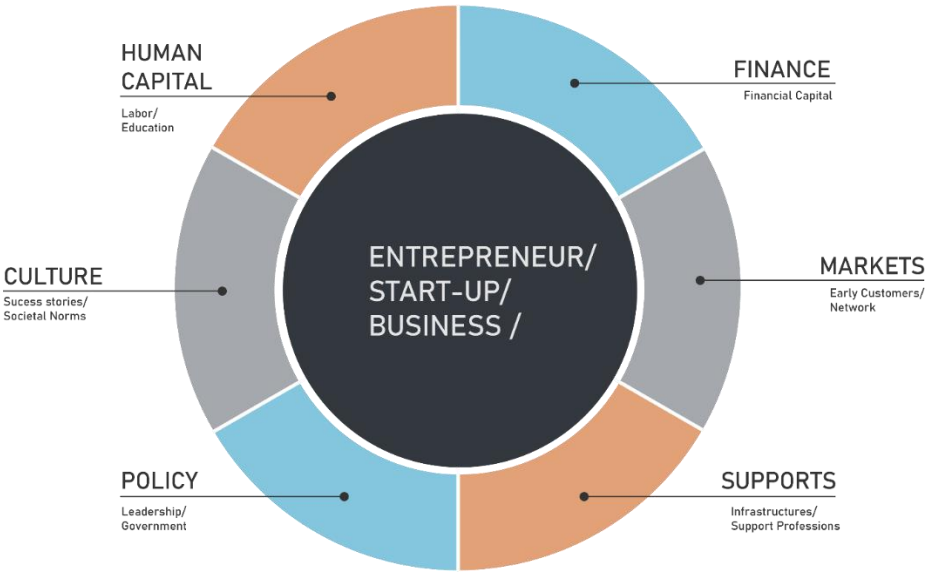


2 Start-Up Life Cycle Model, Thesis

Overall, the stage and particularly the juncture between stages indicate a specific main challenge a start-up may be facing (such as finding the right business model). The start-up stages are never set in stone, but rather dynamic as a start-up can jump from one stage to another depending on the market circumstances – e.g. a new product application or a pivot. Understanding the important activities that help start-ups overcome the barrier between stages and progress further is necessary to understand how and to what extent an entrepreneurial ecosystem is influential.

1.2. Start-Up//Entrepreneurial Ecosystem

Being a business endeavour of entrepreneurial nature, a start-up is also exposed to an environment, a part of regional context, that influences its operations, to this extent better represented by the notion of a start-up or entrepreneurial ecosystem. An entrepreneurial ecosystem is an interconnected actor network that facilitates or hampers the growth of a start-up. This research field has seen an uptick of interest, especially in the policy design field as start-ups do facilitate economic growth, culminating in governmentally issued policy framework. One such example is World Economic Forum issued report about entrepreneurial ecosystems around the globe denoting 8 pillars of entrepreneurial ecosystem consisting of accessible markets, human capital, funding and finance, support actors, regulatory framework, education and training, universities as catalysts and cultural support. This gives a clear image of how such an ecosystem might look, the inter-connected set of actors that play a role towards start-up growth with varying degrees of influence from one region to another.



3 Entrepreneurial Ecosystem Model (Isenberg, 2011)

If stages of start-up growth are defined by firm size, organizational style, market approach, funding sources or product maturity it means that at every stage or at any critical juncture a start-up requires different set of resources to continue its growth path or overcome a given challenge. Since start-ups operate within an ecosystem comprised of multiple actors that influence it, on a firm level an entrepreneur or a start-up in general has to understand the importance of ecosystem elements at a given time to make an informed strategic decision. Some elements of an ecosystem may facilitate or hamper an activity of a start-up; therefore, knowledge of ecosystem strengths and weaknesses goes a long way. However, the ecosystem and life cycle research has revolved around a more static approach by analysing a single case at a given time to benchmark ecosystem influence on start-up regarding their stage and a more dynamic approach is needed (Lee, Lee & Kim, 2017). A dynamic approach here incorporates a life cycle approach to start-up growth and context, seeking insights into potential strategic solutions in regard to the ecosystem at hand.

Nevertheless, an ecosystem, as established within a specific region as it may seem, may not be enough to elevate start-up success rates. A lot of challenges that start-ups are exposed to fall within internal realm. For example, a start-up founder being of technological background may not have experience to design a profitable business model and may give too much attention to product development side of thing and stagnate within early growth stages; a scaling start-up may already have entrenched cultural attributes that may hamper operational efficiency at later stages and leaves this entity improbable to achieve sustainability. Even though such things may be taught through various ecosystem actors, it is questionable if there exists such an effective ecosystem, hence an ecosystem may generally help to alleviate external to start-up challenges, such as funding. External start-up challenges here relate to challenges that include a set of out of organization boundaries actors to facilitate or hamper it.

1.3. The Need for a Comparative Study

There are a lot of reports generated about start-up ecosystems annually – World Economic Forum reports, Start-up Genome ecosystem ranking reports, Kauffman Foundation ranking reports or even European Commission Horizon reports. These reports are very similar to each other with a difference being a method of ranking start-up ecosystems and a sample size used to do that. Academic field is not exclusive as the research done is either on a regional policy level (Isenberg, 2011) or on a case by case basis (Borissenko & Bochma, 2017) that ultimately results in a poorly developed research field that lacks firm level insights. The generalizations undermine the uniqueness of a start-up and constitute a one-fits all approach which is faulty since every region is exposed to different contextual landscapes. Case by case basis may provide some deeper insights into what challenges a start-up may face and how a particular set of ecosystem elements influence probability to overcome a challenge. However, here the lack of general applicability kicks in if firm-level perceptions are not considered.

Moreover, start-up lifecycle and entrepreneurial ecosystem research are based on rather static models. It is quite interesting considering that an ecosystem is based on an evolutionary approach. Joining these two research fields from a firm-level provides a more dynamic approach, since regional inhabitants, in comparison, provide different views of what matters. In addition, the regional contexts affecting, the entrepreneurial activity, gives an indication of why differences in ecosystem support appear. Therefore, such a gap must be filled in order to advance both research fields.

Here Delft, Netherlands and Vilnius, Lithuania are focal entrepreneurial ecosystems that are analysed. Both fall within European Union macroeconomic influence and are guided by similar EU Commission principles. Nevertheless, Netherlands are considered a more developed region than Lithuania economically and considering TU Delft being one of the better technical universities in EU the contextual differences are enough to create an assumption of non-similarity.

1.4. The Problem Statement

The entrepreneurial ecosystem and start-up life cycle models are two different streams of academic literature that in reality affect each other and have to be studied in conjunction. A start-up goes through its life cycle by overcoming stage-contingent challenges/critical junctures (Steinmetz, 1969), (Churchill, 1983), (Vahora, Wright & Lockett, 2004), (Clarysse, 2007), (Picken, 2017). To navigate these issues, start-ups engage in knowledge and resource manipulation that is inherent to the start-up expertise base, as internal or external capabilities (Camison, Boronat-Navarro & Fores, 2018). An entrepreneurial ecosystem in this matter may provide support through various dimensions (Isenberg , 2010). The state of such support is determined by the contextual factors that facilitate entrepreneurial ecosystem development. Therefore, a problem is the lack of research done to join these streams of literature that may help to effectively understand the entrepreneurial ecosystem influence.

In order to concisely determine the effective support of an entrepreneurial ecosystem, a firm-level approach has to be developed, that takes into consideration the key business activities from a start-up life cycle approach, entrepreneurial ecosystem support dimensions that benefit these activities and contextual factors that affect both – incentive to consider a business activity important and an entrepreneurial ecosystem as supportive. In the related literature, the approach is to measure entrepreneurial ecosystem factor influence on entrepreneurial success and growth, when the dependent variables are of economic scale (size, revenue and etc.). This thesis project will convene a research process that measures the ecosystem influence on a more detailed scale, which should provide a better understanding of which unique ecosystem qualities matter on a day-to-day growth of start-ups.

Objectives:

- *To understand the dynamics of start-up entrepreneurial ecosystem in regard to start-up life cycle stages.*
- *To find the challenge that a start-up may face through its growth path.*
- *To underline the key business activities that start-ups engage in at every stage.*
- *To find how start-ups in Delft and Vilnius perceive an entrepreneurial ecosystem importance through start-up growth stages.*
- *To highlight the contextual differences of Delft and Vilnius regions that may affect start-up perceptions of ecosystem importance.*
- *To provide insight for the management board of a start-up about how relevant critical junctures may be navigated through and higher growth success rate to be achieved in regard to the actual ecosystem influence.*
- *To generate potential policy implications that may be needed to evolve ecosystems further.*

Scientific Relevance

On a scientific basis this research aims to fill the gap in the recent and relevant literature. The gap mostly relates to the complex relationship of the start-up life cycle and the ecosystem it operates in. Thus, a well-done study in this area would provide incentive to further undergo a merging process between these fields. A comparative nature of the study provides more generalizable results and proceeds to further the called upon need for comparative studies in ecosystem research field. Moreover, the presupposed dynamic nature of a start-up ecosystem and its influence over the course of a start-ups life cycle provides a novel approach on firm-level decision making that results in the face of growth challenges.

Societal Relevance

Firstly, a start-up or a new venture creation process results in various factors that ultimately affect the regional activity at worst and international spill overs at best. A new venture creates new jobs (Kauffman, 2010) that serve the local community in either increasing the demand for particular professionals that a local education institution may be producing or attracting outbound talent that indirectly affects economic activity. Moreover, there is a significant

amount literature that points to the fact that new venture creation and start-up activity directly and positively influences local and regional economic growth (Carree a& Thurik, 2010), (Westlund ,2011). Since start-up activity depends on the environment it operates in, it's ecosystem, understanding the importance of key business activities throughout the start-up life cycle and what is needed to support them may yield much better results – ultimately by tailoring the entrepreneurial ecosystem and providing a solution.

Secondly, a vast number of new ventures do fail in the first years of operation with a varying set of reasons. It is reasonable to assume that most of the reasons revolve around unexperienced entrepreneurs poorly assessing the future path of a start-up and failing to overcome a given challenge. As a start-up ecosystem supports or hampers the potential to overcome a given challenge, understanding this relationship may lower the failure rate to some extent. Given that would happen, greater success rate would transfer to greater growth rate - more jobs, less capital vanishing, greater innovation momentum. Therefore, a firm-level understanding of these relationships and proper evaluation of the ecosystem would yield positive societal influence.

Research Questions

The main research question in this study relates to the objective of finding a relationship between influence and strength of a particular ecosystem's elements and the challenges a start-up may face in between its stages of growth. Since an ecosystem is of a network nature compiled of a multitude of actors in different roles it is prone to change. It is assumed and will be tested that as this multi-actor environment changes, its influence changes too. Hence it is imperative to understand how ecosystem change affects the start-up through its growth stages.

Main Research Question:

How does an entrepreneurial ecosystem influence start-up growth stages?

This question tackles the main existing literature gap in entrepreneurial ecosystem influence on start-ups growth looking at it on a firm level in addition to more holistic lenses. It aspires to scrutinize the effective degree of support that an entrepreneurial ecosystem provides on a detailed level throughout start-ups growth stages.

The sub questions of this study are aimed to understand and detail the steps needed to achieve research goal. On this level questions are focused on the conceptual model to be developed through the literature study and the foundational data to be gathered for analysis through methodological means.

Sub-Questions:

What are the stages a start-up may go through, the critical junctures towards the growth goal of a new venture and the most important business activities to navigate these junctures at given stages?

Methodology: The concepts inferred from the literature review in addition to valuation from the survey distributed to Delft and Vilnius start-ups.

To what extent entrepreneurial ecosystem supports important business activities to overcome stage-contingent critical junctures in Delft and Vilnius?

Methodology: Mean comparison from the survey response analysis between several sets of independent variables.

How do contextual differences explain the perceived differences in key business activities in Delft and Vilnius?

Methodology: Desk research to delineate the contextual differences between regions and qualitatively infer the contextual effect through business literature.

How do contextual differences explain the degree of perceived support in Delft and Vilnius entrepreneurial ecosystems?

Methodology: Desk research to delineate the contextual differences and qualitatively infer the contextual effect using relevant literature.

What are the most important key actors in entrepreneurial ecosystems of Delft and Vilnius?

Methodology: Desk research to understand the institutional structure in addition to data analysis to understand most important activities. Inferring the most important actors from the conclusive remarks.

1.5. Conclusion & Outline

A start-up is a focus point of many discussion on a regional level development panels and of a multitude reports that come out annually. The growth motivation of a start-up to create a scalable business model is met with a lot of resistance either internally or externally. An entrepreneurial ecosystem is said to be quite influential over the growth and success rates of start-up and nurturing such an ecosystem within a specific region should generate tangible economic yields. Nevertheless, on a firm level there may be a significant difference in how much actual influence an entrepreneurial ecosystem exerts on start-up growth. The internal factors may play a much bigger role in strategic decisions. Ultimately the intricacies of the whole start-up landscape may vary so wildly that arriving at a conclusion on a case basis or through a more generalized way may not yield any valuable insights. Hence a comparative study with a firm-level focus could result in more precise insights that may help properly evaluate the actual influence ecosystem elements have over a start-up and how these elements play amidst the vast number of internal factors that could become an issue.

I. Introduction
   a. Define the research background
   b. Introduce the main theoretical orientations
   c. Introduce the problem and the relevance

II. Literature review
   a. Description of the popular start-up life cycle models and a summary of the one used in the research

b. Detailed characterization of the main challenges that erupt in a start-up's life cycle in addition to the activities a start-up may partake in in order to navigate the landscape
c. Description of the main entrepreneurial ecosystem models in the academic literature and a proposition for the one used in the research
d. Entrepreneurial ecosystem influence over start-up's life cycle through ecosystem elements, temporal.
e. Model of the theoretical model interconnectedness for the purpose of the research

III. Research methodology
a. The type of research, characteristics and the conceptual model used
b. Data types and collection methods to achieve validity
c. Interview design & responses from the interviewees
d. Survey design structure and reasoning
e. Data analysis methods used in the research to achieve significant results and the research model description

IV. Desk research
a. Framework used to define the contextual landscape of Vilnius & Delft regions
b. Describing the factors according to the PESTL model
c. Structure of the institutional network in both regions that is responsible for operating a start-up ecosystem.
d. Defining the uniqueness of both regions according to the contextual factor research outcomes.

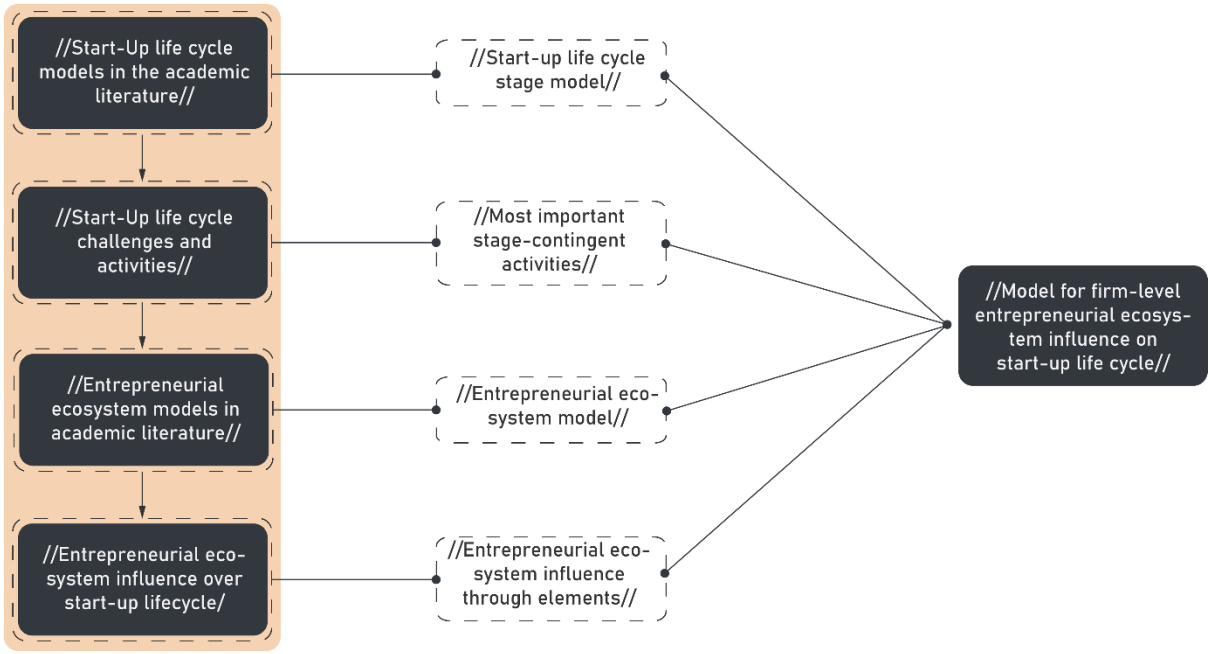
V. Data analysis
a. Descriptive statistics of the quantitative data through desk research and survey responses
b. Inferential statistical analysis of the data set

VI. Results & discussion
a. Providing the discussion regarding the main research question and its sub-questions based on the data analysis
b. Giving recommendations for the future research and describing limitations of this project
c. Providing recommendations for management and policy makers
d. Personal reflection

2. LITERATURE REVIEW

To start conceptualizing this study, a theoretical background through literature review is developed. The literature review provides an overview of the current state of the academic fields in start-up life cycle and entrepreneurial ecosystem research. The aim is to draw the line of the scope of this research project and to underline the models and assumptions used to explain certain phenomena.

The review model (Figure 4) shows the structure of the literature review. First, the start-up lifecycle stage approach is defined with a conclusive model used in this study. Second, the critical junctures between stages are discussed in addition to key business activities. Third, entrepreneurial ecosystem models and its influence are discussed concluding with a model used as a reference for the study.



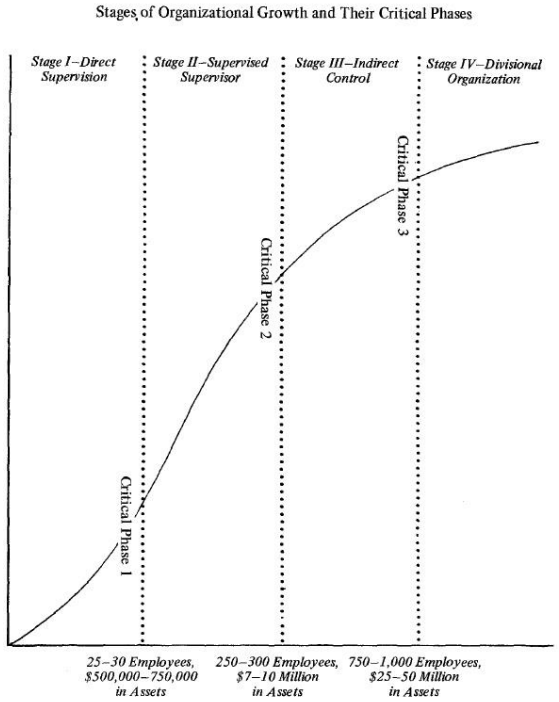
4 Literature Review Structure

2.1. Start-Up Life Cycle & Stages

Amidst the vast amount of literature focused on the growth of organizations from their nascent roots to the stages where large companies devote vast resources to stay nimble and responsive (Christensen, 1997), there exists a cluster of literature focused on new ventures or start-ups. In this review a new venture and a start-up is used interchangeably, but it should be noted that generally a new venture may also relate to a small business with the initial focus on profitability. A start-up falls under the umbrella term of a new venture, but the focus here lies within business model scalability and repeatability and, more often than not, activities focused on innovation (Blank, 2013).

Start-up or new venture – *a newly established business entity which may yet to have credibility with the intent to find a scalable and repeatable business model for an innovative idea.*

In a life cycle approach, a business goes through several stages of growth from its nascent roots towards a fully self-sustainable corporate entity. A stage in this case is a timespan between two major points in the life of an organization that differ in numerous qualities – organizational structure, size, product maturity, financing options and etc. This major point in new venture's lifetime is a challenge or a barrier that a company has to traverse to achieve further growth. The life cycle is an established approach to lifetime analysis of an organization and has been around for a while. One of the earlier and more notable works is by Steinmetz (1969) which acknowledges earlier works on S-shaped growth patterns of companies. Steinmetz argues that a company goes through 4 stages of growth and underlines the 3 milestones in between these stages as critical. The growth is measured by the pure size of the company. The stages according to Steinmetz are *direct supervision, supervised supervision, indirect control* and *divisional organization.* The stages here are described through an organizational structure lens. In e.g. *direct supervision* refers to a single person, typically a founder, overseeing most new ventures activities. The growth side of the model, or the vertical axis, refers to the sales volume and the rate of return. Therefore, Steinmetz's model is highly financialized with a focus on organizational structure, since critical points in between stages are delineated by the managerial and financial challenges.

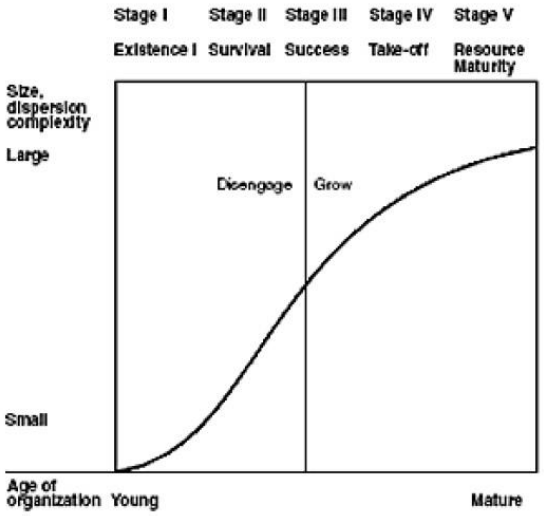


5 Steinmetz, L., L., 1969 model of business growth

Later work by Galbraith (1982) focuses on small companies and start-ups that are the funded by a growing industry of venture capital. Galbraith strictly underlines that a start-up goes through a stage process and that majority of the failures within the start-up community are due to the inability of the management board to think stage-wise. Even though it is a strong statement considering the complex dynamics of business growth, Galbraith describes growth stages through natural organizational stage and financing options/needs. Similarly, to Steinmetz (1969), Galbraith argues that the challenges of growth peak around the need for organizational change that echoes throughout the entire organization on multiple dimensions. According to Galbraith, a start-up (a new venture) goes through these stages in its lifetime – *Proof of Principle Prototype, Model Shop, Start-up Volume Production, Natural Growth* and *Strategic Maneuvering.*

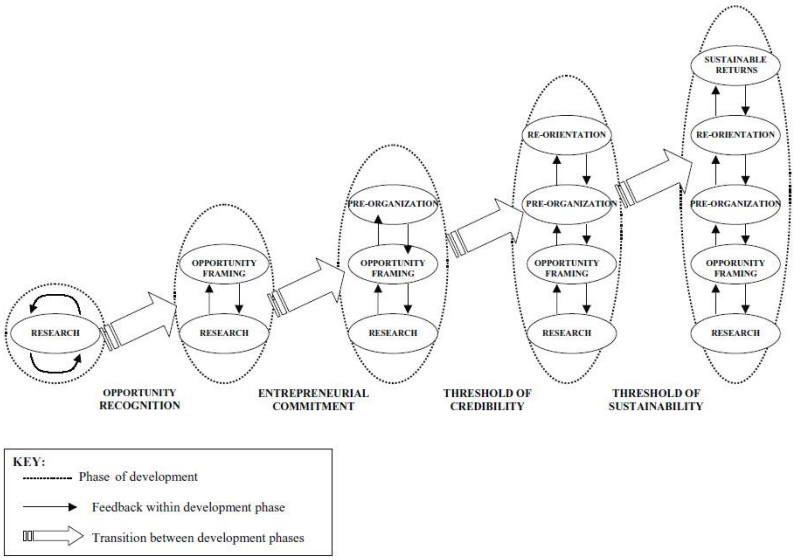
Further research in the field has also stayed within the foundation of an S-Curve. The work by Churchill (1983) has criticized the assumption of previous work in relation to how growth is described. First, the assumption that a company goes through all stages or dies in attempt to do so is proven invalid, as some entrepreneurs pass over a certain barrier

and may stay within a stage until natural erosion. Secondly, according to Churchill previous models fail to capture the importance of early stages involvement in nourishing growth. Third, the size of a company in terms of its sales volume, used in earlier work, does not contain the complexities of a product line, geographical expansion or other factors that may describe growth. Thus, Churchill has developed a 5-stage model of new venture growth as an S-Curve incorporating age of the venture and the complexity dimension. The five stages are – *Existence, Survival, Success, Take-Off* and *Resource Maturity*.



6 5 Stages of growth (Churchill, N., C., 1983)

These models describing the growth of a new venture are quite general by nature and applicable to majority of small businesses. Nevertheless, considering the emergence and rapid growth of start-up communities worldwide and their focus on innovation, these models seem too vague and undermine the iterative and reciprocal nature of growth that appears through a life-cycle of a modern start-up. Therefore, Vahora et al. (2004) have developed a model of university spin outs that occur in an academic environment as new ventures in transition. What Vahora et al. have added to the life-cycle theory is the reciprocal relation between the stages of growth. According to Vahora et al., a spin out goes through 5 stages of growth separated by 4 critical junctures. The stages are differentiated by their resource, social capital and knowledge needs. The stages by Vahora et al. are – *Research, Opportunity Framing, Pre-Organization, Re-Orientation* and *Sustainable Returns*.

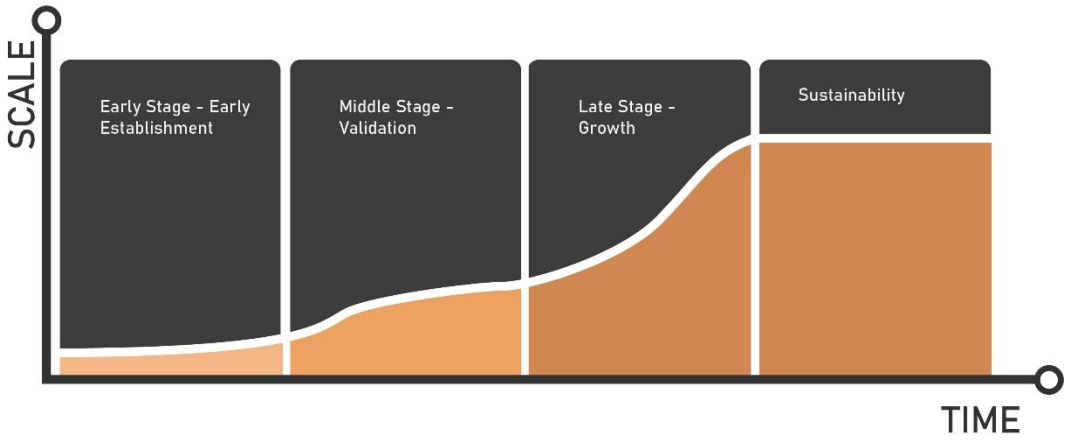


7 USO growth stages and critical junctures (Vahora et al., 2004)

Another work that relevant to a start-up environment considers 3 stages of start-up growth (Clarysse, 2007). The 3-stage model is used to understand policy intermediation at any given stage in regard to 3 attributes – networking, financing and coaching. These attributes are paramount to nurture a successful start-up growth regime. Since these attributes by themselves and the focus on policy is of networked nature, it could be argued that Clarysse (2007) was close to discussing an ecosystem dynamic. Nevertheless, the focus was government as an intermediating actor. Furthermore, Clarysse's 3 stage model seems too general and not as close to reality as say Vahora et al. (2004) USO

growth model. This is because the initiation phase (Clarysse, 2007) envelops all the activities that an early start-up may have to do, from research to opportunity recognition and framing with a goal to have a viable product. But there may be multiple barriers within this single stage and thus it seems too much aggregated.

The stage-wise models presented are used as the starting point of a conceptual model developed within this thesis project. All models presented in this literature review correspond to a linear growth model with Vahora et al. (2004) introducing a slight dynamic feedback loop. To the extent that this project does use particular model design, but rather develops a model as a proxy to understand entrepreneurial ecosystem influence, a simple 3 stage design is used similar to Clarysse (2007) or Picken (2017). The difference is that the stages are separated on firm level growth incentives rather than by external observational factors. The first stage is *early establishment*, which corresponds to a seed stage and is defined by a service/product being in development in search of viability. Second stage is *validation phase*, where a business model is developed, and commercialization opportunities are framed for a developed product. Pivoting in this stage is frequent. Third stage is *growth*, which is characterized by an increasing rate of growth on a valid business model also including stable and sustainable companies. This is due to the fact that this project seeks to understand influence hence immediate present perceptions are most relevant rather than already overcome ones. The definitive qualities of these stages are assumptions and only used to segregate the start-up community within a region.



8 Start-Up Life Cycle Model used in this project

2.2. Start-Up Activities to Navigate the Stages

If we assume that a start-up goes through several growth stages in its lifetime separated by critical junctures or stage gates, there must be somewhat uniform set of requirements to be achieved in order to hop from one stage to the proceeding one. Ideally, a new venture would engage in research activity in addition to a business model design, gain its first customer and iterate the business model to achieve scalability. Nevertheless, the real-world scenarios are much more complex, especially if we add a business network coevolution, information asymmetry, stakeholder dynamics,

societal or economic backgrounds and etc. These levels of complexity define the difficulty to study start-up or SME transition and growth dynamics.

Since the stage gates or critical junctures are defined by the milestones to be achieved and are quite general to most of the start-up population, the activities to overcome these junctures are also similar and can be generalized. *Types* of activities encapsulate a slightly larger scope than a unique activity. In example, a detailed activity would be "setting up an introductory video campaign through Facebook advertising services" and a *type* of activity would refer to "digital social media marketing". The first example assumes that a company needs to use Facebook as a distribution channel based on the situation it is in and thus would be more suitable to be scrutinized on a case-based research. The second example does not assume that much detail about a specific company case, but rather focuses on qualities that such *type* of activity would pertain – associating digital marketing with internet, customer profiling, social media, analytics or image building.

//Early Establishment//

In the first stage, *early establishment* or *start-up*, the start-up aims to find a solution to an uncovered market opportunity by developing a product or a service. Hence, in this stage the start-up focuses on opportunity recognition, researching a market and finding a gap to fill, developing a mock-up product or service and building a preliminary business concept. Picken (2017) defines this *startup* stage as business concept validation without detailing what validation means. In the model used throughout this research, a business model is validated only when it starts to generate market traction, in Picken's model that would occur in the second stage. Nevertheless, a start-up has to create a *preliminary* business model with a go-to-market strategy that is facilitated by a somewhat robust financial forecasting, that actually shows a start-up being profitable in the near future. In order to have some argumentation behind it and actually start operations to validate the business model, a start-up needs a working product or a service. In this stage we assume the first product iterations that are actually working and postpone the idea of pivoting towards latter stages. So ultimately a start-up needs to have a working product/service prototype or an alpha, a market growth strategy, financial backing and detailed marketing research done in order to progress forward.

- **Stage-contingent challenge** – recognize the market opportunity and build the first iteration of product/service, whilst completing pre-organization activities – business plan, securing initial financial backing, developing a growth strategy.

The recognition of opportunity part is very important to set-up the stage for an establishment of a start-up but is related to an individual psyche and perception of the surrounding environment (Vahora et al., 2004), hence adds little to the discussion of firm-level decision making amidst important activities. We assume that at the start of this stage the founder already has an idea for a product/service that serves a purpose of solving a problem, but still has not found a market opportunity that is clear, and a product would fit perfectly.

Firstly, a start-up as any business, must know its target market – a set of qualities that a potential group of customers pertain. This is done through deliberate *market research* that lets to quantify the product/service financial feasibility (Bygrave & Zacharakis, 2011). Reaching the first set of customers, let it be immediate family members or friends or some of the neighbouring community members, can help the start-up generate feedback and iterate on the product development process (Ries, 2011). An activity that may generate feedback and help with market opportunity recognition is to tap into a immediate network – friends, family, mentors and etc. Growing such a network is also a viable business activity, especially when a founding team recognizes some lack of experience. Finding a suitable mentor or mentors can help the founder leverage outside knowledge to raise the possibility of success. Related to *growing immediate network* is the issue of *team formation*, which results from the knowledge needs. For example, an initial product idea has been conceived by a highly technical individual, but the lack of business-related skills incentivizes the search for a co-founder in order to complete the set of required skills to run a business.

Secondly, from the product development side of business, a start-up needs a working product/service that prove start-up existence feasible. To develop an idea into a working product, a start-up progresses through a research phase, where only knowledge is being generated and ideas sketched. If a founder has an idea for a product, there is good possibility that he/she still lacks related knowledge to be able and develop a product prototype (Marcolongo, 2017). Furthermore, the ideated product/service has to be developed at least into a prototype or a working version to be able to attract the first set of customers. This activity is referred to as *research & development* to define the feedback loop between knowledge gathering and product iterations.

Lastly, the business development activities are as important in the early stages as in the latter ones. When an idea is clear and a path to a working product is sketched it is important to understand how a developed product/service will generate profit in the market. To this extent *business model development* is quite important, even though a start-up may pivot in the latter stages. Having developed a business model will help to structure a *financial management* strategy that translates a potential market into a potential cashflow (Spinelli & Adams, 2011). This is extremely important, since any business entity has to be able to quite precisely estimate its product market reach and value. The why is quite simple – gain financial backing. *Raising capital* may be one of the most important activities at any stage of the start-up life cycle depending on the industry or a product/service. For example, an Android app may not require vast amount of resources at the start as it can be quite easily developed by one or two people but may require increasing amount of resources to maintain as the market penetration grows. On the other hand, biomedicine related innovations require vast significant amounts of resources from the start-up that mostly relate to materials and lab equipment/access. In either case, a founder has to take into consideration the available options to raise capital and prepare beforehand which also falls within the activities of raising capital. *Early Establishment* key business activities are presented in Appendix 2.

//Validation//

The second stage, coined as transition by Picken (2017) or pre-organization by Vahora et al. (2004), in this research report is referred to as *validation*. Here a start-up should start gaining traction in the respective marketplace with an

initially developed product/service. Even though, the product is probably in its first form, the opportunity arises to initiate a learn-build-measure feedback cycle (Lean Start-up) with the first set of customers. The information available at this stage lets the start-up to understand the market better and *validate* that the business model is working as intended. To this extent, a start-up may choose to pivot or to prepare for scaling. The ultimate goal of this stage is to scale the developed business model, driven by the clearly communicated product/service value to a clearly defined set of customers. First, the start-up has to maintain a clear customer focus as the initial traction is achieved and it is established that the product is working. Secondly, even though an organization focuses on the customer, there is the issue of a chasm between different customer segments (Moore, 2014). Scaling the enterprise means that access to other market segments has to be established while different needs and expectations have to be met.

- **Stage-contingent challenge** – validate the business model based on the built product/service.

Simply put, a start-up has to establish that every part of the business model works as intended and serves a purpose of becoming profitable if scaled correctly. A business model is a sum of its parts (Johnson, Christensen & Kagermann, 2008) – customer value proposition, profit model, key resources and key processes. So, in order to validate a structure business model a start-up has to test it and come to a successful outcome.

Firstly, a strategic business model must be put in place, an ideal framework of how a developed product would be created and delivered to the customer and what is the monetization based on (Spinelli & Adams, 2012). In example it may be a subscription-based model, where a customer pays periodically for an access to the service (most magazine access models), it may be that the business relies on complementary product markets and provides a primary base product for low price but reaps the benefits through complementary products (game consoles) and much more. Either way, a profit model has to be established. Therefore, the activities within this project reflect this through *financial business management, strategic business model development.*

Secondly, a start-up must have a clear value proposition design in addition to a detailed market growth strategy. The customer value proposition dimension here reflects the tried and tested initial product/service from the first stage and generates a more valuable solution to the customer compared to other offerings in the market (Johnson, Christensen & Kagermann, 2008). The value added may be an innovative solution or rely on network effects. However, a trap here is quite common – you may have the best product/service everyone has ever had, but how does it matter if the customer has no idea it exists? To this extent, marketing communication becomes ever so important, since it directly influences the precision of business model validation (Bygrave, 2011). In example, if other parts of the BM are almost perfect, but the communication is directed at a wrong customer segment, a start-up may conclude on a false negative and deem a business model invalid and choose to pivot. It is hard to stress the importance of marketing in this stage to a realistic extent. Activities that reflect these hurdles are referred to as *developing a value proposition, customer acquisition/marketing campaigns* and *growing partner and immediate network.*

Third, we pool resources and processes together since these parts of the model depend on each other. The amount of resources needed depend on the processes necessary to create and deliver value and on the other hand a resource limited

venture must cut on its non-core processes. It is a delicate procedure, since it is hard to separate which processes are necessary in these early stages of growth. Nevertheless, a high-tech start-up probably relies on some sort of R&D process that facilitates product/service evolution, either it would be a scientific R&D approach (Marcolongo, 2017) or a test-learn-build cycle (Ries, 2011). A high-tech venture cannot push the innovation processes to the side-lines if the product relies on it and therefore indirectly affects how feasible is the business model. Relating to the innovation processes, it may be important for a start-up to extend the intellectual property strategies if they apply. Furthermore, to support each necessary activity that realizes the business model effectiveness, a start-up must pool some financial resources. In this stage the source of financial support may change from debt financing to equity financing opportunities or venture capital if the start-up needs much larger financial resources than its credit history guarantees (Clarryse, 2017) most of the time defined as seed stage. Activities that relate to process and resource bound challenges are defined as *IP safeguarding, developing a legal framework, raising venture financing capital, R&D.*

//Growth//

The third stage is in this project named *growth* or in Picken's (2017) *scaling.* Throughout this phase, a start-up aims to exponentially grow its size – market reach, production capacity, revenue, sales volume and etc. This is due to the already validated business model and a product/service that customers agree to purchase. As the product is established and pivoting has been achieved (in some cases) the business needs to inflate its operations and often lean on internationalization to expand the market share or a potential market in general (disruptive technologies). The goal of this phase is to reach a sustainable corporation, since at the end of this phase the market growth will probably slow down to a growth rate equal to the market growth (Galbraith, 1982). Sustainable in this sense means a company that draws a positive cashflow and has achieved constant profitability with a rather fixed mark-up and ultimately focuses on control activities (Kazanjian, 1990).

- **Stage-contingent challenge** – reach a critical mass of users via scalability operations and guarantee a positive cashflow in the long-term.

This stage is quite difficult to manage not less to reach, so there are generally quite few start-ups that can be coined being in this stage. This is due to the fact that most of them fail to validate the business model or generate enough market traction to transition to a scaling enterprise or fail to innovate beyond their initial product and become irrelevant. It is worth mentioning that this stage is the pinnacle of start-up community, since each company aims to become scalable and repeatable.

First, if scaling is an important goal, on a process level a start-up has to expand every part of its core and non-core processes in an effective manner (Bygrave, 2011). It may be that a start-up that develops a product inhouse has to build additional manufacturing plants or enlarge their R&D facility to cater the growing demand of their customer base. As a venture scales and becomes more recognized it may be viable to expand its product/service offerings to cater various customer needs that become apparent only in the latter stages of start-up life cycle. To this extent the business

model of a start-up may also change slightly. For example, a product focused venture that builds personal computers may expand to include services such as custom builds, onsite assembly and software to facilitate computer operation. Including a service into a product focused BM is a challenge that changes the organizational approach an includes additional layers of complexity, even though it is rather popular in the digital age and the notion of the digital economy. Activities that reflect this are coined as *R&D* and *customer acquisition.*

Secondly, relating to the changing organizational approach. As mentioned, in the earlier stages a start-up is a fluid, non-formal organization that dynamically changes its structure to cater the fast-paced innovation & market cycles (Spinelli & Adams, 2012). Nevertheless, as the organization grows, a non-formal organizational structure can become inefficient and chaotic, which becomes a reason to establish a more formal organizational structure and clearly define the culture. If one of the core competencies of a venture is innovation it may be feasible to establish an ambidextrous organizational structure an cater to both – the creative and chaotic requirements of R&D and the clear hierarchical transparency of operations. Furthermore, a growing organization requires an increasing amount of human capital to sustain the workload required, therefore talent acquisition becomes an important process. Activities relating to these issues are defined as *expanding operational processes on multiple levels, establishing a clear organizational structure.*

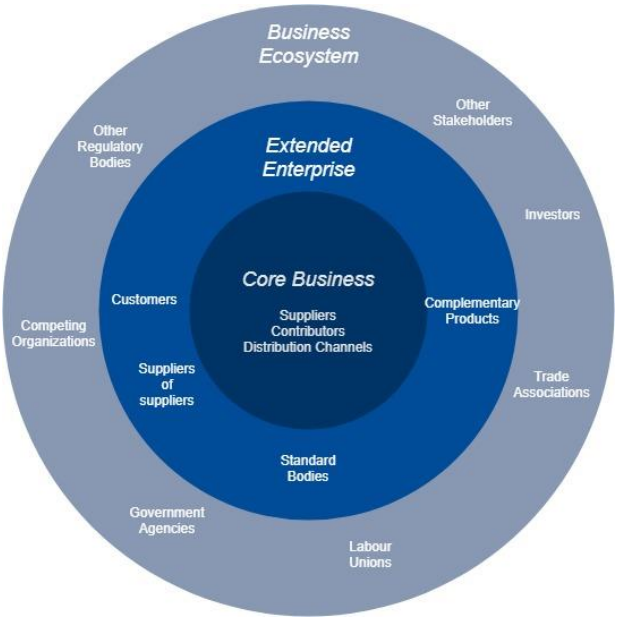
Third, the key resources in this stage also expand. The human capital resource has already been mentioned and required financial resources to sustain scalability become rather an apparent feature. However, since financing and cashflow grow exponentially, financial management importance in this stage also increases. As the sales and manufacturing volumes increase there may be time lags between issued and received accounts that "freeze" financial resources creating a backlog. Such backlog must be considered by the financial managers that set the financing requirements for the firm. This example shows the complexity that may arise in this stage and is not bound only to financial management. It should be kept in mind that this example is extremely simplified, and the complexity may be much greater. Furthermore, in the digital age, the importance of a network is underlined by multiple academics and becomes a relevant resource in this stage. For one, an extensive supplier network has to be established and relationships managed, customers become a part of your immediate network, since feedback is greatly valued. Also, since high tech start-ups are in focus of this research, a start-up community may bring unforeseen benefits to the venture through partner deals, mentorships and general knowledge spill overs that may envelop (Feld, 2012). Activities used in this research model are defines as *raising venture financing capital, financial business management, growing partner & immediate network.*

2.3. Entrepreneurial Ecosystem

The second important part of the conceptual model developed and used within the thesis projects is the start-up ecosystem. The notion of a start-up ecosystem is in its infancy and is quite vaguely described as is. Nevertheless, ecosystem in business literature has been around for quite some time, therefore it is possible to find overlapping and influential academic and non-academic works that shaped the field as it currently is. A very close substitute for a start-up ecosystem is entrepreneurial ecosystems.

Moore (1993) is considered one of the pioneers (Gomes, 2016) that started the discussion around the topic of ecosystems. In his early article, right before the launch of the book, Moore argued that the high growth and dynamic market of high-tech required the management board to develop a new set of tools to be able to tap into the strength of community. He referred to the works of some ecologists by defining an ecosystem as a dynamic environment in which *"changes in species A set the stage for the natural selection of changes in species B"*. Of course, the A and B here are referred to as different organizations within a network. The main addition by Moore to the strategic literature is the push to think about the strategy through a lens of a network – companies do coevolve to support their products or services sometimes in a cooperative or a competitive manner. Furthermore, Moore proposed that the ecosystem by itself changes, quite logical if all the parts within the system change, through several stages that correlate with the maturity of an ecosystem – *birth, expansion, leadership* and *self-renewal* (Moore, 1993). Figure 10 represent the adopted vision of Moore as to how a business ecosystem may look.

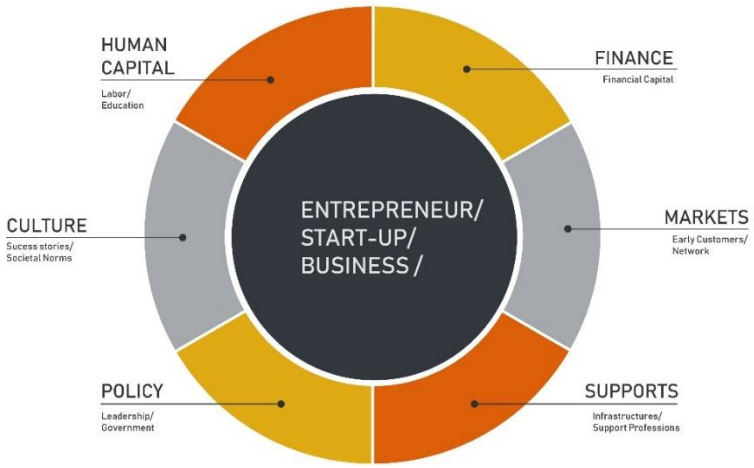
9 B. Feld Ecosystem Model (2012)



10 Business Ecosystem, Adopted from James Moore (1993)

A business ecosystem term and use in the strategy literature is quite general as it applies to every business to some extent and is rather a strategic tool and a guiding principle to view the organizational relationships with the environment as of a networked nature. But to further proceed with the research and make the field more specific, start-up ecosystems have to be considered as quite separate, since they may not have the qualities that constitute a business ecosystem yet and to this extent may be pre-birth according to Moore. It is valuable to look through an ecosystem perspective since it gives a dynamic understanding of the current affairs. So, in order to understand the intricacies of a start-up ecosystem an entrepreneur has to be taken into account as the starting point. Thus, the notion of entrepreneurial ecosystems, as ecosystems that explain the growth of activity in entrepreneurship in a certain region, is used as related to the start-up ecosystem. Entrepreneurial ecosystems have been discussed in academia, policy and more popular business literature

quite recently. In popular business literature, Feld (2012) has been quite influential and vocal about the effective ways to develop an entrepreneurial ecosystem. Being an active player in the start-up communities elaborating on his opinion is relevant to understand the start-up ecosystems better. In his book, Feld recognized the importance of ecosystem participants that drive entrepreneurial activity through a community perspective. In the analyzed case of Boulder, Colorado, Feld focuses on the activities of entrepreneurs themselves to spur activity in the community via the reason of experience – an established entrepreneur is at a better position to understand the need of emerging entrepreneurs. Furthermore, Feld discern the participants into leaders and feeders. Feeders being the actors that input the resources needed to activate entrepreneurial activity. However, the model proposed by Feld is focus on particular actors rather than a whole environment that may be more nuanced or ambiguous.

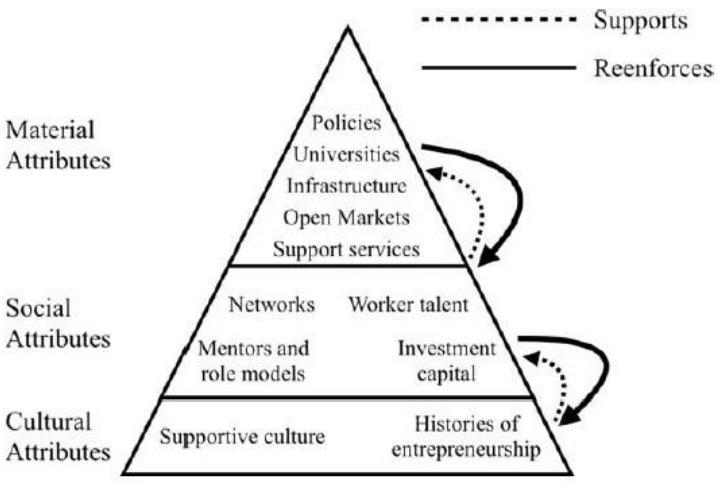


11 Entrepreneurial Ecosystem Model (Isenberg, J. D., 2011)

Similarly, to Feld (2012), a model of entrepreneurial ecosystems has been developed to present understanding of this topic for policy development (Isenberg, 2011). In his paper Isenberg describes entrepreneurial ecosystem as a complex and intricate network of a set of actors that together facilitate a nurturing environment for start-ups to grow and entrepreneurship to evolve in general. The focus here is on ecosystem strategy through the lenses of policy development. Nevertheless, the firm level should benefit from this too since policy focus may translate a particular ecosystem element strength or weakness. Isenberg presents his model including 6 main groups of facilitators – policy, finance, culture, supports, human capital and markets. These 6 groups are aggregation of numerous small entities that may support or hamper entrepreneurial activity.

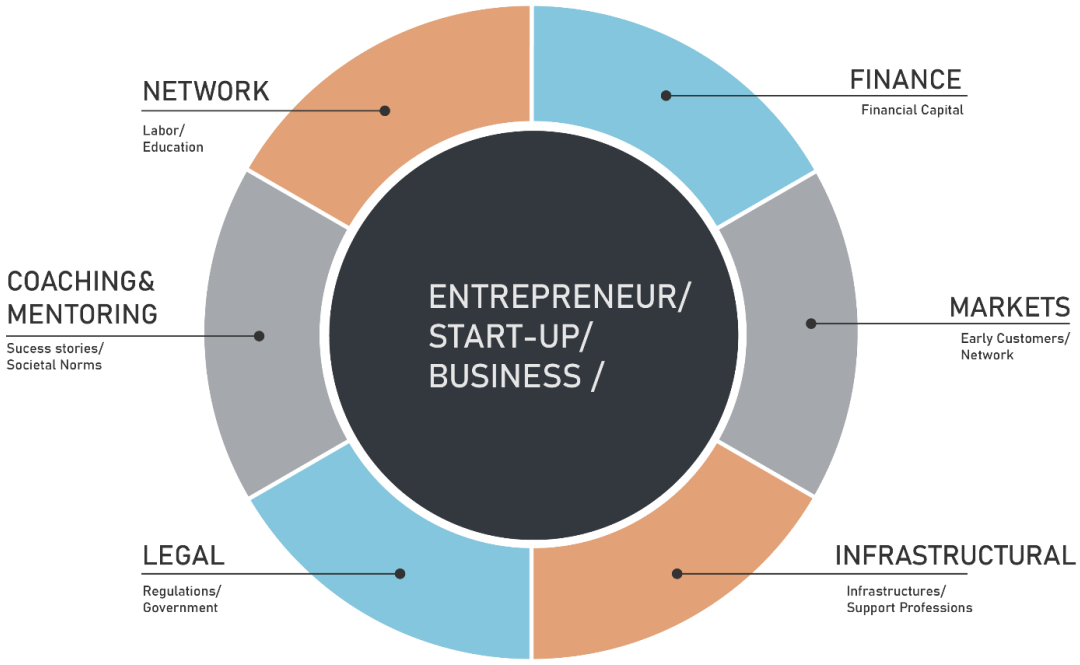
Taking a more holistic approach, through a wider lens, entrepreneurial ecosystems are comprised of attributes that may differ in their importance (Spigel, 2017). In his work, Spigel addressed the gap in the literature about the relationships between various attributes of an entrepreneurial ecosystem by providing a hierarchical model and applying it to couple cases. Entrepreneurial and start-up activity in this case, closely relating to a start-up ecosystem, is influenced by social, political, economic and cultural elements.

To contribute to the thesis project at hand, it should be mentioned that by nature all of these elements are dynamic and by itself curate an ecosystem, hence it is logical to assume that they change through the lifetime of a start-up. Considering how the benefits are created by multiple elements that contribute to an entrepreneurial ecosystem, Spigel categorized the attributes into 3 dimensions. *Cultural attributes* relate to the general consensus and opinion about entrepreneurship within a region that ultimately influences separate start-up entities. *Social attributes* are described as resources generated through a social network within a region and influences a start-up. It could be network density, knowledge exchange, maturity and etc. *Material attribute* directly translate in any tangible infrastructure or other resources that may constitute to entrepreneurial development – in e.g. financing opportunities, incubators, offices and etc. Spigel argues that these categories of attributes work in a hierarchical fashion and influence and reinforce each other introducing a complexity problem and an inter-organizational decision-making environment, which is slightly out of scope of this thesis project.



12 Attributes that constitute an entrepreneurial ecosystem and the relationship between them (Spigel, B., 2017)

The entrepreneurial start-up ecosystem is complex and multifaceted. The dynamic nature of it feeds into the constant change of the network and the focus actor – a start-up firm – has to consider its relationship with the ecosystem at critical times. The model used in this project reflect the surface level ecosystem models provided by Feld and Isenberg



13 Entrepreneurial Ecosystem Model used in this project

renaming the elements to be slightly clearer from a firm level. In this model the 6 elements are – *network, coaching & mentoring, legal, finance, markets & infrastructural.* Network element represent the ecosystem parts that result in relationships between various individuals in the labor market – the relationship between education institutions and firms, the ability of these institutions to grow competent workers and the quality of the labor market to facilitate knowledge transfer. Coaching & Mentoring dimensions also resembles a network-like relationship, but rather on a professional and cultural level. The idea here is that quality mentoring is provided only when an entrepreneurial community is established and there have been enough success stories that incentivize serial entrepreneurs to coach first-timers. Through close collaboration on a mentoring level, the community grows stronger and the potential to spur entrepreneurial activity grows larger. The legal dimension captures the policy and regulation decisions that directly affect the firm decisions on various levels. For example, it may be labor market flexibility level, tax subsidies, revenue tax, trade laws and similar rule sets. Infrastructural dimension represents the founding and supporting actors/institutions that help start-ups stabilize and facilitate their growth. It may be co-working spaces, legal advisory services, good internet connection, an abundance of accelerators and incubators to choose from and government driven direct support.

2.4. Entrepreneurial Ecosystem Influence over Start-Up Growth Stages

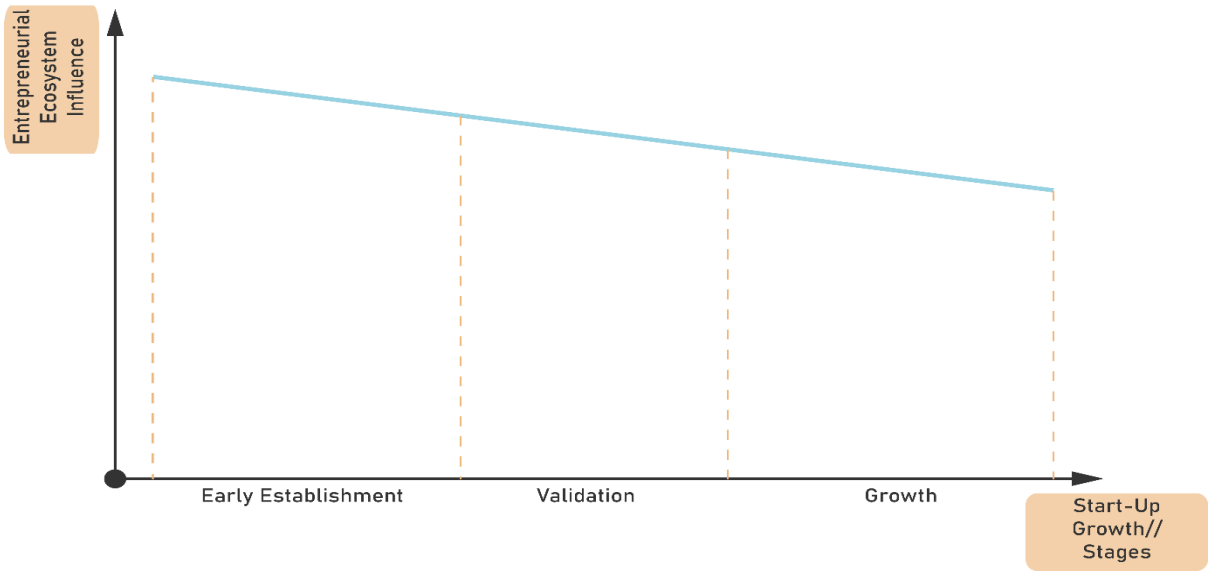
In the previous section the most popular ecosystem models have been reviewed in addition to the detailed elements of these models. Every model has described what constitutes an entrepreneurial ecosystem and why the proper development of every element is paramount to create a nurturing ecosystem. These models assume that an entrepreneurial ecosystem facilitates the growth rates of start-ups, by definition. The elements of an ecosystem denote the important channels of this facilitating support structure. Nevertheless, to scrutinize the entrepreneurial ecosystem actual influence over start-ups growth, it is paramount to understand to what degree these models expect an entrepreneurial ecosystem to be influential.

Feld (2012) emphasizes the importance of community in an entrepreneurial ecosystem that ultimately affect the way knowledge and resources are made available to various participants. He argues that experienced entrepreneurs should be the leading operators of an entrepreneurial ecosystem as they can understand the needs of new ventures. Nine attributes of a successful entrepreneurial ecosystem are also provided – *leadership, intermediaries, network density, government, talent, support services, engagement, companies, capital.* Through these elements an ecosystem should be able to support the whole set of needs a new venture, a start-up in this case, requires in order to grow. Special focus is given to the resources needed, mainly financial, infrastructure and talent, which a densely network ecosystem should be able to provide. Either way, according to Feld (2012) an entrepreneurial ecosystem is important through the life-cycle of a start-up towards every activity that relates to growth at almost equal rate, putting a slight emphasis on early stage development.

Isenberg (2011) in his work on entrepreneurial ecosystem model postulates 9 principles that should be followed in order to develop a healthy ecosystem. The principles are of a bottom-line approach and eventually focus on new venture creation and value creation process. Even though Isenberg does note that an entrepreneurial ecosystem is valuable through the life of a start-up, the general notion is to focus on new venture creation and stress the root causes/needs that start-ups face.

Spigel (2017) denotes 3 main categories of attributes that work together in a reciprocal fashion to develop a successful entrepreneurial ecosystem. Spigel focuses on the relationship between these attributes and on the policy level the most not giving a lot of focus onto how actually an ecosystem affects firm growth. Nevertheless, the 3 groups of attributes – *cultural, social & material* – are argued to have most influence into facilitating entrepreneurial activity. This means that the model Spigel proposes highlights the importance of an entrepreneurial ecosystem at the early stages of start-ups. In addition to this, the relational dimension of this model shows that success stories, or start-ups that achieved growth and sustainability, are important to facilitate entrepreneurial activity. Hence Spigel argues that an ecosystem is important throughout the life of a start-up, but a larger portion of focus is put on early growth stages.

In summary, there is an underlying pattern in entrepreneurial ecosystem models. All of these models point out that a well-developed ecosystem is influential through the life cycle of a start-up. In addition to this a larger weight of importance is given to the early stages, hence it may be assumed that the aggregate of these models shows a slightly diminishing importance of entrepreneurial ecosystems through a start-ups life-cycle.



14 Entrepreneurial Ecosystem Influence over stages

Considering the more detailed description of the start-up lifecycle through key business activities and critical junctures, it is necessary to underline how an entrepreneurial ecosystem may affect the key business activity. However, as mentioned this kind of research on a detailed level from a firm perspective has not been done or an academically viable study has not been found. So, in order to overcome this hurdle, a point from business ecosystem perspective is taken. Since a business ecosystem is an external factor that affects business (start-up) growth rather than internal, key activities

that require external capabilities are deemed to gain most from entrepreneurial ecosystem support. Activities that rely mostly within internal capabilities are deem the least to gain from ecosystem support. The third category of activities through this approach regard the key business activities that rely from both, internal and external capabilities. The third type is quite vague as most activities can be categorized here. To be more precise, first and second category activities can be done by mostly solely relying on internal or external capabilities, but the third one requires almost equal parts of both to be successfully done.

In e.g. developing a business model activity can be achieved relying only on internal capabilities of the founder. Gaining financial capital is by itself purely external, since the capital comes from outside. Scouting for talent probably relies on both, since knowledge of talent needed (internal capability) and the appropriate labor market presence (external) is essential to successfully complete this task. Therefore, in order to achieve a clearer view between Delft and Vilnius, all activities are categorized in 3 entrepreneurial support categories according to the literature interpretation – low, medium and high potential support. Empirical deviations from these categories may guide to compelling results and insights. All activity categorization is provided in Appendix 1.

2.5. Conclusion

Start-up growth and activity is an essential part of the high-tech ecosystem as a vast majority of technology-oriented solutions come from tech-clusters, therefore facilitating economic growth and an abundance of customer facing innovations. Through the life-cycle lens, start-up growth can be separated into several stages/phases that denote specific circumstances and requirements that these small companies face. Even though there are multiple life-cycle models, each of them is correct in their own way and a model is developed according to the interpretation a problem necessitates. In this project, a 3-stage model is used which is highly focus on the front end of a start-up's life-cycle – early establishment, validation and growth. This is due to the vast majority of start-ups being in the first phases and a large churn rate of growing start-ups leaving only a handful in a sustainability phase.

Since every stage has somewhat general requirements that start-ups must complete several barriers exist between stages that are stage contingent. In the early establishment phase a start-up seeks to recognize a market opportunity and build a solution that satisfies it. Notably a huge challenge is to find the leading customer that is more than eager to share its insights about how a solution should look like. In the validation phase, the challenge that a start-up faces mostly comes around validating a business model. It means that a company has to find a suitable business model around the designed solution and/or pivot in the process of doing so. In the growth phase, the challenges are highly organizational facing as the start-up seeks to achieve a self-sustaining company.

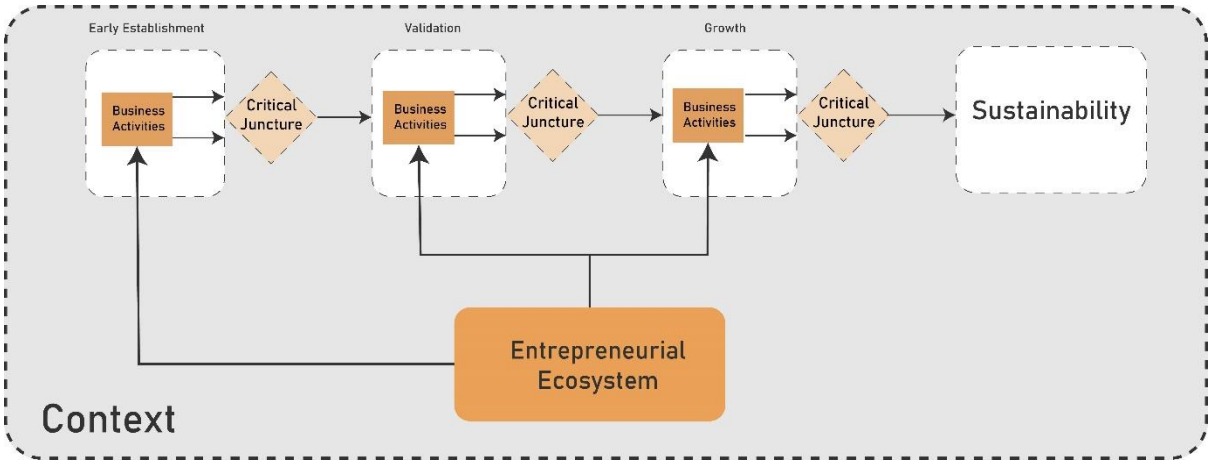
In order to navigate the barriers existent at every stage, a start-up proceeds in a range of business activities that help overcome these challenges to a varying degree. These challenges are also stage-contingent and range from early customer acquisition, minimum viable product design to network extensions and expansion of operational activities.

The activities are quite general to majority of companies with the addition of business activities that facilitate and support innovation that is apparent in most start-up companies.

Start-ups also operate in a business ecosystem, which in this project is more entrepreneur facing and is coined entrepreneurial ecosystem. It is a network of actors that facilitate or hamper start-up and entrepreneurial activity. Several elements of the ecosystem exist and their state of development influence specific start-ups or specific activities. In e.g. a well-developed financial infrastructure may help start-ups quickly gather financial resources or in some cases get enough funding to scale globally. It is important to mention, that every ecosystem is unique and has been and is developing in different ways. In the same example, one ecosystem may not be able to support a potential unicorn, while the other could easily do that.

So, as the entrepreneurial ecosystem may be able to support a specific business activity that a start-up partakes to overcome a stage-continent challenge, the ecosystem influence, if it exists, may also be stage-contingent and varying. It appears that academic literature takes entrepreneurial ecosystem necessity as a status quo and the influence of it towards start-up life cycle slightly diminishes from the early to growth stages. The connection of these models through a lens of a firm-level decision making may provide valuable insight into the extent of ecosystem importance in start-up growth and success daily.

Below, a conclusive theoretical model is presented that reflects the interplay between a start-up lifecycle, an entrepreneurial ecosystem and the contextual factors at hand. A start-up goes through its lifecycle by successfully completing key business activities that may be facilitated by an entrepreneurial ecosystem. The state of development of an entrepreneurial ecosystem and the entrepreneurial behaviour depend on the regional contextual factors that historically shape the effectiveness of the ecosystem support.



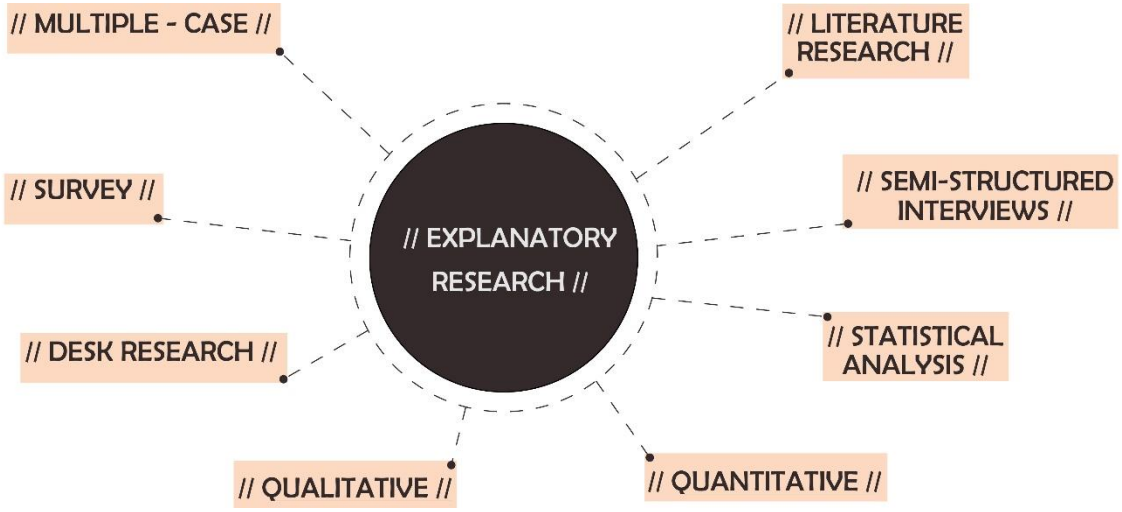
15 Context, Entrepreneurial Ecosystem & Start-Up Life-Cycle interplay

3. RESEARCH METHODOLOGY & REASEARCH DESIGN

Introduction:

This research thesis aims to understand the interconnectedness of two entrepreneurial topics – start-up life cycle and start-up/entrepreneurial ecosystem. Both topics are interpretative, to some extent, as definitions may vary on a case by case basis. Even though there is an abundance of academic research done under the umbrella of these topics, there is not a lot of research that connects and scrutinizes the relevance of both. The studies that do connect these topics are mostly single case study type, assume that entrepreneurial ecosystem importance is a status quo or study the topics on a regional level. Even though the case study approach does provide more detail and does make sense considering the uniqueness of every region, it does lack generalizability. The studies that are more generalizable are done on a regional level and sacrifice a lot of details that may matter for a firm level decision maker and not the regulator.

This study is exploratory, comparative case analysis that aims to understand the connection between an entrepreneurial ecosystem and the start-up lifecycle.



16 Type of research characteristics

Type of Research:

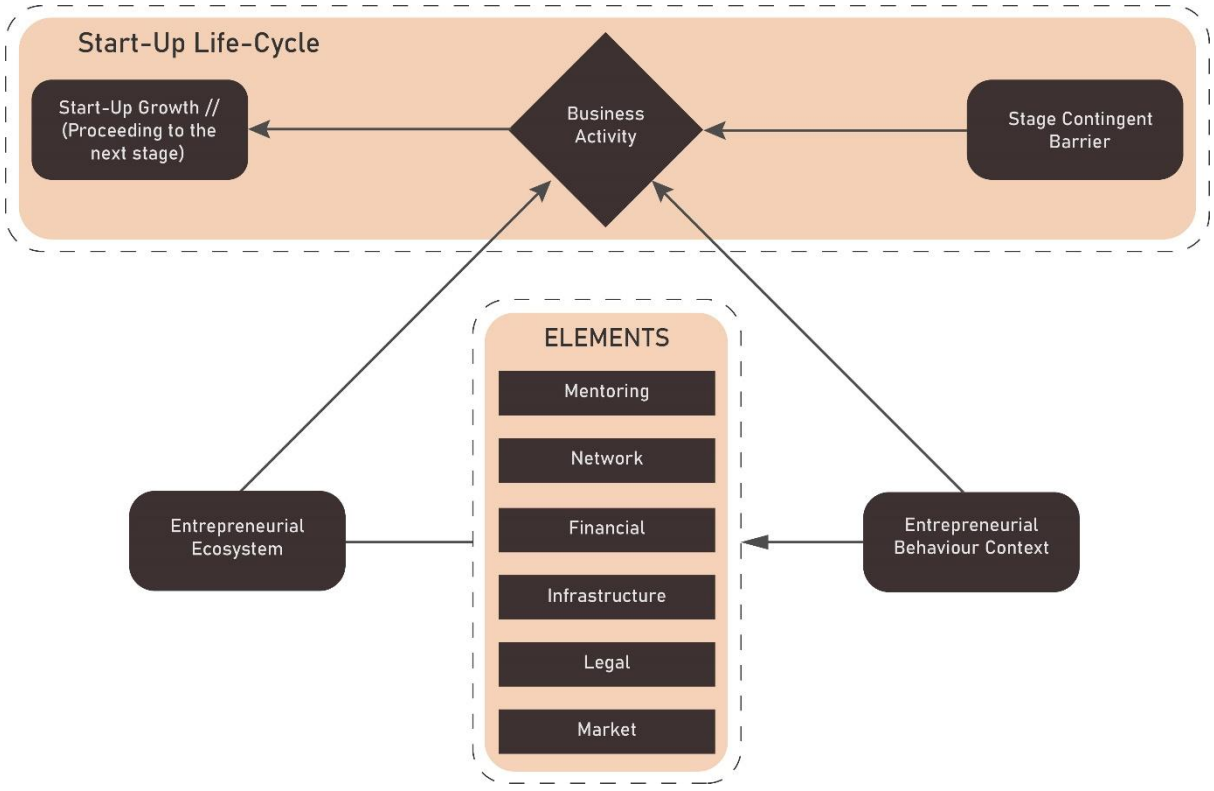
There is a gap in entrepreneurial and start-up lifecycle multidisciplinary research field that connects the ecosystem influence on the start-up day to day activities which are aimed to overcome stage-contingent challenges. Since the goal of this thesis is to understand the nature and the extent of said influence when other academic studies on this topic are rather scare, the study is explanatory. This implies that the underlying models of the entrepreneurial ecosystem and start-up lifecycle are scrutinized and interconnected on a conceptual level. Here it is not hold necessarily true that

an entrepreneurial ecosystem greatly influences start-up day-to-day activities, as academic research would suggest, but rather assume that some influence exists.

Table 1 Project Characteristics

Characteristic	Study influence
No prior research has been done or the existing studies are imprecise	Rather extensive literature review, every concept has to be taken into account with great critical point of view, need to find a good balance between precision and generalizability.
Has business value	The study has to aim for a set of results that are important for businesses and entrepreneurs.
Combination of theories	As the previous studies have been incomplete, this research has to take into account multiple theories in explaining the phenomenon and coming up with results.

This thesis aims to study the phenomenon on a firm level rather than a regional development level. In order to achieve this, the ability to overcome a stage-contingent challenge is defined through business activities that are considered important to do so and discussed in detail through the literature review. In addition to a more detailed and firm-level approach, the study is comparative. A comparative study provides more detailed insights when contextual matters of comparatives are explained. It gains similarity to global start-up reports (such as Genome), but also aims to scrutinize



17 Conceptual Study model

the underlying concept of an entrepreneurial ecosystem. Both academic topics are highly interpretive, and the result depends on the research design or tools used to make it as objective as possible. Since the nature of entrepreneurial ecosystems and start-up lifecycle topics are social sciences, the type of data gathered in order to produce objective results is mixed – quantitative and qualitative. In qualitative terms the study interprets the ecosystem and some expert opinions on start-up life cycle matter. Quantitatively, the study measures the perceptions of research subjects on cause-effect relationships between an ecosystem and the start-up life cycle. Mixed analytical methods are used to produce the results. Conceptually the study model is presented in Figure 17.

Context in this research works as a landscape that forms the entrepreneurial ecosystem and affect the decision-making process of an inhabitant start-up. The context does not change whether a start-up is in an early or a late stage in said region and it does not change whether the ecosystem influence is low or high, the change effect only occurs on a temporal dimension which is out of the scope of this study. Contextual dimensions of both regions are unique in a comparative fashion as historical events have shaped them in a specific way.

Choice of Compared Regions

In this thesis project, two entrepreneurial ecosystems have been analysed representing two regions – Delft, The Netherlands, and Vilnius, Lithuania. The comparative study has been chosen to give more detailed insight if similarities between regions have something in common or if differences occur only through contextual factors. Henceforth, the regions had to be different in multiple contextual dimensions but have some part of it common, so comparison can ensue. Both, Delft and Vilnius, are member states of the European Union and both regions focus on developing an entrepreneurial ecosystem. Nevertheless, the differences in the state of economic development, laws and regulations, social dimensions and the structure of entrepreneurial ecosystems provides enough differentiating contextual factors to derive meaningful interpretations. It is interesting to see how seemingly completely different regions on a contextual level behave similarly on a firm level and ecosystem level basis. And if the differences occurring on a firm-level can be explained by contextual factors.

Data Collection:

The data types used in this study range from qualitative to quantitative as the interdependent nature of this study requires to grasp multiple levels of detail. Qualitative data/information regards the contextual manners of the multi-case approach through dimensional description (contextual factors), expert opinions on the importance of business activities so some triangulation may be achieved and the ecosystem network description on a case-by-case basis. Quantitative data in this study refers to some descriptive statistics about both regions – economic, demographic and etc.- in order give an image of the regional context, measured perceptions of ecosystem influence and business activity importance by start-up respondents and general company details that shape the profile of a respondent.

Qualitative data and information in this study has been gathered through multiple methods. First of all, an extensive literature review has been done to gather information on relevant business activities within every stage in the model used. This has been done through search engines (Google Scholar, Web of Knowledge and etc.) with a focus on *venture creation, venture growth, business growth, entrepreneurship process, business establishment, start-up process* and similar keywords that encapsulate the process. The selected books and articles have been read through in order to obtain relevant information and code it under general business activities coming with a list of stage-contingent activities. Secondly, interviews with several experts have been scheduled to assess the same topic – important business activities to overcome stage-contingent barriers. Adding several expert opinions to the data collected via literature review, triangulation is achieved to some extent and relevant business activities are validated. Third, the context of both Delft and Vilnius regions is defined through desk research. Some of this desk research is directed at interpreting the information available online, collecting information about the stakeholders in the ecosystem and defining the contextual dimensions in a qualitative manner.

Quantitative data and information were gathered through surveys and desk research. First, a list of start-ups in both regions was generated through an online search with the use of several databases (Dealroom & Crunchbase) [6]and through ecosystem operator (only viable in Vilnius through Startup Lithuania) [7]provided lists. The start-ups were categorized by size, industry and valuation, if applicable. The list corresponds the population size that was used to distribute the survey. Second, a survey was designed (See Appendix 2) with the goal to gather information from the population about the perceived importance of an entrepreneurial ecosystem, which ultimately defined the sample size by the respondent count. Through the first part of the survey the general data about the company, in order to create a profile, was collected. The second part asked the participants to evaluate the relevance of given business activities to overcome specific challenges at a given stage on a scale from 1 (negligible) to 5 (necessary). Third part of the survey evaluated how start-ups perceive certain ecosystem elements in being supportive for a given business activity to generate successful results. Here the respondent evaluates on a scale from 1(insignificant) to 7(essential) an ecosystem element in being relevant to support a given business activity (e.g. safeguarding intellectual property). In addition to the start-up focused data, quantitative data about the context and the ecosystem was collected.

Interview design & responses:

A semi-structured interview framework was used to collect quantitative information from several selected experts. The qualitative information here refers to the importance of business activities in order to overcome stage-contingent challenges. The experts were selected from both regions. Since this information was not regarded as the priority for this study, the relevant expert number was held low and eventually 3 experts were interviewed. There were 4 main questions asked that were kept quite open and the interviewee was given the questions prior to the interview. These questions referred to the position of the expert in order to validate his/her expertise, if the respondent agrees and to

[6] See Databases at https://dealroom.co/ and https://www.crunchbase.com/
[7] See Database at https://www.startuplithuania.com/startup/

what extent with the framework of start-up life cycle, what challenges this respondent sees as the most important a start-up may face at a given challenge (in his/her view of the start-up life-cycle) and what activities this respondent held as important in order for a start-up to grow. All interviewees validated most of the important business activities gathered through the literature review highlighting the need to focus on customer, innovative behaviour and management, finding a fitting team and a fitting market. The mentioned key business activities and their validation by the interviewees is provided in Appendix 2.

2 Interview Information

Interviewee	Position	Country/Region	Interview time	Goal	Type
A	Academic Expert	Netherlands, Delft	43 minutes	Business Activity Validation / Ecosystem information	Semi-Structured
B	Ecosystem Operator	Lithuania, Vilnius	54 minutes	Business Activity Validation / Ecosystem information	Semi-Structured
C	Governmental Support Institution representative	Lithuania, Vilnius	49 minutes	Business Activity Validation / Ecosystem information	Semi-Structured

Survey Design:

The survey was used to collect quantitative data about start-up perceptions regarding important business activities, entrepreneurial ecosystem influence over said activities and descriptive profile data of respondent start-up companies. The survey primarily used rating scales with interval level measurement, where differences between ratings reflect the magnitude of perceived importance/influence. The survey has been divided into 3 main parts – company profile information, start-up activity importance and entrepreneurial ecosystem importance.

In the first part of the survey, start-up company profile data was collected. Profile data means that a company provides general information about itself, so it can be seen whether the respondent sample better represent a population or a specific group of companies, grouping methods may be applied in the analysis stages of research and general descriptive statistical methods can be used. The information gathered to profile the company includes respondent contact info, company name, employee number and start-up stage. More detailed information about the company current status was collected in order to generate a more detailed. The more detailed questions include:

- *Whether a company is trying to expand internationally;*
- *What was the sales volume (revenue) in the past two years;*
- *Has the company been profitable in the past two years.*

The second part of the survey relates to the business activities that start-ups hold important and 3 start-up stages. The business activities used in this survey are derived from the literature review and validated by the expert interviews. Here the activities were separated into 3 groups representing 3 distinct start-up stages, as has been done in the literature review chapter. Since the keyword here is *importance* and the question measures start-up perception towards a business activity, a rating scale was used with interval values are assumed. Nevertheless, since every company operates in a rather unique way and the business activities are represented in a general way the survey assumes that the respondent answers should weight into the middle of the rating scale. In order to represent the extremes and the neutral points of the scale, extremes were worded as *negligible* and *essential*, the neutral point was labelled *situational*. It should now be obvious why it is expected that companies tend to the middle of the rating scale. The reason why this is important lies within the research question and the approach towards the study. This study tries to scrutinize whether the ecosystem is actually important or not and extreme and different answers than the expected provide much more valuable insight. The rating scale used was 1-5.

An example question in the second part of the survey:

How important are these activities in the early establishment phase?

The third part of the survey has focused on the respondent perceptions of entrepreneurial ecosystem influence on supporting the given business activities. Here it was assumed that if an entrepreneurial ecosystem has influence on start-up growth and general activity it appears through support for various business activities. This is because an ecosystem is a network of actors cantered towards an entrepreneur and the support provided is mostly indirect. The extent of support for an entrepreneur is known only when an ecosystem element is able to provide support and the entrepreneur knows that the support is available. Simply put, entrepreneur perception of ecosystem importance reflects the state of an ecosystem in a region and hence the magnitude of influence it asserts. Ultimately an ecosystem that exerts more valuable support at a specific business activity is deemed better at a specific dimension.

For this part a rating scale single question was issued that measures ecosystem perceived influence over key business activities. The business activities were not categorized into stage-contingent categories so potential bias can be eliminated and the survey may seem more approachable. A respondent had to rate 14 business activities on a scale from 1 to 7. As in the previous question it was assumed that the responses should have a tendency towards the neutral point if an ecosystem is supportive in all dimension equally and the supposed influence of an ecosystem is taken as a status quo. Any deviation from the neutral point will be regarded as significant and a foundation for scrutiny. The minimum importance of an ecosystem (rated 1) was labelled as insignificant and the maximum perceived importance (7) was labelled as essential. Considering that the nature of business is networked, no min-max responses were expected. Furthermore, as an entrepreneurial ecosystem consists of several dimensions and their influence may differ from activity to activity (e.g. a strong labour market may not be very influential on an activity of raising venture financing capital) a somewhat detailed explanation of an entrepreneurial ecosystem and its dimensions was provided for the respondent. This way a respondent was given s a basic understanding of what is measured, and we could assume

that when an ecosystem influence was rated a specific dimension corresponding a key business activity was more likely responsible for the rating than the others.

The key question in the 3rd part of the questionnaire was frame in this fashion:

How relevant is the entrepreneurial ecosystem in providing support for these activities?

Conclusively the survey results presented 5 data sets that were used for the analysis of the entrepreneurial ecosystem influence – company profile, importance of key business activities in the 1st stage, importance of the key business activities in the 2nd stage, importance of the key business activities in the 3rd stage and the entrepreneurial ecosystem influence over key business activities. The rating of a business activity importance and the rating of entrepreneurial ecosystem influence on said activity correspond the entrepreneurial ecosystem influence over stage-contingent challenge.

Data Analysis:

The data that has been collected through the survey, distributed to start-up founders in Delft and Vilnius, is analysed through statistical inferential tests. An inferential statistical test describes a method (most often a tool) of extracting (inferring) some qualities, underlying dimensions of a population from a given sample (Field, 2013). Most of these tests require a relatively large sample size to be statistically significant, especially when a population is hard to quantitatively estimate. In addition to this issue, a test requires specific qualities of the data set (dependent, independent variable types and quantities).

In the survey, conducted through this research, most of the variables were of interval nature and only a handful of categorical nature (mainly start-up stage, country or industry). If the respondent sample was not an issue, the most appropriate test to be conducted would have been an ordered logistic regression – a category predicting model based on probability estimates derived from a logistic equation model. Ideally it would show the most important (predictor) variable in each stage, according to the stage a respondent start-up is at, and the magnitude of influence over predictive power of a model. However, the actual sample size in this research was too small for such a predictive model to be significant or even be able to do anything (Field, 2013). Therefore, the main analysis tool used throughout this project is an independent sample t-test. The test compares the overall scores on a variable from a sample against the "expected" score that would represent a population (Field, 2013). This test was used because the survey data collected represents two different conditions a respondent may belong/be attained to – either a participant is in Delft or in Vilnius. Since it is impossible infer differences between these regions from a single respondent, multiple independent respondents with different conditions were selected.

The dependent variable here is the interval variable measured through the survey (in e.g. business model design importance) and the independent variable is the category the cases refer to, which in this research is the country of origin (or region). This test has served as a foundation for following comparative discussions between 2 regions as both, similarities and differences, were of interest, especially considering the different contextual factors that have

evolved in both regions. By connecting the entrepreneurial ecosystem support variable differences and magnitudes, a clearer picture has emerged that gave insights into the interaction between an ecosystem, a start-up that operates in it and the context of the region.

In order to conduct an appropriate and scientifically procedural independent sample T-test, several assumptions had to be met. Even though the test by itself is quite robust towards some deviations from the assumptions, corrected violations may yield more significant and objective results and improve internal validity (Field, 2013). The assumptions are testes before and in-between conducting a T-test and are listed as follows (Field, 2013):

- **Independent observations**. The cases, or observations, must be independently collected and cannot have influence over each other. This holds true, since every case represent a different individual respondent (start-up founder) and the data has been collected through an online, personal invitation survey.
- **The dependent variable must be normally distributed**. The distribution of the dependent variable response must follow a normal distribution. This assumption, if violated, can be corrected through data transformation to some extent. Nevertheless, the independent t-test by itself is quite robust to violation of this assumption (Reference). A non-parametric test may be used in order to check the robustness at a glance.
- **The dependent variable must be homogenous across both populations (regions)**. The standard deviations of the dependent variable must, more or less, be equal in both populations. The test for this assumption is done a T-test is run, so It will be tested, and the results presented. To correct the test, if violation is uncovered, the process is straightforward and will be described if such violation appears.

Additionally, a correlation matrix was derived from the entrepreneurial ecosystem support data set, that showed significant correlation between ecosystem support variables on a region-by-region basis. The multiple significant correlation was used in addition to the contextual qualitative information in order to derive reasons why an ecosystem has been more/less supportive for a given business activity in a specific region.

Alternative Used Analysis Methods

The data set qualities and the research question at hand initially has called upon numerous analytical methods that could be have been used to produce general results. 3 statistical analysis tools have been used prior to the attempt of an independent samples T-test, but have been disregarded as non-significant, non-valid or too sensitive.

First analysis tool was a linear multiple regression. The idea here was that independent variables, perceived key business activities, would affect a single dependent variable – start-up growth. The model ideally would predict at what start-up stage (or growth) a company would be at depending on the importance put on key business activities at every stage. It then would help start-up realize which activities are important at every stage. Then adding the perceived ecosystem support to the mixture, it would have been possible to quite accurately assess to what extent an ecosystem is helpful. The dependent variable (called start-up growth) was a score derived from a stage a start-up was in, its revenue, profitability and size (employee count) – basically a score of success. The main pitfall of this approach – too many

independent variables or not enough cases to make the model robust, it was extremely sensitive to small changes in value (in e.g. deleting one case), the dependent score was not entirely representative of the issue at hand. Nevertheless, with a bigger sample it would have been possible to create such a model and maybe even add the ecosystem support as an interactive (moderating) effect to the model.

Second model used was also a linear regression, but it was based on a factor analysis generated output. The idea here was to lower the number of variable so the multiple regression model would become more robust and less sensitive. A Principal Component Analysis was used for the data reduction as some correlation were observed. The initial tests have shown 3-4 extractable factors from the stage-separated data sets. The extracted factor outputs for every case (as z-scores) were used as an input to the multiple regression model. Even though the whole concept here statistically is quite viable, especially if we consider the entrepreneurial ecosystem obvious correlations, the approach did not work here for simple reasons. One was the lack of decent sample size that would follow a rule of thumb for factor analysis (5-10 times more cases than variables), another was the difficult interpretation and the third was the dependent variable (growth score) irrelevance in this study.

The third analysis tool was the most promising and the most difficult to complete properly – ordinal regression analysis. Understanding that the growth stages indicated by the start-up respondents is a categorical variable with a rather natural order, which is much better than o comprised growth score (a little bit sketchy), a logistic regression was the answer. The idea was that start-ups in different growth stages value activities at every stage differently and the latter stage start-ups are more accurate in their valuation of key business activity importance in earlier stages. By grouping these respondents according to the stage, they were in, a predictive model could be designed, that would predict a start-ups stage probabilistically depending on the valuations of key business activities. By inverse, the model would provide effect sizes of each key business activity and ecosystem support could be introduced as interaction effect in the model. Nevertheless, even though the model in the end was significant, the variable effect was not with relevant quasi-separating data points. This meant that the data set was way to small (case-wise) to conduct such a model without it being too erroneous. A large samples size (100+ cases) would provide very accurate result through this model in regard to key business activities. Although, the results, especially when entrepreneurial ecosystem support is included as an interaction, are notoriously hard to interpret since everything rests on probability and effect size measurements.

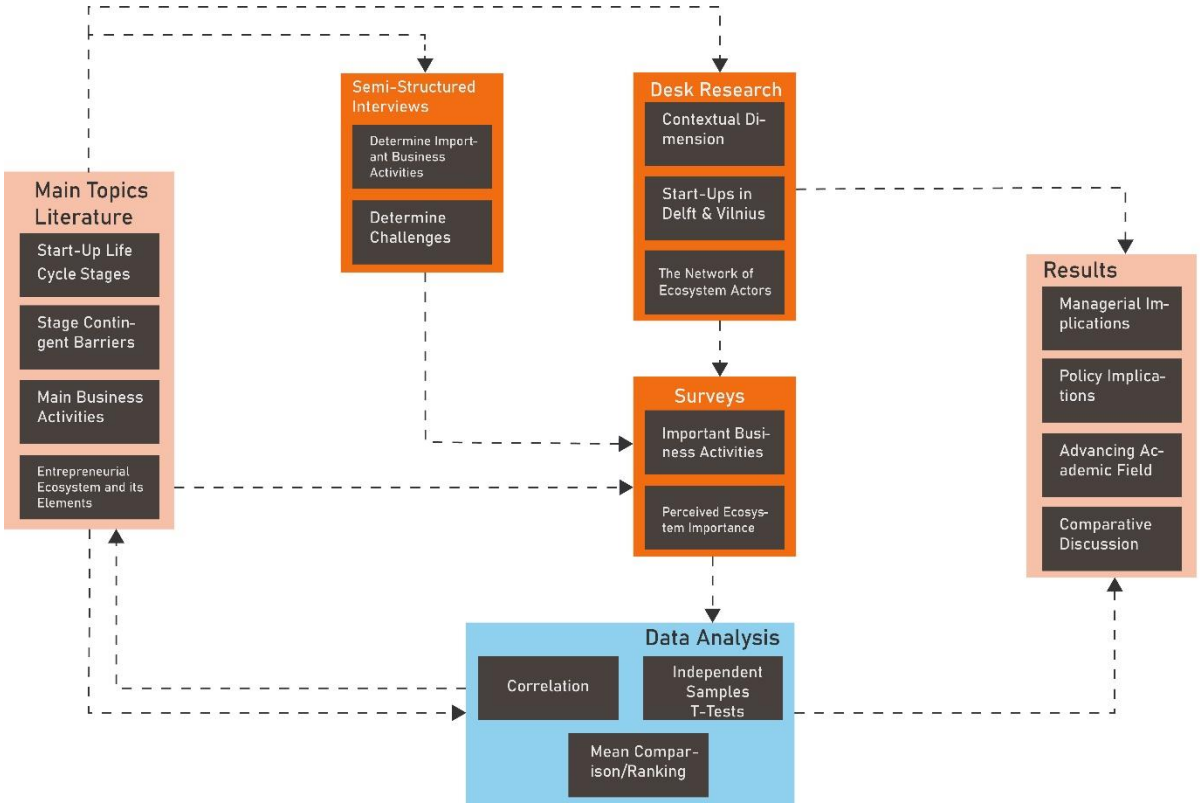
Validity and Reliability

The external validity refers to the degree the finding of a study may be generalized and used in other settings, while internal validity defines the degree of the causal effect (Sekeran & Bougie, 2016). In the survey phase of the research, the population was picked from the imminent and most available information databases/source. For example, most of the Delft start-ups come from YES!Delft and DelftEnterprises nearly disregarding other possible organizations. This decision may have influenced the external validity of the study through purely selection bias. The type of the study – two-case comparison – affect both the internal and external validity of this research project. On one hand, the causal effect between an entrepreneurial ecosystem support and start-up growth is rather dangerous to conclude as the study describes the situation at a particular time. On the other hand, entrepreneurial ecosystems are quite unique and as in

the field of entrepreneurship in general, case study analysis does not necessarily translate into generalizable results regarding the causal relationships. It may be that a similar ecosystem from a context point of view may be analysed, when some differences in type of industry or start-up stage may show completely different results.

This study uses a Likert type of scale to measure perception of entrepreneurs in both regions. Since the scale is not large and important points are represented by explained adverbs, the study from a quantitative data point of view is quite reliable. Nevertheless, this only holds true if temporal dimension is not taken into account. Start-ups operate in highly dynamic environments, entrepreneurial ecosystems and context change. This mean that an entrepreneur taking the same survey another day may give different results if the company has moved to another situation. Therefore, temporally speaking, the study does present some reliability issues as it has been done on a fixed point in time.

Research Design Summary:



***18** Research Design Model*

The research design of this study follows a simple route. First of all, a literature review and research study are undertaken to understand the main focus fields of the thesis project – *start-up life cycle & entrepreneurial ecosystem.* In the start-up lifecycle studies, the focus is on the life cycle model itself, the barriers start-ups may face in their path to growth and activities that said companies undergo in order to overcome these challenges. In the entrepreneurial ecosystem studies, the focus is on the entrepreneurial ecosystem model used in this thesis project and the underlying elements that provide a more detail foundation for further research process. This part of the study is highlighted in a light orange box within the figure. After the literature review is completed and the main elements of an ecosystem are

defined in addition to the model used to delineate life cycle stages of a start-up, a desk research is conducted. The goal of the desk research is to collect all publicly available and relevant information about the state of ecosystems in Delft and Vilnius, a list of start-up companies that operate in these regions and profile them and to figure out who are the main ecosystem actors that operate the entrepreneurial ecosystem in addition to some detail about them.

After the desk research has been done and the main actors and elements established in detail, the study proceeds to its qualitative data acquisition phase. Here semi-structure interviews are carried out in order to gain insight into what some experts think are the main barriers and activities at given start-up life cycle stages and present their view about the entrepreneurial ecosystem. This information validates and/or extends previously collected information through literature review thus triangulation is achieved to some extent. The goal of these interviews is to gain input data to proceed with the surveys.

In the survey phase, a survey is designed to gather information from the list of start-ups that was created in the earlier phase. The information gathered includes – a profile of a company, how important are given business activities at start-up life cycle stages and how a responded start-up perceives certain ecosystem elements of being important in supporting a business activity. The data gathered in the contextual sub-phase and the surveys feeds into the analysis phase. Here the quantitative data available is ran through several statistical analysis methods to see whether there is any significance. The tools used range from simple descriptive statistics and correlation to multivariate analytical tools.

The interviews, literature review and the analysis phase feed into the discussion phase. Here the study will try to underline the most important implications for management on a firm level through a strategic lens, potential policy implications that may be issued to evolve the ecosystem further based on its weak parts at every stage of the start-up developments and a comparative discussion to find similarities within how start-ups approach the barriers and use the ecosystem at hand in Vilnius and in Delft.

4. DESK RESEARCH

In this chapter, we present the desk research results – the collection of data about the contextual dimensions of Delft and Vilnius. These regional context factors affect and shape the entrepreneurial supportive ecosystem and affect firm behaviour. To categorize relevant data, we adopt a reduced PESTEL framework. The reduced framework considers these relevant contextual factors: (1) political, (2) economic, (3) social and (4) legal. Factors are complemented by entrepreneurial ecosystem stakeholder structure.

4.1. Political Factors & Institutional Context

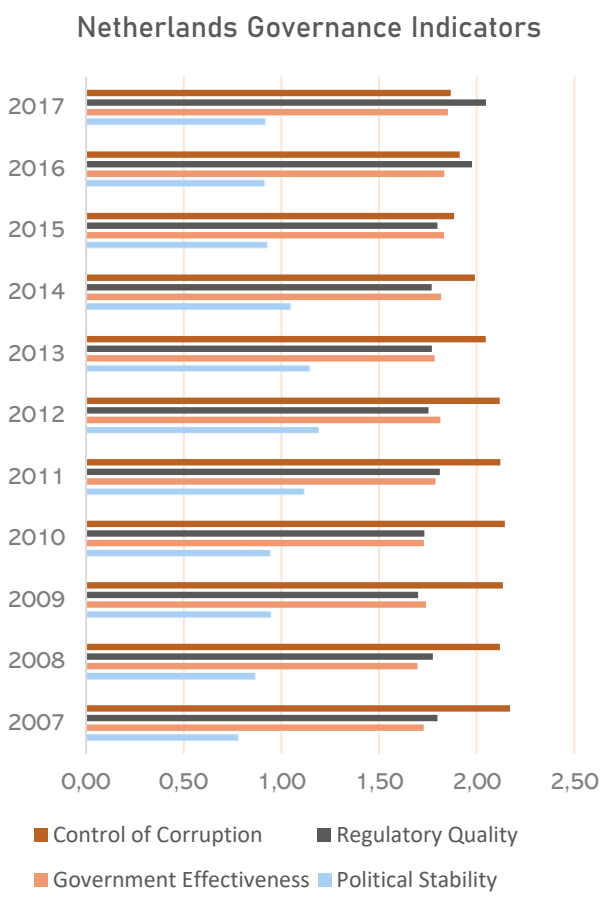
Delft [NL] & Vilnius [LT]

The Worldbank organization provides multiple indexes to measure political factors of every country in the world. Here, we are interested in the Worldwide Governance Indicators[8] project which presents 6 indexes. Out of these 6 indices, 4 of them profile the Netherlands and Lithuania in this study. The indices are:

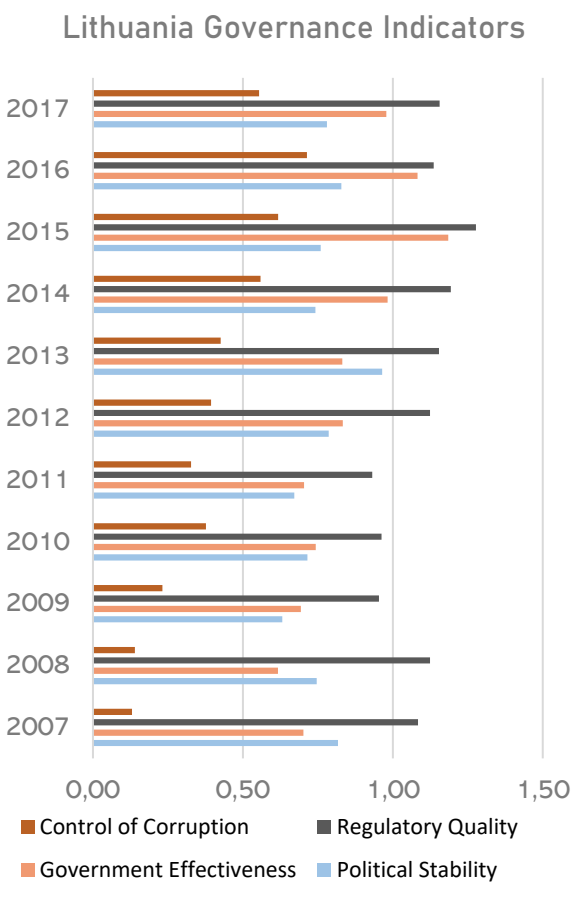
- Political stability – measures the likelihood of political instability.
- Government Effectiveness – the quality of public services, policy formation and credibility to carry out the said policies.
- Regulatory Quality – this is the ability of the government to implement sound policies that facilitate private sector development.
- Control of Corruption – the perception of how public power may be used to exercise private gains.

The indexes measure the data on a scale from -2.5(Weak) to 2.5(Strong). Government Effectiveness in Netherlands is rated as one of the strongest in the entire Europe region and falls slightly below Norway, while Lithuania is far behind the Netherlands. The Netherlands Regulatory Quality is the strongest and highest-ranking index in Europe, whilst Lithuania cannot demonstrate a surprisingly high rating. The difference between the Regulatory Quality ratings in these regions is influential for start-up communities, as robust regulatory framework provides stability and clarity. Control of Corruption index is also ranked as one of the highest in the world with Stability index being slightly above average terms for the Netherlands. In Lithuania, the index of Control of Corruption, reflects that corruption control is becoming more transparent and stricter.

[8] Worldwide Governance Indicators by World bank. https://info.worldbank.org/governance/wgi/#home



20 NL Governance Indicators



19 LT Governance Indicators

Ultimately, the indices paint a picture of Netherlands as an extremely competent, coherent and credible government, where agenda settings and resource allocation on a national level should be taken for granted in the long term. Lithuania, on the other hand, scores averagely on government indices with a tendency to change for the better.

The labour market in the Netherlands is strictly regulated and rather tight – meaning a high demand for workers with a rather limited supply[9]. The tight regulation comes from a high minimum wage (5th in the world) and government commitment to take action against underpayment[10]. In 2019 several new regulatory laws pass aimed at strengthening trade secret protection, increasing the low VAT rate, self-employed professionals are given compensation, minimum wage increase and etc. It gives indication of tight control and regulation in favour of the employee, rather than the employer. The minimum wage in Lithuania currently is one of the lowest in the EU, increasing slowly. According to the employment flexibility index, Lithuania has had a big leap since 2017 labour law reform[11]. The deregulation of the labour market means that a businesses should respond better to market fluctuations. It is curious that both regions

[9] Tightness of the labour market in The Netherlands - https://ec.europa.eu/eures/main.jsp?catId=2588&acro=lmi&lang=en&countryId=NL&regionId=NL0&nuts2Code=null&nuts3Code=null&regionName=National%20Level

[10] The Netherlands commitment to proper payment - https://www.government.nl/topics/minimum-wage

[11] Labour market regulation in Lithuania Report - https://en.llri.lt/dedicated/labour-market-regulation

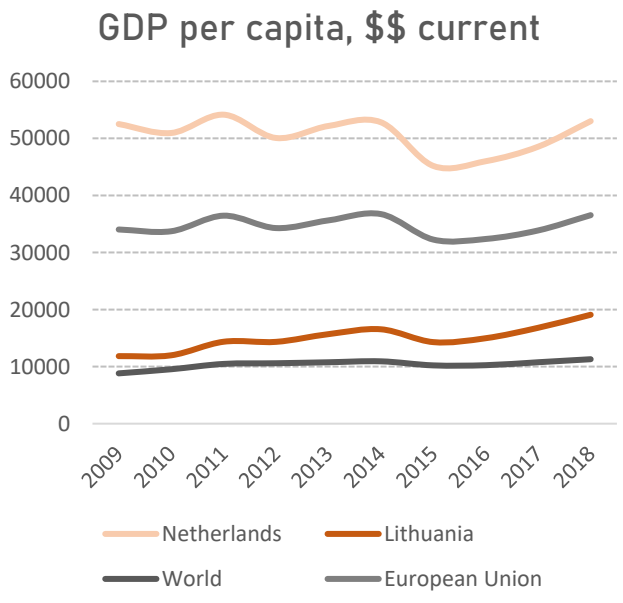
take different approaches to labour market regulation policies while both aim to stabilize economic growth and activity, though Lithuania takes a more ECB postulated guideline of labour market deregulation.

4.2. Economic Factors & Industry Context

Delft [NL] & Vilnius [LT]

Similarly, as in the political factor section, economic factors apply on a national level. GDP (gross domestic product) per capita is one of the most frequently cited economic development indicators that represent the monetary value of goods produced in the country divided by the population.

Netherlands GDP per capita is quite large and surpasses the world average several times (see Figure 20). The GDP and inflation rate charts (see Figure 21) show tendency towards growth. This growth may be due to ECB interest rate policies, although these topics are out of the scope of this projects. Nevertheless, it is commonly agreed that a rise in inflation boosts short-term spending since perceived risk of future money worth decline is rising. Since consumption is rising, the value produced is also rising meaning that Netherlands do not rely on imports to satisfy the increasing demand, but rather increase the internal production and supply.

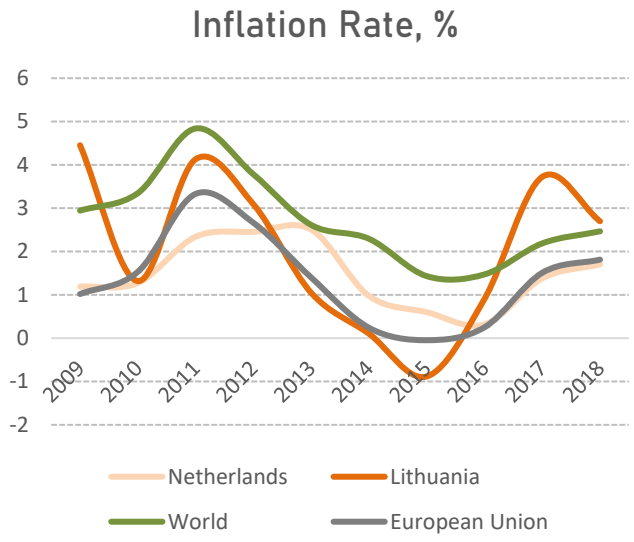


21 GDP per capita, current $$

Vilnius is the capital of Lithuania, the biggest city and the economy within the country. Lithuania has been a member of the European Union since 2004 with an intent to collaborate with other EU countries on open trade and economic growth. Lithuania's GDP per capita has been increasing since the last recession in 2008. However, the value added through productive means by an average individual in Lithuania is closer to the world average than to the EU average – in 2017 it was 16.8 thousand US $$ while EU average was 33.8 thousand US $$[12]. The growth of GDP in the recent decade indicates a steadily growing economy, which implies growth opportunity for businesses.

Inflation rate in Lithuania recently (as of 2018) fell to a stable 2.7%, closer to the EU average of 1.81%. The inflation rate growth though the EU have been accustomed to extremely low ECB interest rates (approaching 0%) in order to

[12] Information on inflation rates and GDP available at https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG

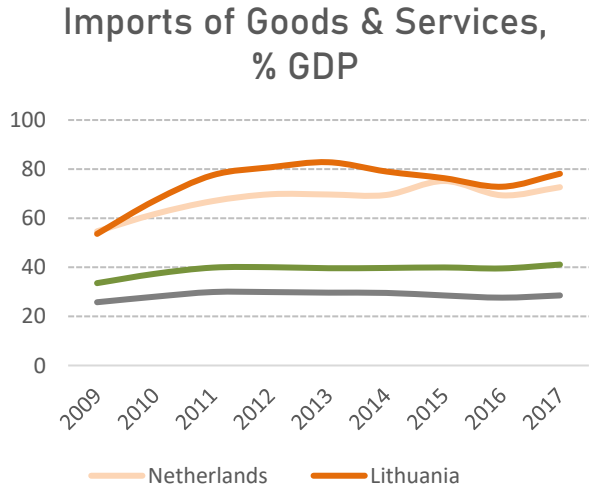


22 Inflation Rate, %

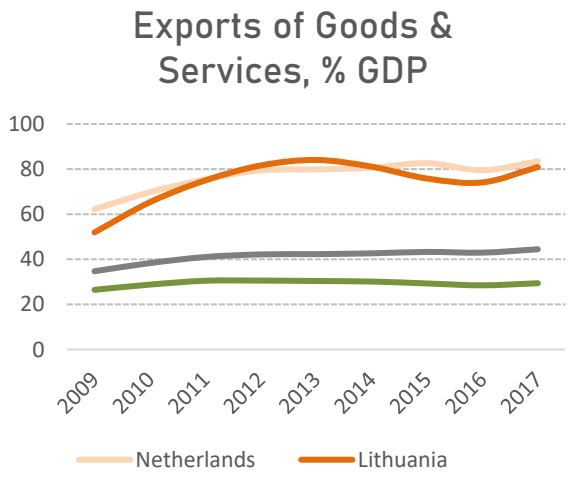
fuel the economy through borrowing. However, the indication of a very high interest rate in Lithuania may translate in higher interest rates in the near future and a slowing down economic growth which in turn could decrease business growth. ECB price stability function is focusing on long term inflation rate of 2% or lower[13] and that should be achieved soon.

Trade is another part of the economic dimension that we consider as an indication onto why specific industries grow and emerge within a country. Interestingly here, both export and import volumes in the Netherlands are almost double the average of the EU[14], indicating an active economy. The exports of goods and services slightly exceed the imports, hence implying a growing economy, strong currency and potentially lower unemployment rates (see Figures 22 and 23). For start-ups it may imply access to large markets and well-regulated trade policies. However, it also implies much higher levels of competition in the early stages, when markets are approached. Lastly, both imports & exports are showing a growth trend, which does prove an economic expansion once again. Since economic expansion attracts more individuals to start businesses, it is not farfetched to assume that economic growth may result in a more active start-up community.

On the trade dimension, the percentage of exports of goods and services of GDP in Lithuania has been higher than the imports, even though the country runs a trade deficit. Since aggregate trade deficit takes goods into account rather



24 Imports of Goods & Services, % GDP

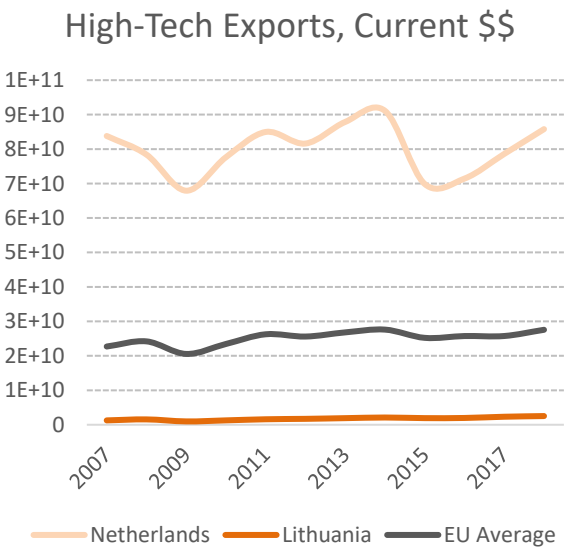


23 Exports of Goods & Services, % GDP

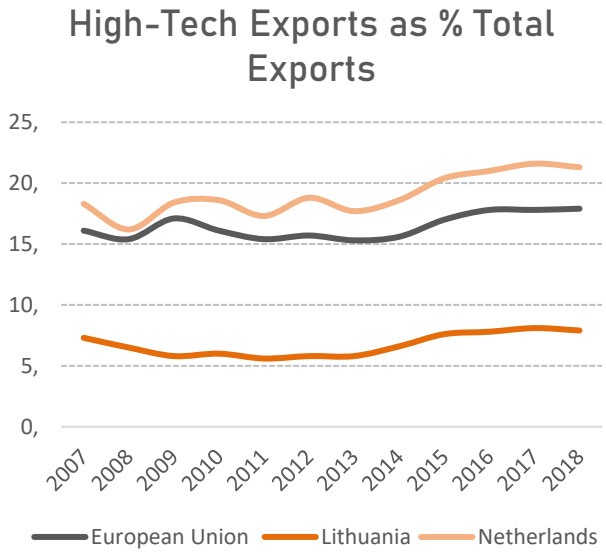
[13] ECB price stability at https://www.ecb.europa.eu/mopo/strategy/pricestab/html/index.en.html

[14] Information on Imports/Exports of goods and services available at https://data.worldbank.org/indicator/NE.IMP.GNFS.ZS

than including services, it means that Lithuania produces significantly more services than it imports. As it can be seen the closest trade relations are kept with the neighbouring countries and the economics powerhouses of the EU. Even though the trade deficit is not that large, the existence of it means that businesses are more focused on import relationships rather than production. It is nearly impossible to highlight the factor that leads to a deficit without going too much in detail – which is out of the scope of this project. Nevertheless, the export and import indicators of Lithuania show an active and growing economy with a significantly larger indices than the EU average. An active and growing economy is a good indicator for a business to emerge, so it would be no surprise to notice an uptick in new established ventures and growing businesses.



26 High-Tech Exports, Current $$



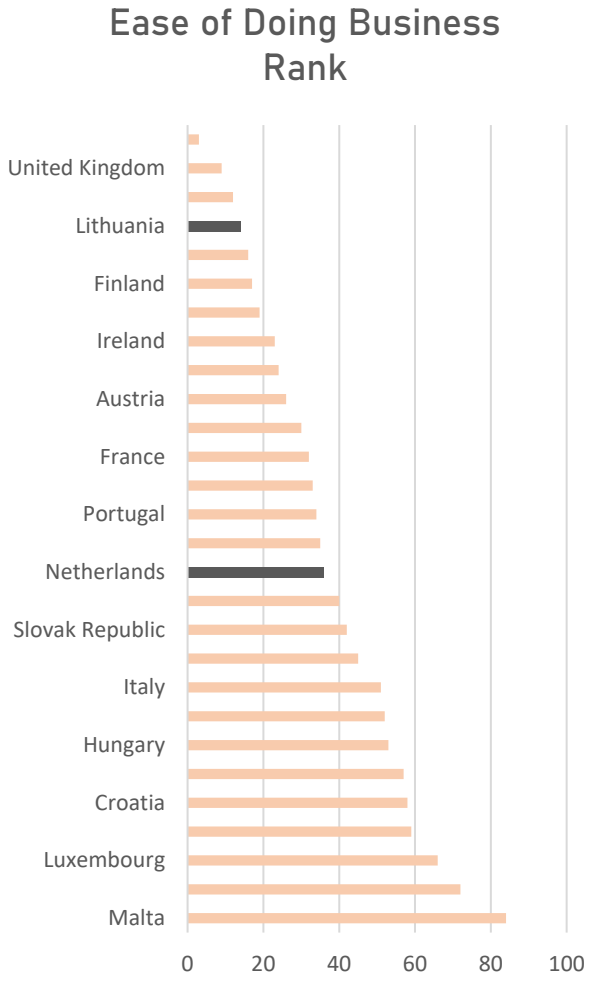
25 High-Tech Exports, % Total Exports

A lot of start-ups do operate in the high-tech sector, so we consider the high-tech related production within the country. In Netherlands, high-tech exports have hovered around the EU average for the past decade, but in the recent years it has grown significantly on an annual basis (see Figure 24 and 25). This means that The Netherlands is more competitive globally than an average EU country and inhibits good market conditions to produce high-tech products.

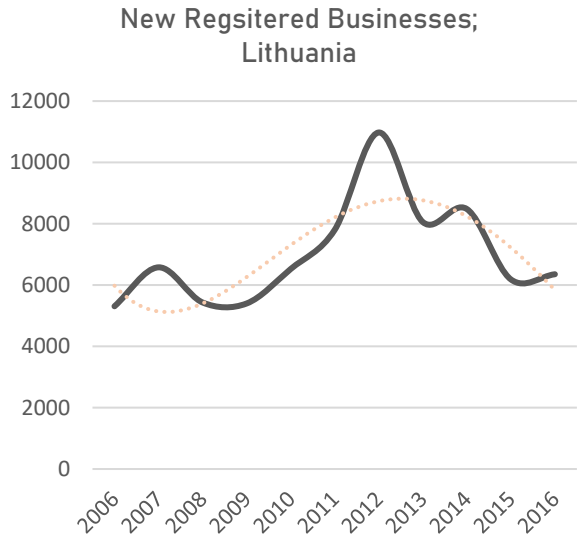
Recently high-tech exports in Lithuania have been increasing and have reached ~6% GDP at 2.16 billion US $$[15]. The growth is unsurprising since Lithuania is a member of EU and has been quite active in pursuing the EU Commission agenda through budgeting allocations. In 2017 Lithuania has seen a large % increase in high-tech exports comparing to EU average, which means a developing manufacturing sector and a more internationally competitive economy, assuming that high-tech rises competitiveness.

The last of the indexes to be considered in the economic dimension of the regional context relate to the business environment. These indexes are – Ease of doing business, start-up procedures to register a business, new business registered & foreign direct investment. These indices appropriate the business environment hostility and activity.

[15] Information on High-Tech exports is available at https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS



27 Ease of Doing Business Ranking

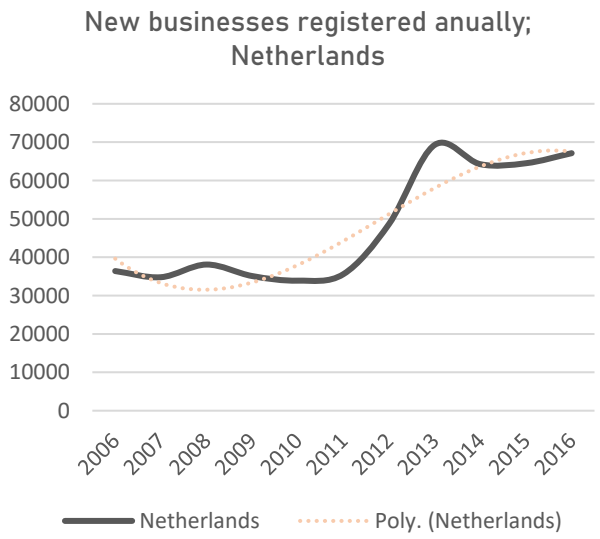


28 New Registered Businesses, Lithuania

Netherlands are amidst the average in the EU in the ease of doing business rank[16]. This rank represents how regulatory environment is conducive to business operation and how intravenous is it on a day-to-day basis. This fact results from a previous analysis of strict regulations in the Netherlands and active policy formation and motivation to regulate every aspect of the economy. It is reasonable to assume then that even though opportunities in the Dutch economy are plenty, it is not so easy to chase them from the get-go. Lithuania has been ranked 4th in EU region in 2018 ease of doing business ranking (see Figure 26). The rank shows that it is quite easy to open a business due to a fast and informative registry procedure, low costs of application, ease of getting financing, comparatively lower taxes and time – cost efficiency of trading within borders. It makes sense that an individual with an idea for a business would be motivated to start a venture on these comforting foundations. However, there have not been a largely increasing amount of new registered businesses in Lithuania recently (See Figure 27) and there is hardly an evident reason for this phenomenon which description is out of scope of this project.

According to these indices there is some growth in new registered businesses in the Netherlands, which does corelate with the growth of economy (See Figure 28). Interestingly there is an increase in foreign direct investment over recent years. Considering the new business registry growth and the decreasing timeframe to establish a start-up, it is safe to assume that there is an increasing amount of financial resources available to start-up entrepreneurs.

[16] Ease of doing business ranking available at https://www.doingbusiness.org/en/rankings



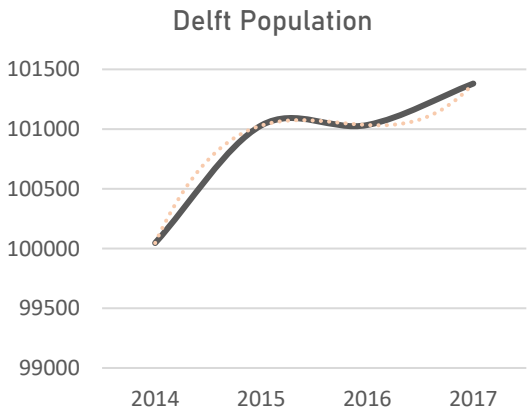
29 New Business Registered, Netherlands

4.3. Social Factors

The social factors dimensions of the PESTEL analysis framework delineate the demographics of the subject in question. Here the population statistics and data are used to paint the image of potential trends and influences into start-up activity and growth.

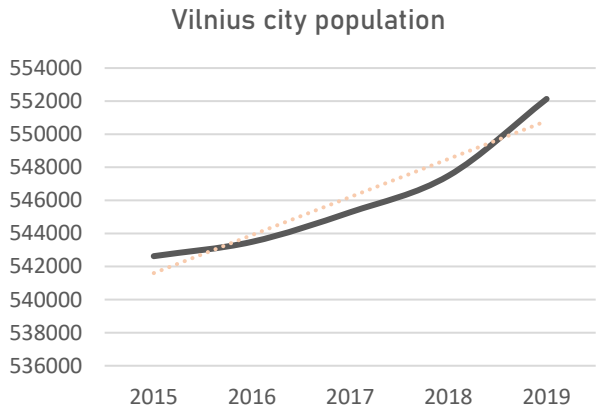
Delft [NL] & Vilnius [LT]

Vilnius is the capital of Lithuania with a population of 552 thousand at the start of 2019[17]. The number of people choosing to live in Vilnius have been growing over the past years even though Lithuania has been suffering from a declining and aging population. However, the increase in population in Vilnius is due to an increase in young individuals – children, teens and young adults (students). Since a younger generation is driving a lot of novel ideas, the city of Vilnius has seen a boom in cultural activities, various community events and profession related seminars. Since the cost of living in Vilnius is much larger than in other cities, even nearby, the people who choose to do so are prone to be focused on their career and are active in pursuit of professional interests.

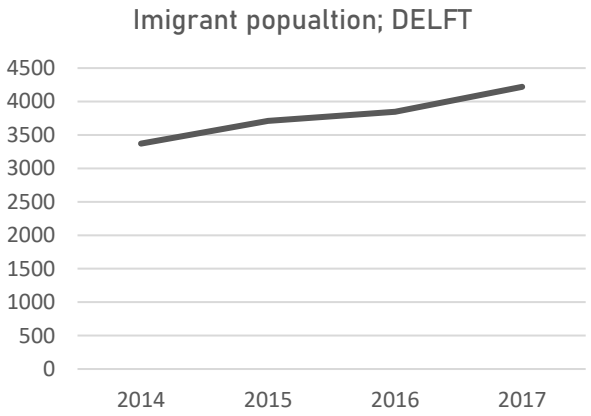


30 Delft Population

[17] Recent population info available at https://madeinvilnius.lt/naujienos/gyvenimas/vilnieciai/idomioji-statistika-kiek-sostineje-tiesu-gyvena-gyventoju/

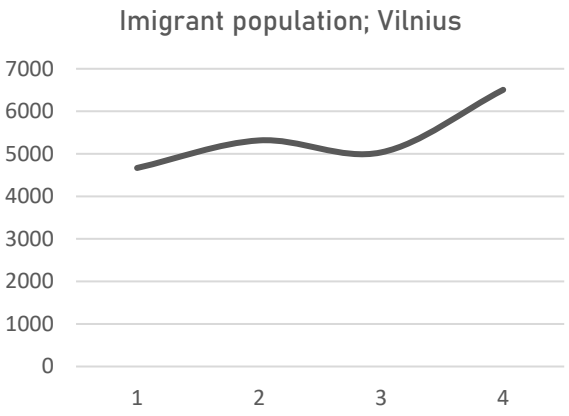


32 Vilnius Population



31 Delft Immigrant Population

Moreover, in the recent years there has been an influx of immigrant individuals to the city of Vilnius. However, it is hard to determine whether such individuals are a talent spill over from other countries or just low-tech workers from Eastern Europe. Either way, there is an increase in multicultural aspect about Vilnius, which may be of significance.



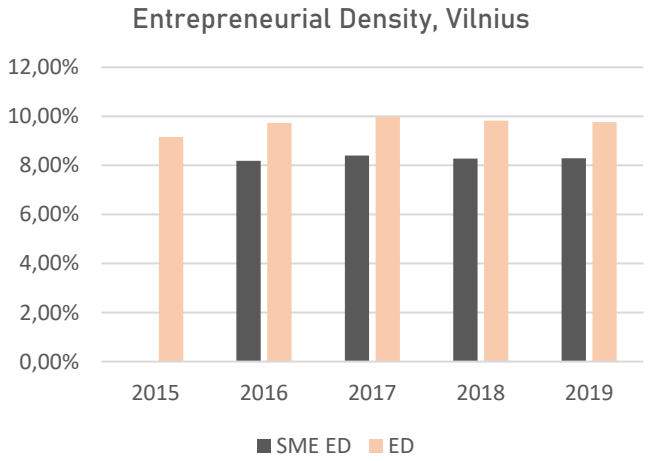
33 Immigrant Population, Vilnius

Population in Delft in 2017 has reached 101381[18] registered individuals. There has been some growth in the recent years which attributed to approximately 0.3% annually. However, this growth is lower than the national population growth which stands around 0.6% meaning that Delft population growth is slowing down relatively to the whole Netherlands. Furthermore, the number of immigrants annually is also rising and at a much larger pace ~9% than the general population growth. This may be attributed to several factors – most probably the growth of TU Delft. The immigration growth has numerous benefits, mostly attributable to cultural diversity that ultimately leads to a more tolerant community and an abundance of differing ideas. The most important area of the social dimension in Vilnius is the entrepreneurial density, especially around SMEs and the number of students currently living in Vilnius. Entrepreneurial density is simply the entrepreneur population in the entire population. The higher the number the more entrepreneurial is the community in general, potentially. However, it is hard to get a good number of entrepreneurs simply because some of the companies are founded by one person while other may be co-founded by 2 or more. Thus, the averages have to be used, but since only the rends are needed and the numbers for comparison, it should be enough.

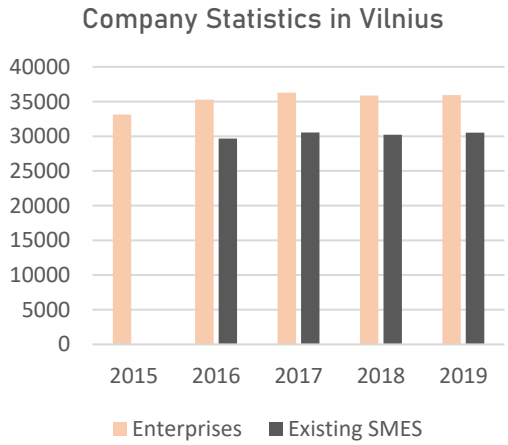
[18] Recent Delft population available at https://www.citypopulation.de/php/netherlands-admin.php?adm2id=0503

According to the most recent data of operating companies in Vilnius and the general population, around 9.6% percent of Vilnius population are entrepreneurs when corrected for the average founders per company (1.5 in this case). 8.3 % of the population are SME owners[19]. The density has not been changing over the past years but has been on the same level even though the population has been growing and through a younger side.

The exact historical company statistics in Netherlands are difficult to come by – are unreliable or behind a paywall of the chamber of commerce. In 2018 there were 18650 companies registered in delft of which around 15850 were SMEs. Considering the population statistics and registered companies Delft entrepreneurial density is around 23%. This is a huge number meaning that a lot of companies have clustered around Delft. This may be attributed to multiple factors as Delft has good infrastructural connections to other large cities and transport connections, is highly appreciated by tourists and boasts a well renowned university.



34 Entrepreneurial Density Vilnius



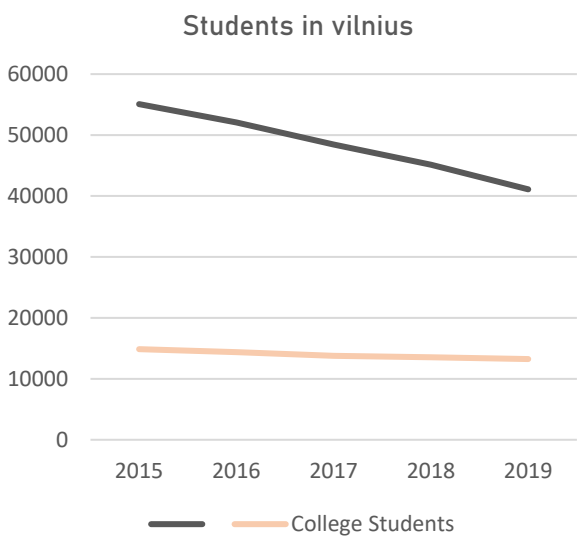
35 Firm Statistics Vilnius

Lastly, there are several universities and colleges in Vilnius which specialize in multiple areas. Recently there has been debates about conjoining several universities to create one or two, which would cover a wider area and the initiative would decrease the costs of operating these institutions. To give a number, there are 11 universities in Vilnius including a couple of arts academies. Excluding, the number of universities sits at 8. This is comparatively a very large and an inefficient number of higher education institutions in a city of half a million individuals. The problem that arises here is the competence these universities can provide. It is a chain of simple logic that concludes the argument that a small capital in eastern Europe with average economic development rates cannot provide high quality educators to so many higher education institutions. This remains more of a fact when average salaries are included.

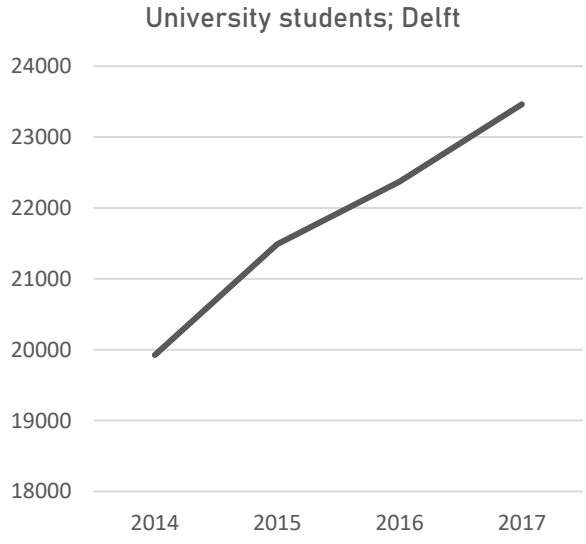
Delft does not house a lot of universities or collages. The only university in this town is TU Delft with a population of 23461 students in 2017 which is around 23% of the entire Delft town population[20]. Arguably Delft is a highly

[19] Data to infer Vilnius firm statistics is used from https://www.stat.gov.lt/
[20] Stats from TU Delft at https://www.tudelft.nl/en/about-tu-delft/facts-and-figures/education/student-population/

intercultural place swarming with young and ambitious individuals which ultimately results in a space generous with novel ideas. There is an observed student growth of 5% annually in TU Delft.



37 Vilnius Students



36 Delft Students

The number of students in Vilnius has been declining over the past several years, even though the amount of education institutions has not. The decline can be attributed to the aging population in Lithuania and the fact that a lot of students come to Vilnius from towns throughout the whole Lithuania. Nevertheless, there has been a slight increase in students in a couple of most influential universities in Vilnius, which does contribute to a larger number of well-educated individuals.

4.4. Legal Factors & Policy

Delft, Netherlands

First, in the Netherlands corporation tax rates depend on the taxable amount of income annually. If a company has a taxable amount which is less than 200000 EUR, the tax is 20%. If the taxable amount exceeds 200000 EUR annually, the tax rate is 25%[21]. These tax rates are similar to rates in other European countries that well developed. In addition to this, a Dutch company may qualify for an innovation box if it operates to create intangible and patented assets, which are in-house innovations. The tax rate for income generated through these assets is 7%[22]. It applies to royalties generated through patent licensing, direct profits from developed innovative technologies and basically anything that

[21] Info from https://www.government.nl/topics/taxation-and-businesses/corporation-tax

[22] Information from https://www.tax-consultants-international.com/read/Tax_Incentives_netherlands?sublist=3626&submenu=3644

relates to innovative activities to generate profits. In addition to this, there is no upper limit of assets that can qualify for the innovation box.

Second, there are several tax incentives that may contribute to establishing a start-up. Incentive for research and development (WBSO[23]) focuses on promoting corporate R&D through tax deduction. The deduction occurs through wage related taxation on R&D work. R&D allowance accounts for 32% of the first 350000 EUR of the wage bill per calendar year and if the bill exceeds this amount, the allowance drops to 16% for the rest. For start-ups the first allowance increases to 40% while the second one is the same 16%[24]. The peculiar thing is that self-employed entrepreneurs that spend time on R&D can also apply for this allowance, which basically means that a single person start-up that focuses on innovation in the early establishment stage can get the operational costs way down.

If a company invests in energy-efficient technologies and assets it is viable to qualify for the energy investment allowance (EIA[25]). Through this allowance a company can offset the investments made in these technologies against the corporate income tax. Currently a business entity engaging in such investments can deduct 45% of the investment costs from fiscal profits, which contributes to almost 13.5% tax advantage. Therefore, it is viable to assume that incentive exists for companies to engage in energy-efficient technology R&D and investment, explaining the surge in sustainability tech in the Netherlands.

There are around 30 subsidy programmes directed at various industries to strategically facilitate the development of companies within these industries in the Netherlands[26]. It is out of the scope of this project to cover most of them, but, a high-tech start-up can qualify for multiple tax deduction schemes from its early days up until a self-sustainable company has been established. One of the more peculiar funding schemes that directly affect start-ups is called proof-of-concept funding, through which a start-up or an SME can apply for a loan for proof-of-concept validation.

Moreover, if you are a self-starter and self-employed entrepreneurs you may be eligible for private business ownership allowance that permits you to deduct from annual gross profits to pay lesser amounts of tax. However, you must work at least 50% of your working time on your established company. In addition to this, an SME can deduct up to 14% from its annual profits after deducting the private business ownership allowance to reduce the taxable income amount even more.

Third, the employee wage taxation rates are important, since it affects the number of employees a company may be able to employ and what salaries make most sense at a given circumstance. Currently there are 4 tax grades that relate to annual wage paid to the employee. From lowest to highest these tax grades are – 36,65%, 38.10%, 38.10% and 51.75%[27] . Higher wages on the upper limit incur high taxes. The VAT has 3 grades in the Netherlands and

[23] R&D tax credit info at https://english.rvo.nl/subsidies-programmes/wbso
[24] Info at https://www.tax-consultants-international.com/read/wbso
[25] Info at https://english.rvo.nl/subsidies-programmes/energy-investment-allowance-eia
[26] Info from https://english.rvo.nl/subsidies-programmes
[27] Info at https://www.belastingdienst.nl/wps/wcm/connect/bldcontenten/belastingdienst/business/payroll_taxes/you_are_not

corresponds to similar rates in other EU countries. A 0% VAT may apply when business is done with other countries in EU, 9% for certain products and 21% for the rest.

Fourth, protection laws and regulations affect firm activities in numerous ways. An IP protection law that gives a certain time frame to complete the patent application may be very beneficial for some companies. Poor protection laws can result in hidden patents and reduced transparency which hampers technological innovation. Currently the Netherlands fall within the same GDPR rules as other EU countries in protecting personal data[28], which affects B2C companies the most and requires transparent information provision. Patent protection in the Netherlands is like other EU countries. A company may issue a national, regional or an international patent. If a company in the Netherlands chooses to apply for a national patent, it has 1 year to file the same application for other countries called a priority year. Through this time a company may engage in research activities to choose the countries to which a patent may be applied. Furthermore, employees that happen to come upon an invention at their workplace by chance may be eligible to patent it themselves rather than through the company they work at. It depends on the employment contract or the job description. If both decisively point that an employee is working on inventions for the company, the employer is qualified to patent rather than the employee. But if the invention comes upon in a different area than the employee was assigned at, the said employee may patent the invention.

Vilnius, Lithuania

In Lithuania the corporate tax rate currently is 15% on the table profits of any Lithuanian business entity. If a foreign company does business in Lithuania it is taxed the same amount, except when the profits come from royalties and compensation for copyright laws and related rights. In that case the tax for profits accrued from such activities is 10%. There are some nuances for the companies that do not exceed a specific size and can gain some deductions on tax. If a company employs less than 10 people and the revenue is less than 300000 EUR annually, in the first tax period the corporate tax rate is 0% and 5% for the following periods. Essentially this tax scheme incentivized companies to be established giving them room to growth through tax cost reductions.

If a company in Lithuania accrues cost through R&D, these costs may qualify for taxable income deductions. The deduction is however not a percentage value, but rather a fixed deduction which depends on the costs accrued through R&D. The company can deduct 3 times the R&D costs from the income statement at the end of the taxation period. Ultimately it means that a company that actively participates in R&D can lower its taxable income by deducting 2 additional amounts of R&D spending. In 2015 15 the deductions amounted to 77.5 million EUR through multiple companies. This is an additional deduction scheme that may help innovative companies grow[29].

_established_in_the_netherlands_are_you_required_to_withhold_payroll_taxes/when_you_are_going_to_withhold_payroll_taxes/calculating_payroll_taxes/rates/rates-for-2019/table-1-graded-tax-system-payroll-taxes-2019

[28] Info at https://gdpr-info.eu/

[29] Info at https://mita.lrv.lt/uploads/mita/documents/images/infografikai/pelno_mokescio_lengvata.png

Moreover, if a company accrues income from patented invention through selling, using or transferring the said invention profits are taxed on the lower amount of 5% rather than 15%[30]. Essentially it motivates companies to build their value propositions on innovative solutions and pursue R&D activities to speed up the patenting cycle. In addition to tax deductions, companies in Lithuania may also qualify for various types of funding that depends on the nature of the company and is backed-up by EU regional funding.

Firstly, a company can apply for funding at the early stage of development. To be precise the stages range from ideation, prototyping to proof-of-concept[31]. The funded activities also include employing researchers and subsidizing their pay out in order to let SMEs be able to employ highly educated and experienced individuals without accruing too much cots. However, the funding pool in this area is not that large – around 5 million EUR. However, even this amount is sufficient enough to help some companies and especially start-ups to go through the early establishment and growth phases without much operational costs.

Secondly, entities that pursue R&D activities and are affiliated with educational institutions – such as university spin-offs – may be eligible for partial funding to introduce an innovation into the market. The main funded activities are prototype demonstration, test batch manufacturing and final proof-of-concept directly to the customer. The activities are quite vaguely defined, but the message is clear – spin-offs and educational institution may leverage these funds to back their technology transfers and commercialization[32].

Third, the wage taxation in Lithuania does not scale incrementally as does in the Netherlands. The salary taxation occurs monthly and only has the lower limit called non-table income amount. In 2019, there has been a change in the taxation scheme that taxes the salary from the employee side rather than from the employers. Ultimately it does not change a lot, since the employer must pay the taxes either way, but the distribution of the tax revenue on the government level changes. The tax rate did not change however and still is around 41%, which is a considerably large even through developed EU countries. The VAT rates in Lithuania are similar to the Netherlands. The VAT brackets are 0%, 5%, 9% and 21%. Ultimately the non-zero VAT brackets depend on the products sold and the 0% VAT accrues to international trade in certain occasions[33].

Talking about IP protection, the laws that regulate it in Lithuania are a standard issue of EU. A company must apply for a patent towards a patent office and is given a priority year to screen potential patenting opportunities in other countries. However, a subsidy program exists called Innopatent, through which a company can fund the costs of the patent process for up to 30000EUR. This subsidy comes from the similar are of funding backed up by EU that incentivized SME establishment and motivates innovative activities.

[30] Info at https://finmin.lrv.lt/lt/veiklos-sritys/mokesciai
[31] Info at https://mita.lrv.lt/lt/veiklos-sritys/programos-priemones/inostartas
[32] MITA information Lithuania. https://mita.lrv.lt/lt/veiklos-sritys/programos-priemones/mtep-rezultatu-komercinimas
[33] Tax rate and VAT at https://www.vmi.lt/cms/pridetines-vertes-mokestis4

Conclusively, the legal framework in Lithuania does not differ significantly from a relatively standard frameworks apparent in the EU. However, there is are much more options to leverage tax incentives for young companies in Lithuania.

4.5. Institutional Entrepreneurial Ecosystem Network

The institutional network denotes the main actors of an entrepreneurial ecosystem that contribute to the support activities for young entrepreneurs and start-ups. Since to detail the individual actors that may affect the outcome of an ecosystem is out of the scope of this project, the actors described here are of institutional nature – serve many start-ups and promote a growth. In addition, the focus lies upon start-ups, so the institutions and organizations that help SME's in general will not be discussed. The reason is to understand the difference between Vilnius and Delft in regard to the institutions built to nurture start-ups.

Delft, Netherlands

The entrepreneurial ecosystem in Delft is built around the high number of people studying in TU Delft and the magnitude of research output that this educational institution provides. The ecosystem structure in Delft is quite robust and the main support activities lie within few institutions that, in the words of Feld (2012), would be regarded as leaders.

First of all, YES!Delft[34] is a somewhat self-proclaimed (there is no factual data to back this up) leading tech incubator in Europe that supports young entrepreneurs from the ideation phase up until potential exits or IPOs. The incubator focuses on several high-tech areas that are trending in the start-up world – blockchain, biotech, cleantech, robotics to name a few. The incubator supports potential start-ups and entrepreneurs through 3 dedicated programs that tackle specific challenges. Either it is a market-fit research through validation lab, building the first business model and scaling-up through the accelerator program. The incubator works closely with TU Delft and even provides credited courses for wannabe entrepreneurs to learn the early ideation hurdles through a practical program. YES!Delft closely collaborates with numerous corporates to source the funds into the start-ups or find collaborative potential for the incubated companies[35]. The corporate partners include 3M, Shell, TataSteel, NS railways and etc. From the research point of view the closest and seemingly strongest collaboration is with TU Delft and several other research organizations -TNO, Robo Valley and etc. As start-ups find challenges in their path to growth that may require knowledge and expertise that lies way beyond their abilities, YES!Delft holds close relationships with outside service providers, such as E&Y, Exact, Bird&Bird, to mediate a mutually beneficial relationships for start-ups. From the government point of view, the incubator mostly relates to the advisory governmental institution StartupDelta, the

[34] One of the main incubators in Delft https://www.yesdelft.com/
[35] The information at YES!Delft website - https://www.yesdelft.com/about-us/#ecosystem

municipality of Delft and the European institute of innovation & Technology. Lastly, YES!Delft provides a service called YES!FUNDED that helps start-ups find investors for a small fee and investors to find valuable start-ups to invest in. Therefore, relationships are built between various venture capitals and investing organizations that ultimately source a large portion of start-up funds.

38 YES!Delft Stakeholder Network

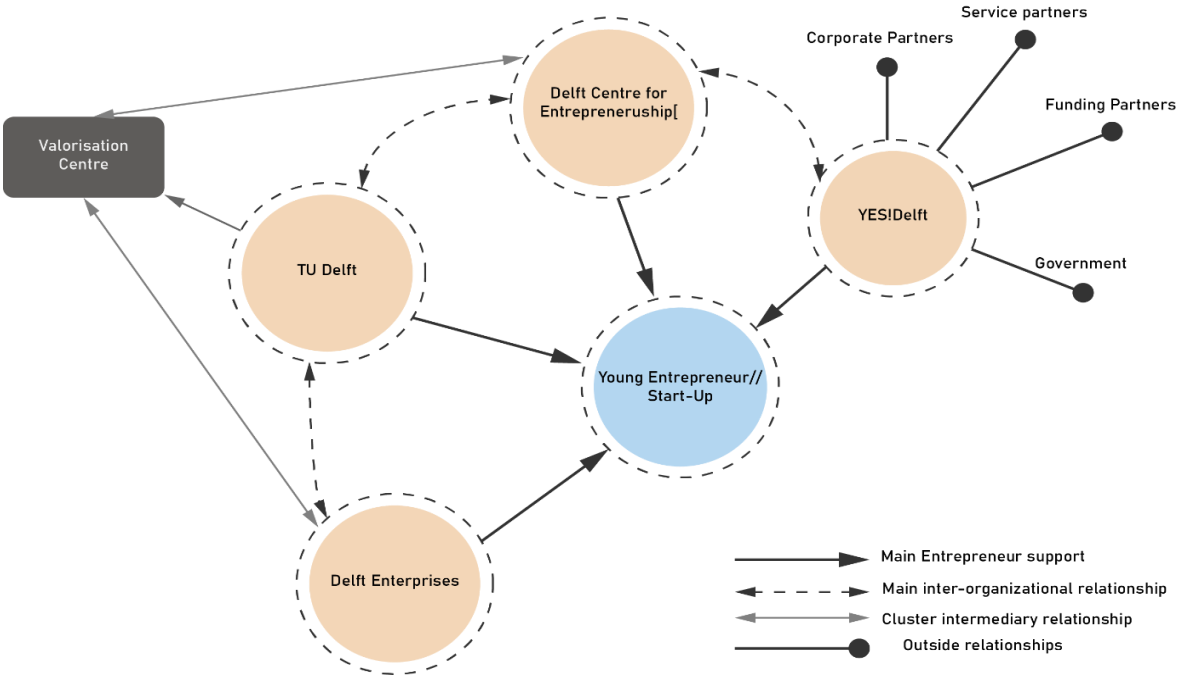
Second major start-up and young entrepreneurs support in Delft comes from TU Delft department Delft Centre for Entrepreneurship[36], which is a part of Technology, Policy & Management faculty. This department focuses on providing information for aspiring entrepreneurs and is built around 3 main activities – education and research on entrepreneurship, practical entrepreneurial activities. The education and practical activities in DCE are established through events that help develop the entrepreneurial culture in Delft entrepreneurial ecosystem, such as Global Entrepreneurship Week, Entrepreneurship day or EIT Health summer school. The department ultimately acts as an entrepreneurial community developer amidst the university students. In addition to these activities DCE also provides help on Intellectual Property advisory through Valorisation Centre of Tu Delft, business development advise and is connected to a non-profit organization Female Ventures, Delft enterprises and the aforementioned YES!Delft incubator.

The third institution in Delft that facilitates start-up growth is Delft Enterprises[37], a spin-off focuses organization in TU Delft. The idea is to connect research output generated in Tu Delft with talented individuals that may develop the idea into a start-up and financing. Delft enterprises mainly focuses on the early ideation stage of start-ups with the

[36] Information about DCE from https://www.tudelft.nl/tpm/about-the-faculty/departments/staff-departments/delft-centre-for-entrepreneurship/
[37] Information about DelftEnterprises from http://www.delftenterprises.nl/

goal of developing a functional start-up that is ready to scale the innovation generated in TU Delft. Delft Enterprises closely relates to the TU Delft Valorisation centre in order to transfer the technical-scientific knowledge to create sustainable and socially conscious solutions that consider the impacts on society.

In summary, the entrepreneurial ecosystem in Delft is collaborating quite closely and the few institutions that support young entrepreneurs seem to be well developed with relatively strong strategies for the long term success. Considering the high amount of research output from TU Delft and the robust reputation in the academic community about the quality of education this university provides for its students it is of no surprise that the collaborating institutions put a lot of focus on student entrepreneurs and community engagement.



39 Delft Institutional/Actor Network

Vilnius, Lithuania

Vilnius start-up ecosystem is much more fragmented than Delft entrepreneurial ecosystem is and is much more difficult to define in a decisive way. The ecosystem in Vilnius consists of tens of institutions that provide some sort of support for start-ups, but considering the number of start-ups, the institutions compete between each other in some form. Nevertheless, here we enlist the largest and most prominent institutions to paint an overall picture.

The first major institution that provides support on only for Vilnius start-ups but also for start-ups all over Lithuania is Startup Lithuania[38]. Startup Lithuania is a part of Enterprise Lithuania[39], a governmental institution that aims to support business growth and entrepreneurship. This institution focuses on information distribution through start-up

[38] https://www.startuplithuania.com/
[39] https://www.enterpriselithuania.com/en/

ecosystem reports, weekly news and a detailed start-up database, organizing various event to build community engagement in entrepreneurship such as hackathons, workshops and fairs, and providing advisory support through a vast existing network.

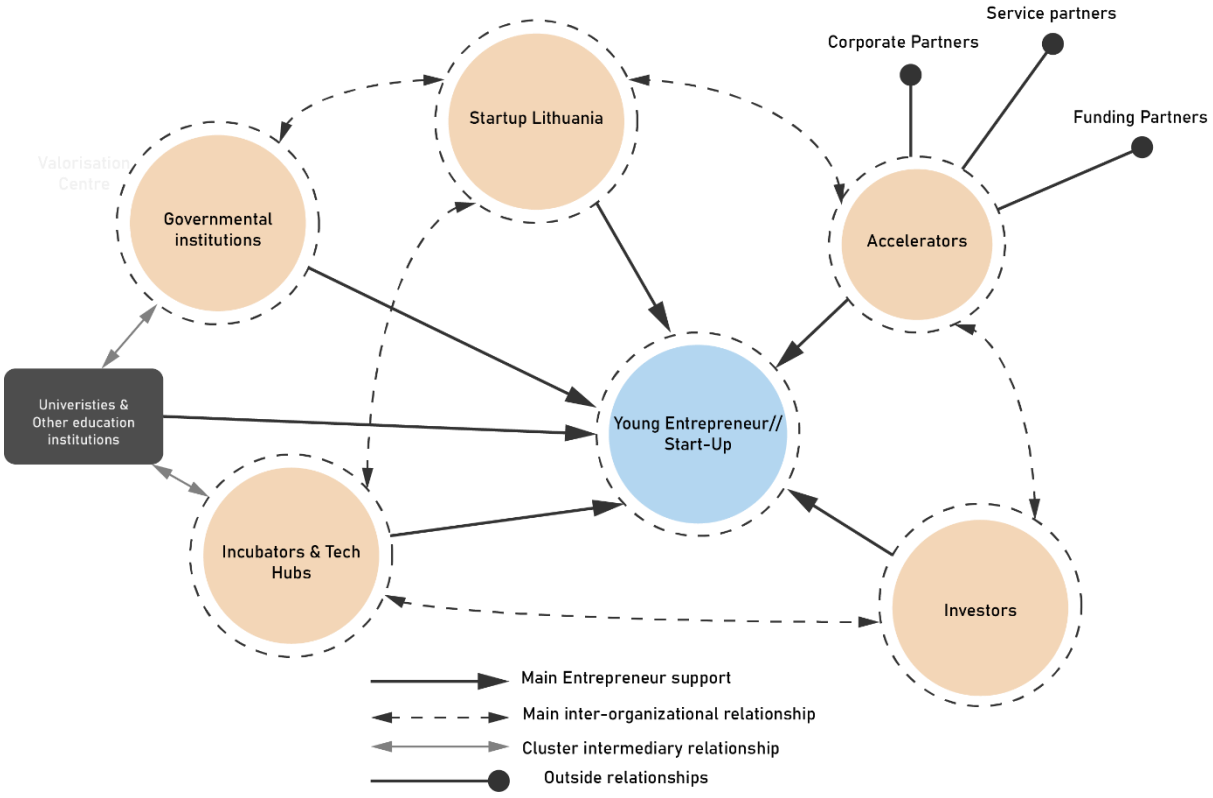
The second major group of institutions is incubators and tech hubs. Vilnius houses one of the first blockchain centres in Europe[40] which, in addition to very novel regulatory approach, gave way to an exponential growth in fintech and blockchain start-ups in Vilnius. This centre provides workspace for start-ups, an accelerator program for blockchain start-ups and provides funding opportunities through a network of investors all over Europe. Business Hive Vilnius[41] is one of the oldest tech incubators in the Baltics providing a vibrant co-working space in addition to several support services. Vilnius Tech Park[42] offers co-working office space for young companies that are eager to operate in an active and dynamic community. This office space houses numerous start-ups and young companies providing a sense of community with the addition of periodic events aimed to connect entrepreneurs and talented individuals. Sauletekio Slenio[43] science & technology park is a non-profit institution that seeks to commercialize technology and science heavy knowledge through offering office space for science knowledge heavy start-ups and companies, technology transfer services, entrepreneurship education and financing options. This tech park is close to several Universities in Vilnius; hence it is filled with student entrepreneurs and companies capitalizing on research output generated within these universities. The institution bears a lot of similarity with Delft Enterprises.

The third group of institutions that operate in Vilnius are accelerators and investors. There are 7 accelerators in Vilnius that focus on multiple stages of start-up growth and mainly provide some co-working space, coaching & mentoring and financing opportunities. All the programs suggested in these accelerators seem to be quite on a standard from reaching the first customer to scaling-up beyond the Lithuania market. On the side of investment institutions, Lithuania does not house a lot of venture capitals so the few of them are quite important for most potential start-ups. The notable mention is the co-investment fund[44] and a business angel fund/network. The former one helps to develop a venture capital market in Lithuania by offering to invest the same amount of money to a start-up as a venture capital if a start-up fits a checklist. The later one is a network of business angels that makes it easy for start-ups to arrange potential pitch meetings.

The last group of institutions are governmental. Business mentor network provide an opportunity for Vilnius start-ups to gain knowledge and advice on various matters – business development, financing, marketing, international relations, start-ups, law & regulation, human resource and social business models. This institution is a digital platform that connects volunteer experience mentors and start-ups. Ideally this relationship is mutually beneficial on a network scale though any financial incentives are lacking. MITA or science, innovation and technology agency[45] that develops regulatory infrastructure to support start-up and company establishment rates, innovation and develops numerous

[40] Information at - https://bcgateway.eu/
[41] Information at - http://www.bhv.lt/en/
[42] Information at - https://vilniustechpark.com/
[43] Information at - http://ssmtp.lt/
[44] Information at - https://www.koinvest.lt/
[45] Information at - https://mita.lrv.lt/

programs to help companies in specific industries to develop easier and faster. This agency closely collaborates with EIT and other European Union institutions to absorb European Commission information and initiatives and translate them into actionable projects tailored for Lithuanian start-ups and companies.



40 Vilnius Institutional/Partner network

Summary

The main difference between Delft and Vilnius entrepreneurial ecosystem form the point of view of the institutional network existing in these regions is the degree of closeness or fragmentation. Delft has quite a robust and close network of institutions that closely work together to achieve a well-developed degree of entrepreneurial support for young start-ups or individuals. Vilnius on the other hand has a relatively large network of individual institutions that had to be grouped to make sense. Another interesting difference is the degree to which educational institutions are involved in the ecosystem activities. In Delft TU Delft is one of the central actors in the ecosystem providing intermediary services between other institutions. In Vilnius universities do not seem to be playing any large role apart providing some research output and a talent pool. The central actor in Vilnius entrepreneurial ecosystem is Startup Lithuania that intermediates a large portion of activities and tries to nurture the entrepreneurial ecosystem by providing numerous services for all ecosystem actors.

4.6. Conclusion

The context plays a large role in defining an entrepreneurial ecosystem because it generally decides why it is unique.

First, the political factors favour Delft region as the regulatory body and governmental regulations are far more robust and decisive in the Netherlands. It provides a lot of trust and long-term transparency for established companies in the Netherlands to continue doing business and grow. In Lithuania on the other hand, the regulatory framework is not that concise and the ever changing political landscape may change the direction of growth quickly when the lack of long-term strategy is apparent .In addition to this, Lithuanian labour market is deregulated closely following the EU guidelines providing a low cost labour pool, but also diminishing labour trust in long term company relationships.

Second, the economic outlook heavily favours the Netherlands as the economy indicators point to a very healthy and extremely well-developed economy with a global outreach. Lithuania on the other hand slowly develops and averages out around the EU average indexes not giving any indication of superiority or inferiority. Nevertheless, it is paramount to mention the difference in economy sizes which points to a fact that Vilnius is better suited for pilot studies and Delft for heavy expansions and scalable business models.

Third, from a social factor perspective, Deft is much smaller than Vilnius but boasts a higher entrepreneurial density. This is due to a large university TU Delft housed in the campus near the city centre. Other than that, other social factors, such as immigration or student growth are rather similar, although Vilnius student count is slowly declining while in Delft it is slightly climbing up. From the point of legal factors, both countries provide decent frameworks for companies to operate on and numerous tax subsidies for innovations. Companies in Delft or the Netherlands have access to better subsidies for sustainable energy while Vilnius start-ups are able to quickly establish fintech companies with relative ease.

Lastly, the institutional network in both regions is quite different. Delft is more robust and closer with a heavy focus on TU Delft research output commercialization and general high-tech start-ups. Institutions in Vilnius on the other hand are much more fragmented but plentiful, giving opportunities for all types of start-ups. Nevertheless, Vilnius entrepreneurial ecosystem institutions do not focus on universities but rather on a wide range of start-up possibilities.

Coupling all the above contextual factors provides a picture of both regions. Delft is a high-tech focus driven entrepreneurial ecosystem that provides the ability for a start-up to scale due to the access to a very large market. Vilnius entrepreneurial ecosystem is rather dynamic and diverse, providing support for a multitude of start-up industries where the focus is adaptability to change.

5. DATA ANALYSIS

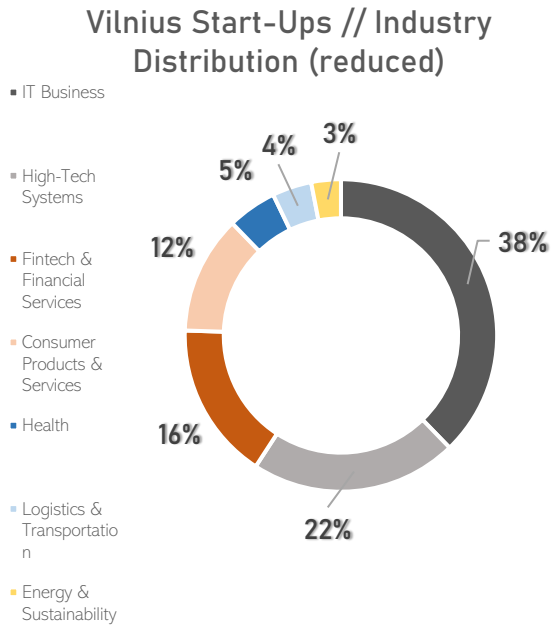
In this thesis section, the quantitative data collected through surveys and desk research activities is analysed in order to obtain potential insights. First, some descriptive statistics indexes are presented in order to show the degree of collected data quality and just getting the feel for the data (Sekaran, U., 2016). Depending on the scales used in the data collection, different measures are used to denote central tendency, dispersion and frequency. Second, inferential statistical methods are used on the data set – independent samples T-test, correlation analysis and mean ranking.

5.1. Descriptive Statistics

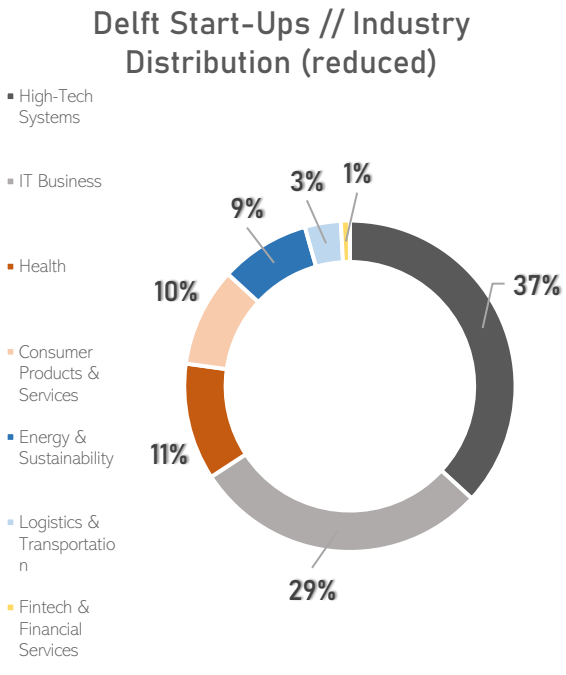
//Desk Research Start-Up Data//

The data about start-ups in both, Vilnius and Delft, regions was collected through several sources in the internet. The main sources used were Crunchbase and Dealroom. These platforms provide start-up data collected through crowd sourcing and web-crawlers, which is the validate by their proprietary algorithms or experts. The data is not-necessarily accurate or up to date, but it gives a close picture of the start-up community. Further population reduction for the sake of accuracy and newness was done by selecting start-ups that participated in the community through well-known actors.

The reduction was done by visiting incubator, accelerator and technology park websites to arrive at a more accurate representation of the population. In both regions, ~100 start-ups were extracted, and relevant data collected through



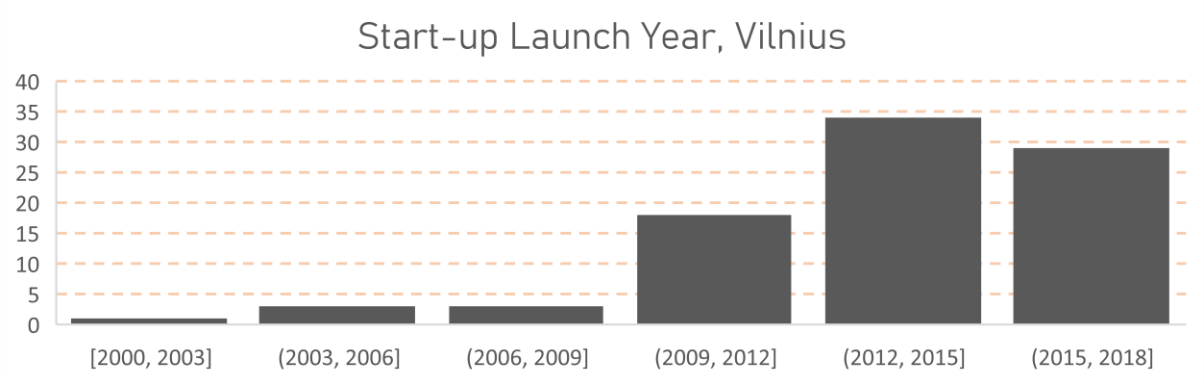
42 Vilnius Start-Up Industries



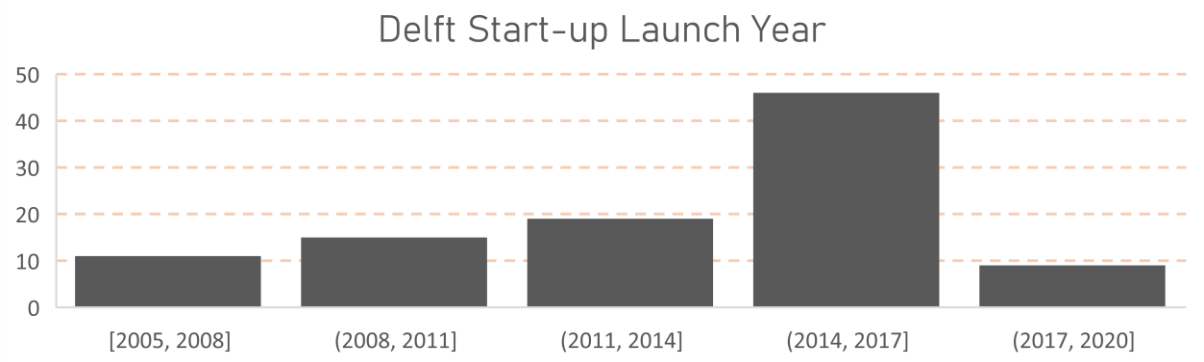
41 Delft Start-up Industries

their landing pages, business registries and promotional websites.

Both, Vilnius and Delft, regions are represented by similar industry categories. The main industry in Vilnius is IT Business, a market where ICT and IT service solutions thrive, while in Delft the main industry category is High-Tech Systems – deep tech, hardware, robotics and etc. The second industry category in both regions are vice-versa the first. The third largest industry in Vilnius is Financial services, naturally represented by the boom of Fintech companies already known to widespread press. In Delft it is Health and Medical sciences. All in all, both regions have some differences when it comes to mainly representative industry categories, but the larges industries are similar in nature, especially considering their percentage distribution.



43 Start-up Age Vilnius - actor sources



44 Start-up Age Delft - actor sources

3 Launch year statistics

Statistical measure; Launch Year	Vilnius; N=98	Delft; N=114
Mean	2013.84	2013.6
Variance	10.96	12.98
Standard Deviation	3.3	3.6

On average both regions show similar launch years heavily gravitating to more recent start-ups from 2014-2019. Start-ups in Delft deviate slightly more in their launch data, which can also be seen in the histogram (Figure 43). Vilnius start-ups have a slightly larger peak activity around a specific date (Figure 42), while Delft start-up launch dates tend to be more dispersed. It should be noted, that this data does not include start-ups that have gone belly-up. It may indicate that in Delft start-ups have a longer lifespan, or that start-up scene in Vilnius has become active slightly later.

//Survey Data//

RESPONDENT PROFILE

The designed survey was sent out to 100 companies in Vilnius with a response rate of 16% and 114 companies in Delft with a response rate of 15.8%. Categorizing by launch date, start-ups from Vilnius show a higher dispersion value than start-ups from Delft. Considering the employee count, Vilnius respondents have nearly equal distribution, 43% house between 1 and 10 employees, 25% house between 11 and 25 employees and 32% more than 26 employees. Delft start-ups that have responded show a much lower employee count and are smaller in size – 72 % have 1-10 employees, 22% have 11-25 employees and 6% 26 or more employees. Even though the response rate is rather small, the respondent sample is quite representative of the selected preliminary group (see Table 3).

4 Respondent profile statistics

Region	*Average Launch Year*	*St.Dev.*	*1-10 Employees*	*11-25 Employees*	*26-+ Employees*	*Recent year Revenue avg. thousand EUR*	*St.Dev*	*Recent year profitability, percent of sample*	*1 year ago Revenue avg. thousand EUR*	*St. Dev*	*1 year ago Profitability*
Delft N=18	2016	2.22	72%	22%	6%	203	328.3	11%	112.3	272.1	6%
Vilnius N=16	2016	2.4	43%	25%	32%	10840	26839	56%	2584	7488	25%

Furthermore, according to the data provided on annual revenue in the past two annual periods and their respective profitability, respondent start-ups have been growing and to some successful degree. Start-ups in both regions have a higher pool of profitable start-ups and revenues in both regions nearly doubled over the recent year. This indicates that respondent start-ups have a relatively good sense of what is important to grow a successful start-up. Considering their respective growth stages, 25% of Vilnius start-ups that have responded to the survey are in the early establishment stage, 25% are in the validation stage and 50% in growth stages. In Delft, 11% of the respondent start-ups are in early establishment stage, 61% in the validation stage and 28% are in the growth stage (see Table 4). It can be said that start-ups from Vilnius that have responded are slightly more successful in achieving growth than the ones in Delft.

5 Respondent profile statistics - Stage

Region	*Early Establishment Stage*	*Validation Stage*	*Growth Stage*
Delft	11%	61%	28%
Vilnius	25%	25%	50%

RESPONDENT ANSWEARS

A much larger number of Vilnius start-ups are profitable, generate larger amounts of revenue and reach the growth stage to a more successful degree. It seems that start-ups in Delft have trouble finding a right business model to achieve scalability or are stuck in constant redevelopment of their product.

The survey has collected data on 41 variables in both regions grouped through 4 questions. The first 3 questions represent the variables to gauge business activity importance, the last question is evaluation of ecosystem influence on these activities (the degree of support). Since the number of variables is quite large, the descriptive will be provided in a tabular manner regarding the main questions asked. The descriptive statistical measures were extracted from the data using SPSS statistical analysis software. The main descriptive statistics table is presented in Appendix 9 and Appendix 10.

The descriptive data shows that there are some potential significant differences between the means. There are no obvious unified points of deviation that would show a respondent bias apparent through incorrect survey design. Variables from all 4 questions show a healthy distribution and a specific point of average. Nevertheless, some variables show a higher variation (wider distribution) as their standard deviation is quite large (assuming larger than 1/3 of the mean). This may be due to a relatively small sample size and is indicative of the inferential statistical methods to be used.

5.2. Inferential Statistics

In this section the data gathered through the survey is analysed using an independent sample t-test and a bivariate correlation matrix. The outcomes of the t-test relate to the ranked important business activities on a stage basis

5.2.1. Independent sample T-Test

In this sub-chapter, the outcomes of the independent sample t-test procedure are presented. The sub-chapter analysis results follow logical path of the data gathered through a survey and is ordered like this:

- T-test outcomes from *Early establishment* stage important business activities dataset
- T-test outcomes from *Validation* stage important business activities dataset
- T-test outcomes from *Growth* stage important business activities dataset
- T-test outcome from *Ecosystem Support* dataset

Test for Normality

In order to test the variable for normality, or how well the data fits a normal distribution, a Shapiro-Wilk test has been done using IBM SPSS Statistics 25 software. This tool tests a null hypothesis that the sample (population) is normally distributed (Field, 2011). If a test for a specific variable shows a significance value (*p* value) of less than 0.05 (*alpha*),

the null hypothesis is rejected, and it is evident that the data is not normally distributed. The test results are shown in Appendix 6 (Vilnius) and Appendix 7 (Delft).

As seen in the Appendixes 6 and 7, the normality test rejects null hypothesis in most of the variables (significance highlighted in **bold**). Nevertheless, since the t-test is robust enough, the test will be continued as planned and a separate non-parametric test is issued as a refence, if high difference in results reveal themselves. As the sample size is relatively small, the point of interest is the difference (even a slight one) in activity importance or ecosystem support and the direction of effect is known (plotting mean values). When the test is close to significant levels, in some cases a one-tailed value is taken.

Independent t-test outcome

6 Independent Samples T-test outcome - Early Establishment

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Setting_an_Exit_Strategy	Equal variances assumed	0.622	0.436	1.912	32	0.065	0.032	0.86806	0.45405	-0.05681	1.79293
	Equal variances not assumed			1.898	30.308	0.067	0.034	0.86806	0.45725	-0.06537	1.80148
Designing_a_Business_Model	Equal variances assumed	2.931	0.097	-2.302	32	0.028	0.014	-0.67361	0.29265	-1.26973	-0.07749
	Equal variances not assumed			-2.254	26.462	0.033	0.016	-0.67361	0.29882	-1.28732	-0.05991
Establishing_Proof_of_Concept	Equal variances assumed	1.142	0.293	-1.215	32	0.233	0.117	-0.36806	0.30298	-0.98520	0.24909
	Equal variances not assumed			-1.199	28.699	0.240	0.120	-0.36806	0.30706	-0.99636	0.26025
Establishing_Founding_Team	Equal variances assumed	0.401	0.531	0.072	32	0.943	0.471	0.01389	0.19234	-0.37790	0.40567
	Equal variances not assumed			0.073	31.831	0.942	0.471	0.01389	0.19011	-0.37343	0.40120
Raising_Financing_Capital	Equal variances assumed	0.357	0.555	0.575	32	0.569	0.285	0.20139	0.35006	-0.51165	0.91443
	Equal variances not assumed			0.584	31.422	0.563	0.282	0.20139	0.34471	-0.50127	0.90405
Financial_Management	Equal variances assumed	2.415	0.130	-0.721	32	0.476	0.238	-0.31250	0.43350	-1.19551	0.57051
	Equal variances not assumed			-0.730	31.694	0.470	0.235	-0.31250	0.42782	-1.18428	0.55928
Research_Early_Customers	Equal variances assumed	0.000	0.996	0.054	32	0.957	0.479	0.01389	0.25789	-0.51142	0.53920
	Equal variances not assumed			0.054	31.941	0.957	0.479	0.01389	0.25667	-0.50897	0.53675
Research_and_Development	Equal variances assumed	1.120	0.298	-0.491	32	0.627	0.313	-0.18056	0.36793	-0.93001	0.56890
	Equal variances not assumed			-0.487	29.995	0.630	0.315	-0.18056	0.37103	-0.93831	0.57720
Early_Customer_Acquisition	Equal variances assumed	0.005	0.945	0.898	32	0.376	0.188	0.25000	0.27834	-0.31696	0.81696
	Equal variances not assumed			0.903	31.948	0.373	0.187	0.25000	0.27698	-0.31422	0.81422
Growing_Partner_Network	Equal variances assumed	0.063	0.803	-0.604	32	0.550	0.275	-0.20833	0.34493	-0.91094	0.49427
	Equal variances not assumed			-0.607	31.959	0.548	0.274	-0.20833	0.34315	-0.90733	0.49067

The table above (Table 5) presents the independent t-test outcome from IBM SPSS Statistics 25 software package. The first set of variables tested were the activity importance in the *early establishment* stage of a start-up, the grouping variable was set to the country of origin. The t-test includes the Levene's test for equality of variances, which tests for homogeneity of variance. If Levene's test shows a significant *p* value (<0.05) there is a violation of the homogeneity of variance assumption. Nevertheless, if this happens, we simply take the t-test value which corresponds to *equal variances not assumed*.

In Appendix 8 a Mann-Whitney U non-parametric test results are presented as a reference point. As we can see in the independent samples t-test outcome table, only 2 variables have a significant difference on a 1-tailed significance level and only 1 variable in a 2-tailed significance. First, "*Setting an Exit strategy*" variable measured a business activity importance accordingly and the mean difference between Vilnius and Delft is seen as significant at 1-tailed *p* value of

0.032 (<0.05) and nearly significant at 2-tailed *p* value of 0.065 (>0.05). The positive *t* value shows that the mean of the first group, Vilnius in this case, is significantly different and larger compared to the mean inferred from Delft start-up responses regarding this activity. Second, "*Designing a Business Model"* variable is significantly different at a 1-taled *p* value of 0.014 (<0.05) and significantly different at a 2-tailed *p* value of 0.028 (<0.05). In both cases the difference is significantly valid. The *t* value of this variable has a negative direction and therefore shows that the second group mean, in this case Delft, is larger than the first group mean. The Mann-Whitney U test shows the same two variables being significant validating that the non-normality of the data set has not impeded validity of the t-test at this point.

7 Validation stage T-test outcome

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Intellectual_Property_Safeguarding_ST2	Equal variances assumed	0.321	0.575	0.185	32	0.854	0.427	0.05556	0.30030	-0.55614	0.66725
	Equal variances not assumed			0.183	28.945	0.856	0.428	0.05556	0.30408	-0.56641	0.67752
Designing_MVP_ST2	Equal variances assumed	0.037	0.848	-1.548	32	0.131	0.066	-0.45833	0.29601	-1.06128	0.14461
	Equal variances not assumed			-1.544	31.067	0.133	0.066	-0.45833	0.29694	-1.06390	0.14723
Designing_a_Business_Model_ST2	Equal variances assumed	1.392	0.247	-0.078	32	0.938	0.469	-0.02083	0.26779	-0.56630	0.52463
	Equal variances not assumed			-0.079	31.904	0.938	0.469	-0.02083	0.26496	-0.56061	0.51894
Recruiting_Additional_Talent_ST2	Equal variances assumed	1.001	0.325	-1.555	32	0.130	0.065	-0.53472	0.34385	-1.23513	0.16568
	Equal variances not assumed			-1.571	31.940	0.126	0.063	-0.53472	0.34046	-1.22826	0.15882
Developing_a_Legal_Framework_ST2	Equal variances assumed	7.554	**0.010**	-1.372	32	0.180	0.090	-0.51389	0.37456	-1.27684	0.24906
	Equal variances not assumed			-1.322	21.364	0.200	0.100	-0.51389	0.38860	-1.32119	0.29341
Raising_Financing_Capital_ST2	Equal variances assumed	1.050	0.313	-2.373	32	**0.024**	**0.012**	-0.77778	0.32772	-1.44531	-0.11024
	Equal variances not assumed			-2.390	31.999	0.023	0.011	-0.77778	0.32545	-1.44070	-0.11485
Financial_Management_ST2	Equal variances assumed	1.743	0.196	-0.792	32	0.434	0.217	-0.25000	0.31561	-0.89288	0.39288
	Equal variances not assumed			-0.784	29.486	0.439	0.220	-0.25000	0.31893	-0.90182	0.40182
Research_and_Development_ST	Equal variances assumed	4.850	**0.035**	-1.982	32	0.056	0.028	-0.54167	0.27333	-1.09841	0.01508
	Equal variances not assumed			-1.933	25.136	0.065	**0.032**	-0.54167	0.28024	-1.11867	0.03534
Customer_Acquisition_Marketing_ST2	Equal variances assumed	1.475	0.233	-0.283	32	0.779	0.389	-0.07639	0.26969	-0.62574	0.47296
	Equal variances not assumed			-0.286	31.861	0.776	0.388	-0.07639	0.26667	-0.61967	0.46689
Growing_Partner_Network_ST2	Equal variances assumed	0.009	0.923	-1.914	32	0.065	**0.032**	-0.50000	0.26125	-1.03215	0.03215
	Equal variances not assumed			-1.897	29.930	0.067	0.034	-0.50000	0.26352	-1.03824	0.03824

Running the independent t-test on the validation stage data set shows 3 activities that are significantly or almost significantly differentiating between Delft and Vilnius region start-ups (Table 6). The Mann-Whitney U tests in Appendix 8 shows similar results in addition to 4th activity being almost significantly differently valued. *"Raising Financing Capital"* is rated differently to a significant degree where the two-tailed *p* value is 0.024 (<0.05) and one-tailed *p* value is at 0.12 (<0.05). The negative t value shows that Delft start-ups have valued the activity as being more important relative to start-ups in Vilnius. *"Research & Development"* mean rate difference is significant with a one-tailed *p* value of 0.032 (<0.05). However, the Levene's test for homogeneity of variance showed that the variance is not equal between both groups, so the value taken is in the row labelled *equal variance not assumed.* In addition, two-tailed significance *p* value is at 0.065 (>0.05) and is only almost at a significant range at 95% confidence interval. *"Growing Partner Network"* is significantly different between both regions at a one-tailed *p* value of 0.032 (<0.05). Since the two-tailed *p* value is at 0.065 (>0.05) the same logic applies as with the previous activity. Here the *t* value is once again negative, an indication that Delft start-ups value it as being more important than Vilnius start-ups.

8 Growth Stage T-test outcome

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Expanding_Operational_Activities_ST3	Equal variances assumed	0.017	0.896	-0.837	32	0.409	0.204	-0.22222	0.26553	-0.76309	0.31864
	Equal variances not assumed			-0.831	30.400	0.412	0.206	-0.22222	0.26729	-0.76779	0.32335
Establishing_Organizaitonal_Structure_ST3	Equal variances assumed	3.656	0.065	-2.396	32	0.023	0.011	-0.63889	0.26668	-1.18211	-0.09567
	Equal variances not assumed			-2.338	25.311	0.028	0.014	-0.63889	0.27328	-1.20137	-0.07641
Raising_Financing_Capital_ST3	Equal variances assumed	0.434	0.515	-2.169	32	0.038	0.019	-0.68056	0.31382	-1.31978	-0.04133
	Equal variances not assumed			-2.176	31.870	0.037	0.019	-0.68056	0.31272	-1.31766	-0.04346
Financial_Management_ST3	Equal variances assumed	1.449	0.237	-1.521	32	0.138	0.069	-0.36111	0.23741	-0.84470	0.12248
	Equal variances not assumed			-1.499	28.401	0.145	0.072	-0.36111	0.24086	-0.85419	0.13196
Customer_Acquisition_Marketing_ST3	Equal variances assumed	1.955	0.172	0.240	32	0.812	0.406	0.06250	0.26081	-0.46875	0.59375
	Equal variances not assumed			0.244	30.958	0.809	0.404	0.06250	0.25610	-0.45986	0.58486
Research_and_Development_ST3	Equal variances assumed	1.769	0.193	0.074	32	0.941	0.471	0.02083	0.28123	-0.55201	0.59367
	Equal variances not assumed			0.075	31.467	0.941	0.470	0.02083	0.27702	-0.54382	0.58548
Growing_Partner_Network_ST3	Equal variances assumed	1.807	0.188	-1.383	32	0.176	0.088	-0.45833	0.33129	-1.13315	0.21649
	Equal variances not assumed			-1.352	25.703	0.188	0.094	-0.45833	0.33907	-1.15570	0.23904

Table 7 shows the independent t-test outcome from the *Growth* stage dataset. 2 activities are considered to be significantly differently valued between Delft and Vilnius regions. Mann-Whitney U test shows similar results with both of these activities as significantly different. *"Establishing Organizational Structure"* is significant at two-tailed *p* value of 0.023 (<0.05) and a one-tailed *p* value of 0.011 (<0.05). The *t* value is negative indicating that Delft start-ups value this activity as relatively more important compared to Vilnius start-ups. *"Raising Financing Capital"* is significantly different at a two-tailed *p* value of 0.038 (<0.05) and a one-tailed *p* value of 0.019 (<0.05) at 95% confidence. *T* value is also negative, which shows that Delft start-ups value this activity as more important. Mann-Whitney U test shows a 0.056 significance level of the valuation difference between these regions, which is a lesser significance compare to the t-test and in only barely significant.

The last data set analysed using an independent samples t-test is *Entrepreneurial Ecosystem Support* – the perceived effect of the ecosystem support on given business activities. Some of the variables represent activities through several start-up life cycle stages, since the ecosystem is taken as static and it would have been too cumbersome for a respondent to provide answers for all business activities.

9 Ecosystem support T-test outcome

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
										95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Sig. (1-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Ecosystem_IP	Equal variances assumed	0.619	0.437	-0.858	32.000	0.397	0.199	-0.375	0.437	-1.265	0.515
	Equal variances not assumed			-0.851	30.051	0.401	0.201	-0.375	0.441	-1.275	0.525
Ecosystem_BM	Equal variances assumed	1.688	0.203	-1.388	32.000	0.175	0.087	-0.667	0.480	-1.645	0.311
	Equal variances not assumed			-1.365	27.746	0.183	0.092	-0.667	0.488	-1.667	0.334
Ecosystem_HR	Equal variances assumed	0.173	0.680	2.015	32.000	**0.052**	**0.026**	0.660	0.327	-0.007	1.327
	Equal variances not assumed			2.030	31.999	**0.051**	**0.025**	0.660	0.325	-0.002	1.322
Ecosystem_VC	Equal variances assumed	0.128	0.723	0.759	32.000	0.454	0.227	0.340	0.449	-0.573	1.254
	Equal variances not assumed			0.753	30.209	0.457	0.229	0.340	0.452	-0.582	1.263
Ecosystem_MR	Equal variances assumed	0.588	0.449	-1.041	32.000	0.306	0.153	-0.514	0.494	-1.519	0.491
	Equal variances not assumed			-1.055	31.664	0.299	0.150	-0.514	0.487	-1.506	0.478
Ecosystem_RnD	Equal variances assumed	0.363	0.551	2.438	32.000	**0.020**	**0.010**	1.083	0.444	0.178	1.988
	Equal variances not assumed			2.473	31.599	**0.019**	**0.009**	1.083	0.438	0.191	1.976
Ecosystem_ECA	Equal variances assumed	0.497	0.486	1.092	32.000	0.283	0.141	0.458	0.420	-0.397	1.313
	Equal variances not assumed			1.094	31.714	0.282	0.141	0.458	0.419	-0.396	1.312
Ecosystem_GPN	Equal variances assumed	1.031	0.318	0.600	32.000	0.553	0.276	0.236	0.394	-0.566	1.038
	Equal variances not assumed			0.593	29.189	0.558	0.279	0.236	0.398	-0.578	1.051
Ecosystem_MVP	Equal variances assumed	0.538	0.469	0.000	32.000	1.000	0.500	0.000	0.396	-0.807	0.807
	Equal variances not assumed			0.000	29.202	1.000	0.500	0.000	0.401	-0.819	0.819
Ecosystem_LF	Equal variances assumed	4.283	0.047	-1.971	32.000	**0.057**	**0.029**	-0.771	0.391	-1.567	0.026
	Equal variances not assumed			-1.898	20.930	0.072	0.036	-0.771	0.406	-1.616	0.074
Ecosystem_FBM	Equal variances assumed	1.229	0.276	-0.789	32.000	0.436	0.218	-0.361	0.458	-1.293	0.571
	Equal variances not assumed			-0.799	31.788	0.430	0.215	-0.361	0.452	-1.282	0.560
Ecosystem_CA	Equal variances assumed	0.022	0.883	1.401	32.000	0.171	0.085	0.583	0.416	-0.265	1.432
	Equal variances not assumed			1.397	31.175	0.172	0.086	0.583	0.417	-0.268	1.435
Ecosystem_EOA	Equal variances assumed	1.580	0.218	2.207	32.000	**0.035**	**0.017**	0.903	0.409	0.070	1.736
	Equal variances not assumed			2.181	29.108	**0.037**	**0.019**	0.903	0.414	0.056	1.749
Ecosystem_ECOS	Equal variances assumed	1.216	0.278	-2.577	32.000	**0.015**	**0.007**	-0.757	0.294	-1.355	-0.159
	Equal variances not assumed			-2.532	27.409	**0.017**	**0.009**	-0.757	0.299	-1.370	-0.144

From the table above (Table 8) it can be seen that there are 5 significant or nearly significantly different variables. *"Ecosystem_HR"* represents the ecosystem support for human resource activities, such as *"Establishing a Founding Team"* and it is nearly significant at a two-tailed *p* value of 0.052 (~0.05) and a one-tailed *p* value of 0.026 (<0.05) at a 95% confidence interval. The *t* value for this ecosystem supported activity is positive indicating that Vilnius start-ups have rated entrepreneurial ecosystem support for this group of activities more important than Delft start-ups.

"Ecosystem_RnD" variable represents the entrepreneurial ecosystem support for *"Research and Development"* business activities at a two-tailed *p* value of 0.02 (<0.05) at 95% confidence interval. The positive *t* value shows that Vilnius start-ups indicate entrepreneurial ecosystem more supportive for this group of activities than Delft start-ups do. *"Ecosystem_LF"* refers to the ecosystem support for *"Legal Framework"* business activities. Here the test indicates a nearly significant difference between both groups at a two-tailed *p* value of 0.052 (~0.05) and a one-tailed *p* value of (0.029). As mentioned in the result presentation on important business activities, such *p* value is still held significant for the sake of discussion and interpretation. The *t* value in this case is negative, showing that Delft start-ups see their

proximal entrepreneurial ecosystem as more supportive toward legal framework establishing activities than Vilnius start-ups do. *"Ecosystem_EOA"* variable measures the entrepreneurial ecosystem support on *"Expanding Operational Activities"* business activities. The test shows a significant valuation difference between Delft and Vilnius at a two-tailed *p* value of 0.035 (<0.05) at a 95% confidence interval. *T* value, in this case, is positive, which indicates that Vilnius start-ups see their imminent entrepreneurial ecosystem as being more supportive towards achieving these activities than Delft start-ups do.

"Ecosystem_ECOS" variable measures the entrepreneurial ecosystem support for a company in its ability to *"Establish a Clear Organizational Structure"*. Here the difference between Delft and Vilnius is significant at a two-tailed *p* value of 0.015 (<0.05) at a 95% confidence interval. The *t* value negative, which points to Delft start-ups perceiving their entrepreneurial ecosystem as more supportive when *"Establishing a Clear Organizational Structure"* is on the agenda than Vilnius start-ups do.

5.2.2. Correlation analysis

Vilnius, Lithuania

Correlating the entrepreneurial ecosystem support variables of Vilnius start-up respondents shows 18 pairs of variables that correlate at 95% or 99% confidence level. Some of the variables are negatively correlated and indicate some peculiar and not entirely natural occurrences which will not be discussed. *"Ecosystem_RnD"* and *"Ecosystem_VC"* has a strong positive correlation where correlation coefficient is 0.629 at a *p* value of 0.009 (99% confidence level). This potentially shows that financing and infrastructural dimensions are closely developed. *"Ecosystem_GPN"* and *"Ecosystem_ECA"* variables have a strong positive correlation with a 0.693 correlation coefficient at a *p* value of 0.003 (99% confidence level). It can be interpreted as entrepreneurial ecosystem ability to provide a wider partner network for start-ups helps them generate a larger number of early customers, which is a relatively common-sense behaviour. *"Ecosystem_LF"* and *"Ecosystem_IP"* variables correlate averagely with a correlation coefficient of 0.575 at a *p* value of 0.02 (95% confidence level). Since legal framework development is majority of the time dependent on the outside service providers (lawyers and etc.), this correlation in Vilnius shows that these service providers are also proficient in providing intellectual property safeguarding legal consultancy and that Vilnius start-ups may heavily rely on these service providers. If such correlation would not exist, it may be the case that in e.g. information about intellectual property safeguarding is widely and clearly available. *"Ecosystem_FBM"* and *"Ecosystem_MVP"* variables are positively correlating with a correlation coefficient of 0.668 at a *p* value of 0.005 (99% confidence level). Both of these business activities require internal knowledge to complete successfully. Since some start-ups do not have this knowledge, mentors & coaches in the immediate network may provide it. In Vilnius it may be the case that the mentorship dimension is developed to provide this knowledge. *"Ecosystem_FBM"* and *"Ecosystem_LF"* are positively correlated with a correlation coefficient of 0.580 at a *p* value of 0.019 (95% confidence level). It may be the case that in Vilnius, financial business management activities are to some extent provided by outside companies and that successful

completion of this activity relies on legality terms. Therefore, infrastructural and market dimensions of Vilnius entrepreneurial ecosystem may be interrelated.

"Ecosystem_CA" and *"Ecossytem_VC"* variables are significantly positively correlated with a correlation coefficient 0.533 at a *p* value of 0.034 (95% confidence level). Since the customer acquisition business activity is a later stage activity in start-up life cycle, it seems natural that financial help to scale a start-up results in easier customer acquisition. From an ecosystem point of view, these activities may rely either within a market/financial dimensions or a mentorship/infrastructural dimensions. *"Ecosystem_EOA"* and *"Ecosystem_CA"* are strongly positively correlated with a correlation coefficient of 0.719 at a *p* value of 0.002 (99% confidence level). To expand operational activities a start-up needs to develop internal capabilities and such a feat may be reliant on the ability of an ecosystem to provide such knowledge through mentors & coaches. Mentors may also help with acquiring customers through guiding start-up management on the right ways to communicate product/service value. *"Ecosystem_ECOS"* significantly positively correlates with 4 other variables – *"Ecosystem_IP"*, *"Ecosystem_MVP"*, *"Ecosystem_LF"* and *"Ecosystem_FBM"*. All of these entrepreneurial ecosystem variables have in common couple of dimensions – mentorship & coaching, infrastructural and possibly markets. The reason is that all of these activities require either having internal capabilities through experience & knowledge to do so or the ability to acquire this knowledge with outside help.

Delft, The Netherlands

In Delft entrepreneurial ecosystem, according to the corresponding start-up responses, there are 13 variable pairs that significantly correlate with no negative correlations (Appendix 12). *"Ecosystem_BM"* and *"Ecosystem_IP"* variable strongly positively correlate with a correlation coefficient of 0.536 at a *p* value of 0.022 (95% confidence level). It may indicate that infrastructural and mentorship dimensions are interrelated in the ecosystem and mutually delivered.

"Ecosystem_HR" and *"Ecosystem_BM"* variables positively correlate with a correlation coefficient of 0.716 at a *p* value of 0.001 (99% confidence level). It may be the fact that the entrepreneurial ecosystem in Delft is very centralized and focused around 2-3 main actors that explains why these support variables correlate. YES!Delft and DelftEnterprises provide mentorship support, but also help to find co-founders and required talent within TU Delft campus or elsewhere. It may mean that this dimension is well developed. *"Ecosystem_VC"* and *"Ecosystem_HR"* are positively correlating at a correlation coefficient of 0.52 at a *p* value of 0.027 (95% confidence level). This may indicate that the same dimensions that provide HR support are able to give access to financing opportunities. *"Ecosystem_MR"* and *"Ecosystem_HR"* are positively correlated with a correlation coefficient of 0.578 at a *p* value of 0.012 (95% confidence level). Since market research activities require internal knowledge, it may be that Delft entrepreneurial ecosystem is able to provide labour that is well versed in what it takes to do a good market research. Or that the ecosystem support actors provide good support for both of these activities. *"Ecosystem_ECA"* and *"Ecosystem_MR"* are positively correlated with a correlation coefficient of 0.493 at a *p* value of 0.038 (95% confidence level). This seems rather natural that if an ecosystem actor is able to help with market research, the ability to help with acquiring early customer should also be higher. *"Ecosystem_GPN"* and *"Ecosystem_MR"* positively correlate with a correlation coefficient of 0.478 at a *p*

value of 0.045 (95% confidence level). It may be that Delft ecosystem support actor provide market research support through helping a start-up establish a large partner network.

"Ecosystem_GPN" and *Ecosystem_ECA"* positively correlate with a correlation coefficient of 0.612 at a *p* value of 0.007 (99% confidence level). This effect may follow the same logic, that the ecosystem actors help start-ups find early customers through exposing them to a larger network of potential partners. *"Ecosystem_MVP"* and *"Ecosystem_RnD"* positively correlate with a correlation coefficient of 0.612 at a *p* value of 0.007 (99% confidence level). *"Ecosystem_FBM"* and *"Ecosystem_VC"* positively correlate with a correlation coefficient of 0.481 at a *p* value of 0.043 (95% confidence level). Here we can see that the ecosystem support actors provide well-rounded financial support activities, either through financing opportunities or through knowledge how financial management should be done. *"Ecosystem_CA"* and *"Ecosystem_ECA"* positively correlate with a correlation coefficient of 0.681 at a *p* value of 0.002 (99% confidence level). These activities represent different start-up stages, so it may be that the entrepreneurial ecosystem is stable between stages regarding support to acquire new customers. Nevertheless, it should be mentioned that the majority of start-up respondent in Delft were in their validation stage of growth. *"Ecosystem_EOA"* and *"Ecosystem_ECA"* positively correlate with a correlation coefficient of 0.679 at a *p* value of 0.002 (99% confidence level). *"Ecosystem_EOA"* and *"Ecosystem_MVP"* positively correlate with a correlation coefficient of 0.551 at a *p* value of 0.018 (95% confidence level). *"Ecosystem_EOA"* and *"Ecosystem_CA"* variables highly correlate with a correlation coefficient of 0.707 at a *p* value of 0.001 (99% confidence level).

Considering the results of the correlation matrices between both regions, it is apparent that there are huge differences between how support is delivered to a start-up through its proximal entrepreneurial ecosystem dimension. It is of no surprise however, because both entrepreneurial ecosystems and their context seem very different in comparison. However, the output (a stage a start-up is in as a respondent) is very different as Vilnius mostly represents growth start-ups and Delft represents validation start-ups.

5.2.3. Connecting the entrepreneurial ecosystem and the business activities

In this subsection means and ranks are compared between perceived important business activities and the ecosystem support in both regions. The goal is to see how different the actual ecosystem effect is on the start-up lifecycle. This is achieved through assumption that an ecosystem is well developed and influential if a start-up activity is seen as important and the ecosystem as being supportive. If an ecosystem is supportive but the activity is not important, or the business activity is important, but the ecosystem is not supportive, the ecosystem is held to be misguided or non-effective. By region comparison, we can infer the most and least effective effects on the ecosystem.

10 Early establishment key activities - ecosystem support Delft

Perceived important business activity	Delft			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Establishing_Founding_Team	4.6111	**1**	4.7778	3
Designing_a_Business_Model	4.6111	**2**	5.1667	1
Research_Early_Customers	4.6111	**3**	4.3889	5
Establishing_Proof_of_Concept	4.5556	**4**	3.5000	9
Research_and_Development	4.0556	**5**	3.1667	10
Early_Customer_Acquisition	4.0000	**6**	3.6667	8
Growing_Partner_Network	3.8333	**7**	4.3889	6
Financial_Management	3.5000	**8**	4.1111	7
Raising_Financing_Capital	3.1111	**9**	4.7222	4
Setting_an_Exit_Strategy	2.4444	**10**	5.1667	2

Table 11 Early establishment key activities - ecosystem support Vilnius

Perceived important business activity	Vilnius			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Establishing_Founding_Team	4.625	**1**	5.4375	1
Research_Early_Customers	4.625	**2**	3.8750	8
Early_Customer_Acquisition	4.25	**3**	4.1250	7
Establishing_Proof_of_Concept	4.1875	**4**	3.5000	10
Designing_a_Business_Model	3.9375	**5**	4.5000	4
Research_and_Development	3.875	**6**	4.2500	6
Growing_Partner_Network	3.625	**7**	4.6250	3
Setting_an_Exit_Strategy	3.3125	**8**	4.5000	5
Raising_Financing_Capital	3.3125	**9**	5.0625	2
Financial_Management	3.187	**10**	3.7500	9

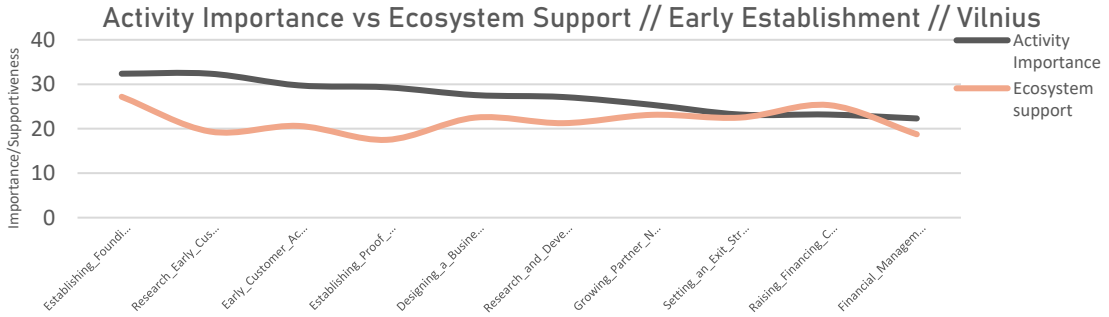
The total mean of responses on entrepreneurial ecosystem support is 4.36 in Vilnius and 4.31 in Delft. This value is denoted as the benchmark for an average ecosystem support value. Anything below is considered weakly supportive and anything above is considered strongly supportive.

The most important activities in Vilnius are *"Establishing a Founding Team"*, *"Research Early Customer"* and *"Early Customer Acquisition*" with *"Establishing Proof of Concept"* not far behind. Now considering the ecosystem support rankings relative to the key business activities ranking, the only activity that is well-supported is *"Establishing a Founding Team"*. Other important activities are not represented by similar ranking of ecosystem support and can generally be described as weakly supported.

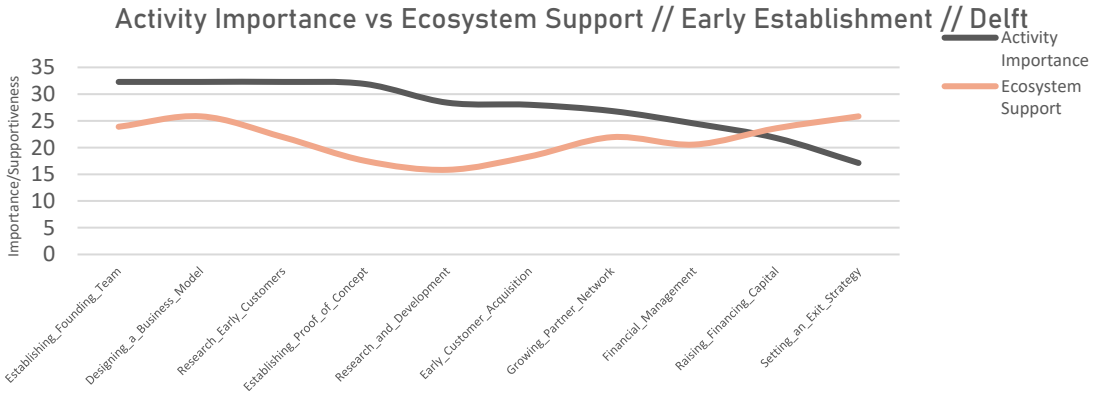
Delft start-ups consider *"Establishing a Founding Team"*, *"Designing a Business Model"* and *"Research Early Customers"* as the most important business activities in the *Early Establishment* stage. First two activities are relatively well

supported by the entrepreneurial ecosystem considering that the rankings are similar. It should be noted that at this stage, the most important business activities are ranked similarly except for *"Designing a Business Model"*.

For further comparison and a bit cleared picture, a joint score between business importance and ecosystem supportiveness was calculated. Since a direct comparison was needed, the highest scores on activity importance and ecosystem support were taken and multiplied to arrive at a high/maximum possible score. Then this score was multiplied by the actual score and divided by the maximum actual score giving a comparative score including an ecosystem ranking – the score also compares the rankings in between the variables. E.g. if the scores are identical between activity importance and ecosystem supportiveness, we can say that an activity is as important to start-ups growth in a life cycle stage as it is supported by the ecosystem. The scores were plotted and the graphs for both regions are presented in figures 44 and 45.



45 Activity Importance vs. Ecosystem Support - Early Establishment, Vilnius



46 Activity Importance vs. Ecosystem Support - Early Establishment, Delft

In these graphs we can see that an ecosystem is supportive for one or two of the most important business activities and then the ecosystem support wanes. Nevertheless, in both regions the ecosystem support for the least important activities is considered high. It is most clearly visible in Delft's entrepreneurial ecosystem.

12 Activity ranking and Ecosystem support, Validation, Delft

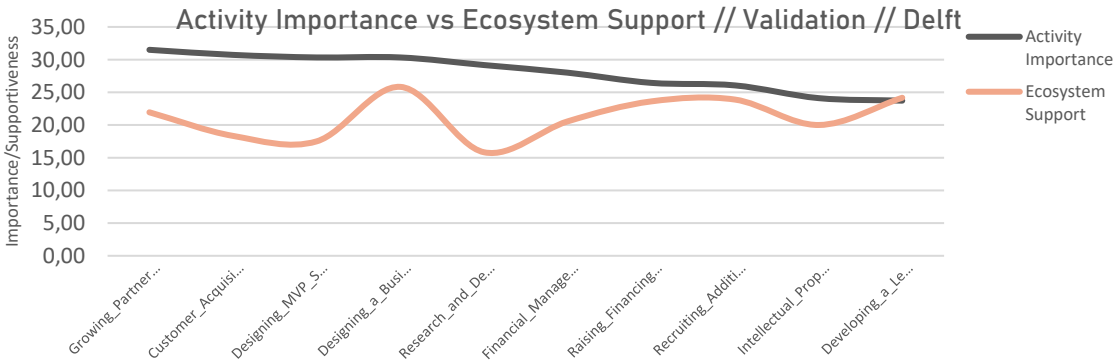
Perceived important business activity	Delft			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Growing_Partner_Network_ST2	4.5000	1	4.3889	5
Customer_Acquisition_Marketing_ST2	4.3889	2	3.6667	8
Designing_MVP_ST2	4.3333	3	3.5000	9
Designing_a_Business_Model_ST2	4.3333	4	5.1667	1
Research_and_Development_ST2	4.1667	5	3.1667	10
Financial_Management_ST2	4.0000	6	4.1111	6
Raising_Financing_Capital_ST2	3.7778	7	4.7222	4
Recruiting_Additional_Talent_ST2	3.7222	8	4.7778	3
Intellectual_Property_Safeguarding_ST2	3.4444	9	4.0000	7
Developing_a_Legal_Framework_ST2	3.3889	10	4.8333	2

13 Activity ranking and Ecosystem support, Validation, Vilnius

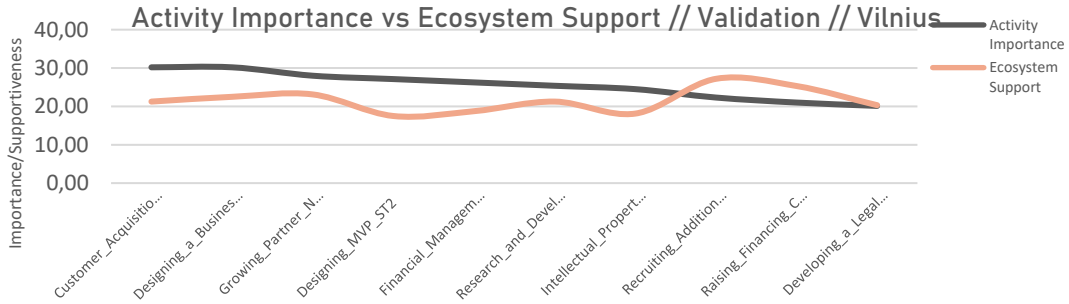
Perceived important business activity	Vilnius			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Designing_a_Business_Model_ST2	4.3125	1	4.5000	4
Customer_Acquisition_Marketing_ST2	4.3125	2	4.2500	5
Growing_Partner_Network_ST2	4.0000	3	4.6250	3
Designing_MVP_ST2	3.8750	4	3.5000	10
Financial_Management_ST2	3.7500	5	3.7500	8
Research_and_Development_ST2	3.6250	6	4.2500	6
Intellectual_Property_Safeguarding_ST2	3.5000	7	3.6250	9
Recruiting_Additional_Talent_ST2	3.1875	8	5.4375	1
Raising_Financing_Capital_ST2	3.0000	9	5.0625	2
Developing_a_Legal_Framework_ST2	2.8750	10	4.0625	7

In the *Validation* stage, Vilnius start-ups (Table 12) rate *"Designing a Business Model"*, *"Customer Acquisition & Marketing"* and *"Growing a Partner Network"* as the most important activities in this stage. The only activity with a similarly represented entrepreneurial ecosystem support rank is *"Growing a Partner Network"*. Other important activities are considered averagely supported as their relative ecosystem support rank falls below.

Delft start-ups consider *"Growing a Partner Network"*, *"Customer Acquisition & Marketing"* and *"Designing an MVP"* as the most important business activities (Table 11). Neither of these activities, according to the entrepreneurial ecosystem ranking, are well supported. There is significant misalignment between the importance of a business activity and the respective support of the entrepreneurial ecosystem. It should be noted that once again, similar activities are held as the most important.



47 Activity Importance vs. Ecosystem Support - Validation, Delft



48 Activity Importance vs. Ecosystem Support - Validation, Vilnius

The same way as in the early establishment stage case, a score is calculated by taking the highest meant in activity importance and ecosystem supportiveness and corresponding scores are calculated accordingly. The scores are rank based and comparable when we consider importance and supportiveness being of similar degree. The charts 46 and 47 show the perceptions in both regions.

It can be seen through the charts that the activity importance and the corresponding entrepreneurial ecosystem support is very misaligned in this stage of start-up growth. Here none of the most important activities for start-up growth to overcome challenges is supported by the entrepreneurial ecosystem properly, which is a considerable problem. In Vilnius start-up valued most importance activities the difference is not that large, so it is possible to consider Vilnius ecosystem as somewhat more supportive than the ecosystem in Delft. This argument is also supported by the fact that majority of Vilnius start-ups were indeed in *Growth* stage of their life cycle.

14 Activity ranking and Ecosystem support, Growth, Delft

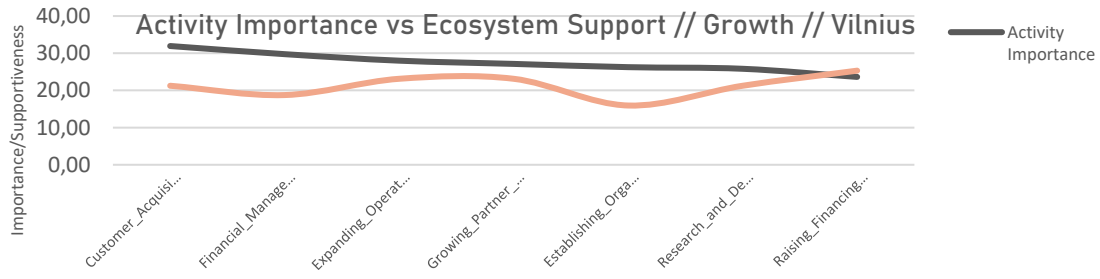
Perceived important business activity	Delft			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Financial_Management_ST3	4.6111	1	4.1111	3
Customer_Acquisition_Marketing_ST3	4.5000	2	3.6667	6
Establishing_Organizaitonal_Structure_ST3	4.3889	3	3.9444	4
Growing_Partner_Network_ST3	4.3333	4	4.3889	2
Expanding_Operational_Activities_ST3	4.2222	5	3.7222	5
Raising_Financing_Capital_ST3	4.0556	6	4.7222	1
Research_and_Development_ST3	3.6667	7	3.1667	7

15 Activity ranking and Ecosystem support, Growth, Vilnius

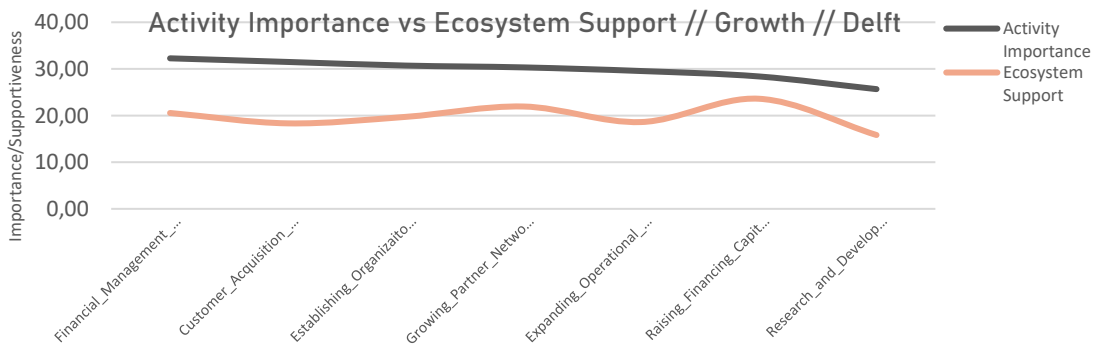
Perceived important business activity	Vilnius			
	Activity mean score	Activity rank	Ecosystem mean score	Ecosystem rank
Customer_Acquisition_Marketing_ST3	4.5625	1	4.2500	4
Financial_Management_ST3	4.2500	2	3.7500	6
Expanding_Operational_Activities_ST3	4.0000	3	4.6250	3
Growing_Partner_Network_ST3	3.8750	4	4.6250	2
Establishing_Organizaitonal_Structure_ST3	3.7500	5	3.1875	7
Research_and_Development_ST3	3.6875	6	4.2500	5
Raising_Financing_Capital_ST3	3.3750	7	5.0625	1

In Vilnius the most important activities are *"Customer Acquisition & Marketing"*, *"Financial Management"* and *"Expanding Operational Activities"* (Table 14). Only one activity is well represented by the ecosystem support considering the rankings – *"Expanding Operational Activities"*. Other important activities are relatively weakly supported. It should be mentioned that the least important activity is considered to be the most supported by the entrepreneurial ecosystem – *"Raising Financing Capital"*.

Delft start-ups rate *"Financial Management"*, *"Customer Acquisition & Marketing"* and *"Establishing Organizational Structure*" as the most important business activities (Table 13). All these activities from the entrepreneurial ecosystem support ranking point of view are weakly or averagely supported. Once again one of the least important activities *"Raising Financing Capital"* is the most supported according to the entrepreneurial ecosystem rankings.



49 Growth Stage key activities / ecosystem support graph



50 Growth Stage key activities / ecosystem support graph

Through scored charts it is possible to see that in both ecosystems the support provided is misaligned with the importance of business activities to overcome a stage-contingent challenge (see Figures 48 and 49). As it can be inferred from the literature, the entrepreneurial ecosystem support diminished the further stages are reached. From the responses about entrepreneurial ecosystem support for growth stages, Vilnius start-ups seem to value their ecosystem as generally more supportive than Delft.

Conclusively, earlier stages show better alignment of business activity importance and entrepreneurial ecosystem support, while in later stages we can observe significant misalignment.

6. DISCUSSION & CONCLUSION

In this section the main findings, general findings, limitations and recommendations are presented. The discussion of the findings takes into consideration the sub-questions presented in the first chapters and the results/analysis carried out throughout the study. Since there have not been a significant number of studies conducted in entrepreneurial ecosystem influence over start-up life cycle from a firm level point of view, the findings are focused on the outcome of this new approach. The outcomes of this study are explained through the contextual factors detailed in the desk research chapter.

6.1. Key Business Activities and Ecosystem Support – Early Establishment Stage

In *Early Establishment* stage 4 most important key business activities in both, Delft and Vilnius, are *"Establishing a Founding Team"*, *"Designing Business Model"*, *"Establishing a Proof of Concept"*, *"Research Early Customers"* or *"Early Customer Acquisition"*. Delft start-ups consider business model design as more important to a significant degree (Table 5). And Vilnius start-ups see the activity to acquire early customers as more important, albeit the t-test difference is not necessarily significant. According to Picken (2017), start-ups in early stages should focus on discovering a market opportunity, developing an offering, market entry strategy and designing a business model. From a resource perspective, Clarysse, Bruneel & Wright (2011) mention four types of resources needed to grow a firm – human, financial, social and technological. In addition, Kazanjian & Drazin (1980) mention that at this stage, strategic manoeuvring is mostly directed by the founding team with the focus on innovation. In our comparative case, both regions signify founding team as the most important factor. Considering that start-ups usually focus on innovation, the innovation process by itself becomes easier when knowledge is abundant and from different backgrounds (Plessis, 2007), (Colombo & Grilli, 2010), (Renko, Autio & Tontti, 2002). Such abundance is achieved when experience from different fields is merged together – especially entrepreneurial and technical knowledge (Barringer, Jones & Neubaum, 2005), (Munoz-Bullon, Sanchez-Bueno, & Vos-Saz, 2015). Therefore, start-ups correctly estimate the need to establish a strong early team and this activity impact on further growth.

From a product strategy perspective, start-ups in both regions present educated and experienced focus on the customer and the product. In the Lean Start-up culture (Reis, Eisenmann & Dillard, 2012), a start-up would try to create a build-learn-measure loop by establishing close relationships with the customers. It should be noted, that start-ups in Delft have put slightly less importance on customer acquisition and more importance in business model development. Customer acquisition is a part of a business model, but in the early stage of a start-up a business model is not set in stone as customer needs keep unravelling and the product changes are imminent (Ostwalder & Pigneur, 2010). The business model only comes afterwards (Teece, 2010), (Blank, 2013). A couple of experts have identified the problem that some start-up teams focus too much on conceptual design rather than actual tangible results. Therefore, start-ups in Vilnius have a slightly better understanding of the early stage activity importance.

From the entrepreneurial support perspective, this study finds that only one of the important business activities is well-supported by their imminent ecosystem – *"Establishing a Founding Team*". It is well known that in the early stages a lot of uncertainty lingers in the start-up process – it is loosely organized; the target market is in the process of being shaped and the product is just being developed. In all instances, a vast amount of knowledge is needed. An ecosystem supports this by exposing an incumbent entrepreneur to a social network. A network of entrepreneurs provides a relevant information flow (Stam & Spigel, 2016) and a diverse talent pool constitutes an effective entrepreneurial ecosystem. Contextually, Delft entrepreneurial ecosystem achieves this by nurturing a diverse and very skilled talent pool in a globally recognized university and channelling it to proximal incubators and co-working places. Here a centralized and compressed entrepreneurial ecosystem structure strengthens the support via higher levels of connectivity (Spigel & Harrison, 2017). Vilnius start-ups have rated their entrepreneurial ecosystem support as more influential to a significant degree (Table 8). The fact is that Vilnius entrepreneurial ecosystem is abundant of different types of resources, with multiple actors focusing on different industries and several facilitators helping to mediate relationships. Since this ecosystem has a wider reach and good interconnectedness, entrepreneurs may find it easier to find specific skilled and experienced talent in the ecosystem. In Delft, most of the talent is generated in the university, which ultimately lacks real world experience and practice.

Furthermore, Delft start-ups rate their ecosystem very supportive for business model design and that activity as the most important in the early stage. As mentioned, putting importance on this activity at this stage is erroneous. Considering that the ecosystem support is rated high and the ecosystem structure is comprised of only several main actors, it is valid to assume that this importance of a business model is transferred from the mentoring staff in said institutions. Which generally means that, as far as business model design goes, Delft incubating institutions provide inconsistent knowledge with the academically established growth practices.

6.2. Key Business Activities and Ecosystem Support – Validation Stage

In the *Validation* stage, 4 key business activities in both regions have been rated important – *"Designing a Business Model"*, *"Customer Acquisition & Marketing"*, *"Growing a Partner Network"* and *"Designing an MVP"*. The growth of the partner network has been evaluated significantly different, where Vilnius start-ups valued this activity as much less important than Delft start-ups did (Table 6). Once again, in this stage key business activities are ranked appropriately. A start-up needs to validate its business model, after the initial customers have shown interest in the products and the market needs are set (Blank, 2013), and prepare for scaling (Picken, 2017). By establishing a clear business model, the firm crystalizes an effective concept of generating revenue (Teece, 2010). The further business growth depends on the customer attraction and market saturation rates. The growth of the partner network establishes a potential resource abundance in the future as a socially driven resource (Clarysse. Bruneel & Wright, 2011). By expanding their network reach, start-ups may gain resources that are outside their imminent network and establish a foundation for potential growth. However, having a large network does not necessitate growth. Concise actions that directly affect business change are needed. That is why, Vilnius start-ups, considering their key activity importance ranking, are on a better track for growth. In addition, it is peculiar that both region start-ups consider raising venture capital as a non-important business activity, when the amount of resources needed to growth a business forward grows exponentially. Delft start-ups value this activity as slightly more important considering the focus on high-tech industries, which require large capital inputs.

Ecosystem support in this stage is relatively average for the most important key business activities. Most of these key activities require well-established internal capabilities and expertise in addition to the external partnerships at hand (Su, Tsang & Peng, 2009). Customer Relationship Management as a capability directly affects firm revenue and margin growth, which is an internally developed expertise of a firm (Morgan, Slotegraaf & Vorhies, 2009). Minimum Viable Product design is an in-house activity that integrates existing customer feedback into creating a viable product prototype (Reis, 2011). Business Model design at this stage is a process of formalizing and completing the individualized (firm level) business model. It makes sense that these activities are weakly supported by the ecosystem, since most of the expertise to carry them out is developed internally. The outlier here is partner network growth. This activity seems to be socially driven and an entrepreneurial ecosystem should be able to provide support. However, at this stage a business is already generating customers and building their trust, which results in a usually independent firm. Thus, the relationships that are to be built in this stage are strictly business relationship which require trust and are mutually beneficial (Holm, Eriksson & Johanson, 1999). It is reasonable to assume, that when initial product is already developed and scaling is about to ensue, a start-up already knows their potential business partners and business customers. In this sense, an entrepreneurial ecosystem rarely can provide anything of value beyond basic introductions.

It should be noted once again, that Delft entrepreneurial ecosystem strongly supports business model development indicating that the ecosystem actors are strongly focused on transferring the perceived importance of this activity to entrepreneurs.

6.3. Key Business Activities and Ecosystem Support – Growth Stage

Studying the mean rankings at the last stage of the life-cycle model – *Growth* – 3 important key business activities were found. In Delft it was *"Financial Management"*, *"Customer Acquisition and Marketing"* and *"Establishing Organizational Structure"*. In Vilnius *"Expanding Operational Activities"* was found to be important instead of organizational structure establishment. The financing needs (Galbraith, 1982), change of the organizational structure required to support firm growth (Steinmetz, 1969), the need to expand the customer base and generally expanding operational activities facilitating complexity (Churchill, 1982) are generally understood requirements at this stage and frankly both entrepreneurial ecosystem inhabitants share similar insights. Nevertheless, a significant difference occurred in valuation of *"Establishing Organizational Structure"* which by Vilnius start-ups has not been perceived as important (Table 7). Such difference may occur because the number of *growth* start-up in Vilnius (as respondents) is much larger than in Delft and their opinion on this matter slightly more valuable.

From the support point of view, the key important activities at the *growth* stage are averagely supported. All these activities require either completely internal capabilities, or a mix of internal expertise and external knowledge/resources. Therefore, the level of entrepreneurial ecosystem support depends on how the support facilitators can understand internal firm needs and help translate expertise into actionable results. *"Expanding Operational Activities"* is proximal to multiple ecosystem elements – it requires a well-developed market, financial options, talented human resource capital and structured coaching support in some cases. The organizational transition period may be very cumbersome from start-ups and large corporations alike if they do not follow balanced guidelines (Flamholtz, 1995). The effective ecosystem support for this activity then depends on information availability for start-ups in all these dimensions, as the network structure in general may facilitate knowledge transfer (Reagans & McEvily, 2003). In addition, Vilnius is the capital of Lithuania with a large population, growing economy and healthy wages, which eases the ability of start-ups to expand their operations (especially locally). The difference in entrepreneurial ecosystem support for *"Establishing Organizational Structure"* can be attributed to main ecosystem facilitators. This activity is highly internal and therefore the support can only be attained through expertise. Considering that start-ups in Delft value this activity and are given support to do so leads to a conclusion that ecosystem facilitators (incubators/accelerators) in Delft highlight the need for organizational structure.

6.4. Differences and Similarities in Ecosystem Support – Contextual Lenses

In this study the entrepreneurial ecosystem support for 5 groups of activities was found to be significantly different in Delft and Vilnius. 4 groups of activities were found to be similarly supported across both regions. The similarities and differences can be explained through context to some extent. First, Vilnius ecosystem is much more fragmented with a wider array of facilitating organizations that ultimately result in a tighter community through large number of community events (Feld, 2012). Also, the interest in entrepreneurial activities and general youth interest in high-tech start-ups is rising fast, considering several industries that flourished in recent years – mainly blockchain and fintech. In addition to a growing economy and relatively low wages, it makes sense that Vilnius start-ups rate the ecosystem as more supportive to establish a founding team. It should be mentioned that the quality of the talent pool and general cultural community differences are not considered.

Second, R&D activities are more supported in Vilnius. These activities are affected by 3 factors: (1) university proximity/quality (Mansfield & Lee, 1996), (2) public support programs (Ozcelik & Taymaz, 2008) and the (3) economic factors (Akcali & Sismanoglu, 2015). TU Delft is one of the leading technical universities in Europe with a staggering research output which should facilitate R&D activities for commercial firms. From innovation support program point of view, Lithuania offers a wider scope of subsidies aimed at multiple industries, while Dutch government focuses on sustainable innovation. Generally, these should cancel each other out. Netherlands, Delft included, are a much more developed economy with a large part of exports coming from high-tech sector. This results in higher than average competition which requires much larger R&D expenditures and outputs in order to facilitate success (Ito & Pucik, 1993). Vilnius start-ups on the other hand do not experience that much local competition and therefore require lower R&D expenditures and outputs. Perceptions on ecosystem support depend on the industry requirements, which mean that Delft entrepreneurial ecosystem is unable to provide sufficient R&D support for commercial firms considering competitive requirements.

Third, *"Establishing a Legal Framework"* is seen as more supported in Delft, which can be attributed to a better regulatory framework in the Netherlands, more transparent laws and general government indices. Fourth, Vilnius entrepreneurial ecosystem is seen as more supportive towards expanding operational activities. Delft ecosystem inhabits more start-ups that are aimed at the high-tech and deep-tech sectors, which are much more resource intensive and may rely on supply chain management, manufacturing operations and etc. when growing. Competitive advantage to this extent can be achieved through adjustments in resource-based strategy (Liu & Liang, 2013), aggressively expanding supply chain operations (Beckman & Sinha, 2005) or service operations when IT service industry is included. It is obvious that these industries are heavily dependent on various resources, which may be too difficult to gain through an imminent entrepreneurial ecosystem when it is in its nascent state. Vilnius start-ups are much more focused on IT services, fintech and similar "software" industries. These are not that resource heavy and are easier to cater by an entrepreneurial ecosystem in its nascent state (Feld, 2012). Establishing organizational culture is dependent

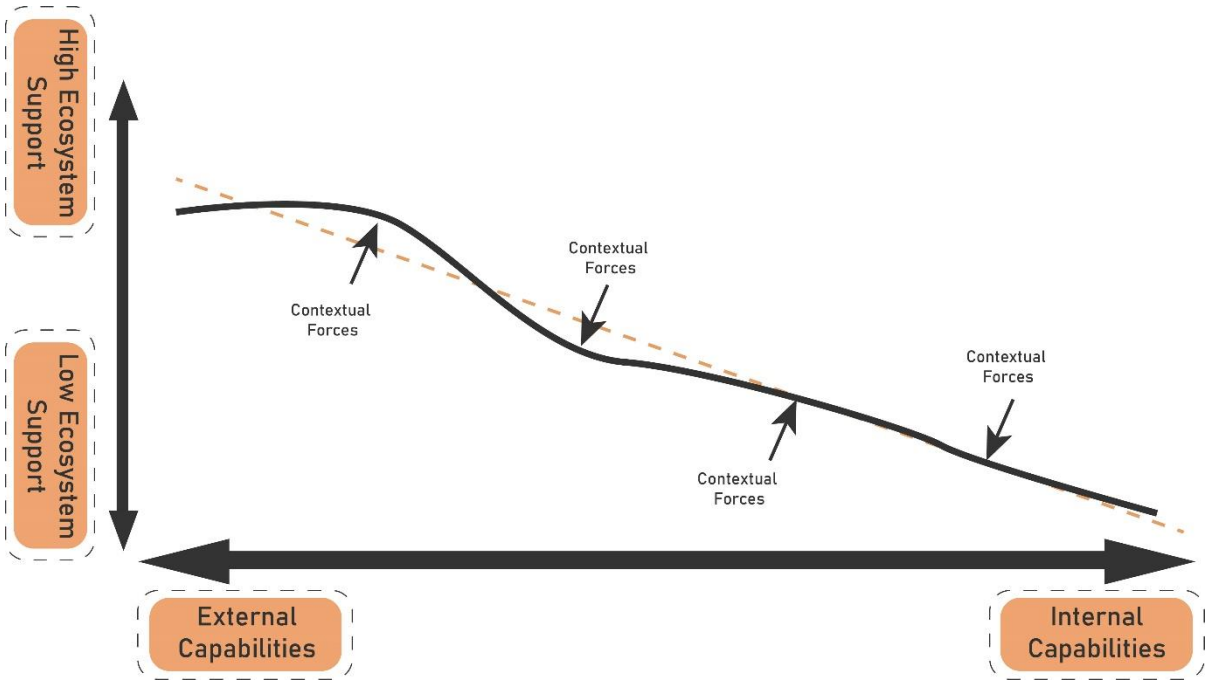
on internal capabilities and the industry start-ups participate in. Considering the high-tech and deep-tech start-ups in Delft and their respective requirements for specific organizational structures (Visser, Weerd-Nederhof, Faems, Song, Looy & Visscher, 2010) it means that Delft ecosystem facilitators understand the organizational requirement of said start-ups and are ready to cater. As mentioned, Vilnius start-ups are on a "software" side and may not require that much organizational structuring to scale properly.

Conclusively, the differences between perceived ecosystem support for given key business activities are quite easily understood contextually, but only if key business activity importance is considered. Researching on a firm level gives insight not only into the size of the difference or its existence, but also the channels through which this difference occurs. Only then, by analysing contextual differences, a researcher can infer reasonable arguments why specific differences or similarities occur.

6.5. Ecosystem influence – internal and external capabilities

The general entrepreneurial ecosystem influence toward start-up growth, considering key business activities and start-up life cycle stages, can be explained through organizational capabilities. Business activities differ in their resource requirements. Knowledge and expertise are mostly developed internally with some external knowledge transfer happening through a social network (Inkpen & Tsang, 2005). Financial resources, professional specialized knowledge, customers, governmental support and infrastructure are mostly external capabilities from the business activity point of view. In e.g. a legal framework development depends on the internal knowledge of an entrepreneurs of what is needed, but the actual case specific knowledge is held outside the firm bounds. Since an entrepreneurial ecosystem is mostly focused on the resources that from a firm-level are deemed external, activities that demand internal capabilities depend less on the ecosystem support. In addition, contextual factors affect the degree of supportiveness for a business activity, from a start-up life cycle point of view.

Naturally, the entrepreneurial ecosystem is most influential through activities that require external capabilities or knowledge that may be transferred through a tight social network. Thus, building a community that facilitates knowledge transfer is required in order to efficiently support majority of start-up business activities when needed. Considering the cases studied in this research, most of the activities that were held as important are dependent on internal capabilities thus rendering both entrepreneurial ecosystems as supportive only on a situational basis. However, this should not be taken with a negative connotation as too much support may impede firm ability to learn and grow through entrepreneurial experience (Politis, 2008). In e.g. if an incubator provides constant help with finding clients and customers a firm may not learn how to do it by itself.



51 External-Internal firm capabilities & Ecosystem Support

Conclusively, building an efficient entrepreneurial ecosystem requires understanding what internal and external capabilities are needed for inhabitant start-ups to grow and how these capabilities may be translated into actionable results. In addition, tension exists between not enough or misaligned support and too much support that may impede entrepreneurial learning. A balance between effective institutional establishments, contextual factors and an entrepreneurial community must be established. Firm-level approach towards entrepreneurial ecosystem provides great deal of insights of how this balance may be achieved – (1) consider the governmental agenda and regulations that facilitate industry specific opportunity and cater to industry specific firm requirements, (2) establish an experimental mindset in the entrepreneurial community to facilitate knowledge transfer, (3) understand where the community is headed and what needs to be done to accelerate it, (4) take into account the internal capabilities required to be developed in inhabitant start-ups and leverage resource to facilitate this development (Camison, Boronat-Navarro & Fores, 2018) and (n) etc.

Considering the effect of the ecosystem support on early stages, the current most important actors within both ecosystems are incubators that closely cooperate with educational institutions (talent pool) and have extensive partnership networks (for finances and services). In the later stages however, since neither ecosystem has shown extensive support, the main actor should be the one who closely monitors start-up requirements and has ability to cater to them.

6.6. Limitations & research recommendations

//Limitations//

Sample Size

For the sample to be representative of the entire population it must confirm to statistical recommendations. The sample size that is statistically valid is usually calculated from the recommended confidence level for a particular type of study (95% in social sciences), the confidence interval and the population size. In this study the sample size was 18 respondents in Delft and 16 respondents in Vilnius. This size sample size not only limits the amount of available statistical analysis tools at disposal, but also introduces a lot of room for error. There is significant chance that a larger sample size of the same population would have produced different results. A more aggressive approach to response collection might have produced a better sample size.

Survey Design

The survey designed in this study aimed to capture as much information as possible with a wide range of variables. This was done due to limited prior research connecting the topics of an entrepreneurial ecosystem and start-up life cycle. Nevertheless, it did produce many variables and the complexity of the survey design might have turned away a significant number of potential respondents. First, a clearer or more specialized survey design, aimed at the key business activities inferred and validated from a larger pool of experts, might have appealed to a larger audience. Secondly, a survey should have been completed in person rather than online. This would have ensured that the responses were honest, and the potential outliers or errors of judgement would have been cut from the source. Of course, considering that the comparative study focused on two regions in geographically far apart places, a larger time frame and more resources would have been needed to complete this task.

Type of Main Analysis Tool

Even though an independent samples T-test is a robust analytical tool for mean comparison, the nature of the research question to study the effect an entrepreneurial ecosystem has on the start-up life cycle asks for a predictive model to be established. An independent samples T-test only provides the differences that occur between measures of the variables but does not give any statistical insight into the causal relationships between groups of variables. In order to achieve this at first, a linear multiple regression model with interactions and an ordinal regression model was used to study the main effect variables and the effect size they produced on start-up growth. But these models suffered heavily from the sample size and became too sensitive to dataset changes to be regarded as statistically significant or valid.

Temporal Study Dimensions

Time has a large effect on not only towards the study, but also the changes that may occur in the subject at hand. This research project studies the start-up life cycle which by itself is a temporal subject in addition to a context sensitive entrepreneurial ecosystem. The effect of time on a start-up's life cycle may be very significant as a start-up that has been surveyed at one point in time may be at an entirely different stage in the very near future due to the dynamics of businesses. It may also be that a potentially growing start-up may stop dead in its track the next month or stagnate for several years. Such nuances may have a large effect on causal relationships. Time also affects an entrepreneurial ecosystem. The temporal dimensions of the regional context describe the changes that may occur on a macro level through time and have a direct effect on the supportiveness of an ecosystem. It may be that several new extremely supportive actors would occur in either of the ecosystems soon, which might change the measurements of the weak supportive channels for the better.

//Research Recommendations//

This research project has connected two academic fields that prior have not been extensively studied in conjuncture – entrepreneurial ecosystems and start-up life cycle. The concept of this study by itself is quite recommended as a firm level point of view on the effects of an entrepreneurial ecosystem support provide deeper insights into how macro level adjustments to the entrepreneurial ecosystem translate into tangible results and it provides fair measure of the real effect of an ecosystem at hand. On a more detailed note, if this study type is chosen, a researcher should take into consideration several recommendations.

First, the topics of an entrepreneurial ecosystem and start-up life cycle carry with them one unique trait – there may be a lot of variance between respondents. In order to combat this a researcher should considered a very large sample size to combat the possibilities of outliers and powerful errors in the analysis. Secondly, a causal effect between an entrepreneurial ecosystem and start-up life cycle would benefit from regression analysis as the effect power could be captured and analysed in greater detail. Third, a researcher should aim to consider a longitudinal study to include the effect of change to the ecosystem and the start-ups at hand that may affect the causal relationships.

On the note of future research, as in *post hoc*, the research should aim to understand on a deeper level how an entrepreneurial ecosystem changes affect a start-up life cycle (growth pace). This may mean that a study specializing on a few ecosystem elements (e.g. infrastructural or markets) should be conducted to analyse internal motivations, incentives and expertise that representative ecosystem actors carry and whether changes in these actor factors translate into changes in effective ecosystem support. Secondly, in this study, two types of entrepreneurial ecosystems were studies – a centralized one and a rather fragmented one. Future research should consider from a network perspective how entrepreneurial ecosystem structure affects the effectiveness of overall and specialized support (catered to particular industries). Third, this study assumed that regional context plays a certain role in establishing differences between entrepreneurial ecosystems. Even though differences were apparent, the directionality of differences was not

described. It would be beneficial to analyse how regional context dimensions affect the development of individual entrepreneurial ecosystem elements and to try and capture to what extent context has a role in the effectiveness of support. Fourth, from a macroeconomic perspective, it would be interesting to see, how costs incurred to develop an entrepreneurial ecosystem (on multiple levels) have benefited the economy through start-up growth. It may be, that an ecosystem that is still underdeveloped does not accrue benefits, but it may be worthwhile to develop such an ecosystem in the long run. Fifth, the correlation analysis has shown several correlating variables regarding ecosystem support, the previous literature has anticipated such an occurrence, but the actual reasons behind this have not been studied. A deeper study on interrelatedness between ecosystem support channels through the proximal key business activities should give insight into the state of development of entrepreneurial ecosystem elements.

6.7. Reflections and recommendations

//Managerial Recommendations and Implications//

Generally, there are two types of managers that should take the results of this study as valuable messages for further development – start-up founders and ecosystem organization management. The considerable attention currently paid to the entrepreneurial ecosystem developments is a double-edged sword, since the actual effects of the support provided are difficult to notice directly. Hence the results of this study provide a way management should consider and scrutinize the reality of an entrepreneurial ecosystem.

First, start-up founders should take the advertised and communicated effectiveness and sometimes necessity of an entrepreneurial ecosystem with a pinch of salt. It is obvious that every company has unique requirements for success that must be fulfilled. Usually, the most required support initially is funding and financial support, which frankly has been shown to not be a dominating factor towards start-up growth from stage to stage and navigating the critical junctures. On the other hand, the support for most important key business activities seems to be floating towards the average. Hence, start-up management should weight its expectation when entering an incubator or an accelerator and be aware that the available support does not necessarily translate into success and that actual individual organizational needs may only be fulfilled by developing internal capabilities, which is not easily supported by an ecosystem. A founder should initially understand the needs his company has and upon researching the actual support of its imminent entrepreneurial ecosystem check if they are relevant before entering. This detailed point of view becomes quite strategic when an ecosystem has multiple actors supporting similar areas and such decisions become much more important for long-term growth.

Second, the ecosystem actors, mainly incubators, accelerators and investors, should consider the actual needs of their inhabitant start-ups rather than focus on proposed “best practices” by the vast amount of annual reports and guidebooks. It is proved that every start-up and a respective industry has a specific set of needs that must be fulfilled in order to grow, thus the management of support providing organizations should focus on how the entrepreneurial ecosystem resources should be directed to provide effective support. A simple outlook on what start-ups deem

important and how they perceive an entrepreneurial ecosystem as being supportive in addition to expertise held by ecosystem support providers should give better insight into what can be done better to optimize the entrepreneurial ecosystem. This study provides a good example of how such a feat can be achieved if it is simplified. In addition to specific key business needs, that start-ups might show, entrepreneurial ecosystem actors must investigate how they can help later stage start-ups develop internal capabilities. If these actors focus only on support that start-ups hold external, they should drop any support for later stage start-ups and focus resources on generating greater establishment rates.

//Regulatory-Policy Recommendations and Implications//

From the regulatory point of view the governing bodies should take into consideration the amount of resources poured into developing an entrepreneurial ecosystem in their region. The actual results, that in this case should be start-up growth, are rather dim and do not seem to be heavily influenced by an entrepreneurial ecosystem even in a contextually developed region such as Delft. The initial policy recommendations by the entrepreneurial ecosystem concept developers are guided towards attracting and spurring the establishment rates of start-ups. Nevertheless, further strategy must be employed into policy changes that may affect start-up growth and realise that the initial influx of resources is only the start of an entrepreneurial ecosystem and it has to be nurtured. A good example is the national bank of Lithuania regulatory change to provide banking and payment transfer licenses with ease for fintech companies. This not only spurred the establishment rates of fintech start-ups and attracted start-ups from overseas but also affected the actual growth of this industry (sales revenue bound). It proves that after the initial entrepreneurial ecosystem has been established, further specialization is needed in addition to close feedback loop by understanding start-up needs.

//Personal Reflection//

This research project has been an unexpectedly hard endeavour that I had pleasure to undertake. The sheer ambition I had, to undertake a topic of interest instead of succumbing to status quo, in addition to a novel approach to it, gave me joy and excitement that even such a complex topic as entrepreneurship may be studied sufficiently. Nevertheless, in retrospect I could have done much better.

First, I could have valued the fact that a research question is extremely related to the analysis tool that may be used. If I have taken more time in understanding the analytical tools before committing to the research project, it would have been more precise. Secondly, the survey design could have been better if I had correctly chosen the analysis tool prior to the empirical research phase. In this case I would have opted for a predictive model and design the questions and measurement scales accordingly. This would have given me a much better cause-effect relationship effect measure than the one in this project. Third, I would have been much more aggressive with colleting survey responses if I have properly evaluated the sample needed and the intrinsic motivations of start-up founders. As I have mentioned in the limitations sub-chapter, I would have engaged in personal surveys going out into the field. Fourth, a larger number of experts should be interviewed so a more concise list of business activities could be developed.

Apart from personal insight into the process and quality of the research project undertaken, the project by itself provided a significant amount of knowledge that is worth the time.

First, trying to interconnect two or three topics that are somewhat related needs a significant amount of literature to be read. In the literature review part and the desk research I had the opportunity to test my assumptions about key business activities by gathering information through multiple sources. It did not only give me purely theoretical knowledge, but also practical. Seeing how a set of key business activities inferred from the literature by interpreting the literature according to your own worldview to only get it validated by experts gives great confidence in one's abilities. Second, the vast number of variables gathered through a survey proved to be extremely difficult to crack. Being ambitious and self-critical I had to crack the dataset on the best possible way, which meant trying multiple analytical methods to see whether any peculiarities occurred. Of course, it was also quite necessary considering the nearly non-existent academic work being done on this topic. Thus, I have learned practically rather than theoretically to apply a large number of different analytical techniques to a multi-type data set. Third, the complexity of the topic tough me how a complex project, even with relatively average quality analysis can still give valuable insights and help to further the academic field, especially when it is interesting.

//MoT Programme Relevance and Reflection//

The project was done under the faculty of Technology, Policy and Management in TU Delft in a Master in Management of Technology program. The program curriculum focused on the gap between an engineering student from a heavily scientific background and the business acumen needed for such an individual to thrive in the high-technology sector.

First two-year courses have been heavily influential for the selection of this project, while the knowledge gained through multiple subject has helped to understand the complexities of an inter-subject thesis topic. The most valuable subject, at far as this thesis is concerned, were Technology Dynamics (which helped to gain insight into what it takes to develop a product and how research has to be conducted through a smaller scale project), High Tech Marketing (underlining the importance of a good product and how sales revenue is driven), inter and intra-organizational decision making (helping to understand complex problems and develop a way of thinking to interpret difficult topics), Corporate Entrepreneurship (which gave insight into venture capital, the processes of start-up and firm growth from a corporate level) and Economics (which solidified the importance of financial resources, which attached to the importance of product development paved way to understanding the needs of start-up growth). This research should be very helpful for students who are interested in start-up growth and may be contemplating building a company on their idea as it gives knowledge foundation that is required to understand the process of growing a start-up. If at any point in time the start-up process is included into the main track of the MoT program, this research project may serve as a good foundation for curriculum building as it involves a multi-level approach to start-up growth.

Suggestions for MoT

Even though the courses have been indeed helpful in a lot of ways, personally I have always been interested in building a company. To no one's shock it always starts small and this is where the main suggestion lies. The MoT program heavily focuses on the strategic aspect of business and the corporate "life", which is to no avail bad, but for an aspiring entrepreneur, the lack of small business-related topics has been somewhat concerning. Considering that the program focuses on bridging engineers towards business savvy individuals, I believe it is imperative to start at the small-scale organizational requirements and processes to build a company. May it be motivation, leadership required, resource-based view or the development of the first prototype. Even though these topics have been touched upon throughout multiple courses, it could be much more effective to put such knowledge into one or two courses. The examples include – S-Curve (which has been taught as a part of strategy), lean start-up, growth stages, critical junctures and challenges, main factors for SME growth, resource requirements and the effect of an entrepreneurial ecosystem and so on. Furthermore, the project has been particularly hard to accomplish because of the lack of practical knowledge in the research field. It would be beneficial to make course project base on research (data collection and analysis) as this would provide comfort for the future thesis for first year students. It may also be, that more students would choose to proceed with a hard research problem rather than a case approach (which is frankly apparent) and ultimately increase the research output quality in TPM.

APPENDIX 1

Theoretical Entrepreneurial Ecosystem Influence over Business Activities

Stage	Business Activity	Ecosystem Influence		
		Low	Medium	High
Early Establishment	Setting an exit strategy	X		
	Designing a business model		X	
	Establishing a proof-of-concept	X		
	Establishing a founding team			X
	Raising venture financing capital			X
	Financial business management	X		
	Research early customer pain points		X	
	Research & Development	X		
	Early customer acquisition		X	
	Growing partner & immediate network			X
Validation	Intellectual property safeguarding		X	
	Designing an MVP		X	
	Designing a business model		X	
	Recruiting additional talent			X
	Developing a legal framework			X
	Raising venture financing capital			X
	Financial business management	X		
	Research & Development	X		
	Customer acquisition/Marketing campaigns		X	
	Growing partner & immediate network			X
Growth	Expanding operational activities on multiple levels	X		
	Establishing a clear organizational structure	X		
	Raising venture financing capital			X
	Financial business management	X		
	Customer acquisition/marketing campaigns		X	
	Research & Development	X		
	Growing partner & immediate network			X

APPENDIX 2

Early Establishment key business activities

Nr.	General Business Activity	Description
1	Setting an exit strategy	While starting a business, especially a start-up, it may be valuable to set a goal of what should be done after scalability is reached. In e.g. IPO being an objective may give different lifetime goals than selling a company at some point.
2	Designing a business model	At this stage, the activity relates to how initial value delivery process and profit gains should look like regarding the conceptual product/service.
3	Establishing a proof-of-concept	A business seeks to gain insight whether the initial product can viably fit the market need.
4	Establishing a founding team	In the event that an individual founder lacks some knowledge or there are a couple initial idea developers a company establishes a founding team.
5	Raising venture financing capital	If the founding team lacks initial financial resources it may leverage close relationships or the financial system to get start-up resources. It also applies to deep tech or heavy R&D focused start-ups.
6	Financial business management	Here the finance management relates to precisely estimating costs to market introduction and planning ahead for scaling.
7	Research early customer pain points	A business tries to gain insight into the needs of customers before developing a product/service.
8	Research & Development	Some start-ups are built on ideas that require heavy R&D even in the early stages, such as pharmaceuticals or deep tech.
9	Early customer acquisition	This activity relates to gaining innovator customers that do not mind some product hiccups but may provide valuable insights.
10	Growing partner & immediate network	Activity that relates to growing a network of actors surrounding the company or entrenching yourself in an existing network.

APPENDIX 3

Validation stage key business activities

Nr.	General Business Activity	Description
1	Intellectual property safeguarding	Activities that relate to protecting intellectual property through some sort of legal framework. The included but not exhaustive activities are patenting, copyrighting and licensing.
2	Designing an MVP	Activity that relates to creating a product that satisfies the lowest amount of customer needs and is still deemed viable to buy.
3	Designing a business model	Activities that relate to establishing a long-term business model surrounding an already tested and proved product.
4	Recruiting additional talent	In the event of growth, companies look into likely talent expansion.
5	Developing a legal framework	If a business model is established and growth goals are in focus, a well-developed legal framework is essential to prevent potential roadblocks in the long run (in e.g. private data security concerns)
6	Raising venture financing capital	Here capital needs refer to scalability, pivot or final establishment requirements for resources.
7	Financial business management	Since a product has been established, finance management here puts larger preference for profits and potential scalability planning in addition to cutting unnecessary costs.
8	Research & Development	In some cases a product needs some R&D work in order to fully represent customer needs.
9	Customer acquisition/Marketing campaigns	Activities that relate to customer base expansion and long-term branding.
10	Growing partner & immediate network	Activity that relates to growing a network of actors surrounding the company or entrenching yourself in an existing network.

APPENDIX 4

Growth stage key business activities

Nr.	General Business Activity	Description
1	Expanding operational activities on multiple levels	As scalability is being achieved, this activity refers to operational expansion needed in order to support growing demand.
2	Establishing a clear organizational structure	As the company grows, a completely loose structure may prove to be ineffective in the long-run and actually pose huge problems.
3	Raising venture financing capital	In the event that demand grows faster than the ability of a start-up to retain profit, external financing may be needed to support growth.
4	Financial business management	Here the financial management becomes more corporate and complex, cost effectiveness becomes paramount to sustain growth and ultimately profitability.
5	Customer acquisition/marketing campaigns	Activities that relate to keeping the demand growth and working on customer relationships in addition to brand (re)positioning.
6	Research & Development	Even if the company has found success with one product, it has to take into consideration that ultimately it will saturate the market and innovation is needed.
7	Growing partner & immediate network	Here the company build closer relationships with its supply chain partner, customers and regulatory bodies.

APPENDIX 5

Start-Up Stage	Key Business Activity	Literature Sources						Expert Interviews		
		William D. Bygrave.(2010) Entrepreneurship.	Eric Ries. (2011). The Lean Startup	Stephen Spinelli. (2007) Entrepreneurhsip for the 212st century	Michele Marcolongo. (2017). Academic Entrepreneurhsip	A. Davila. (2003). Venture Capital Financing and Growth of startup firms	Robert Kazanjian. (1988). Relation of dominant problems to stages of growth.	Expert 1	Expert 2	Expert 3
Early Establishment	Setting an Exit Strategy							X		
	Designing a Business Model		X	X	X			X	X	X
	Establishing Proof-of-Concept	X	X	X	X		X		X	
	Establishing a Founding Team		X		X			X		X
	Raising venture Financing capital	X				X			X	X
	Financial Business Management	X		X	X					
	Research early customer pain points	X	X	X	X	X	X	X		
	Research & Development		X				X			X
	Early Customer Acquisition		X	X	X	X		X	X	X
	Growing Partner & Immediate Network	X			X				X	
Validation	Intellectual property Safeguarding	X		X	X			X		
	Designing an MVP	X	X	X	X	X	X		X	X
	Designing a Business model	X	X	X		X			X	X
	Recruiting additional talent	X		X			X	X		
	Developing a legal framework	X								
	Raising venture Financing capital	X		X	X	X			X	X
	Financial Business management	X		X	X					X
	Research & Development		X				X	X		X
	Customer acquisition/marketing		X	X		X	X	X		X
	Growing partner & immediate Network	X			X			X	X	
Growth	Expanding operations	X		X			X	X	X	
	Establishing Organizaitonal Structure	X					X	X		X
	Raising venture Financing capital	X		X		X			X	X
	Financial Business Management	X		X						X
	Customer Acquisition/Marketing		X	X				X	X	X
	Research & Development		X				X	X		
	Growing parent & immediate Network	X			X				X	

APPENDIX 6

Normality Test

Tests of Normality							
	Shapiro-Wilk				Shapiro-Wilk		
	Statistic	df	Sig.		Statistic	df	Sig.
Setting_an_Exit_Strategy	0.899	16	0.079	Expanding_Operational_Activities_ST3	0.812	16	**0.004**
Designing_a_Business_Model	0.847	16	**0.012**	Establishing_Organizaitonal_Structure_ST3	0.874	16	**0.032**
Establishing_Proof_of_Concept	0.796	16	**0.002**	Raising_Financing_Capital_ST3	0.870	16	**0.027**
Establishing_Founding_Team	0.621	16	**0.000**	Financial_Management_ST3	0.793	16	**0.002**
Raising_Financing_Capital	0.838	16	**0.009**	Customer_Acquisition_Marketing_ST3	0.695	16	**0.000**
Financial_Management	0.850	16	**0.014**	Research_and_Development_ST3	0.788	16	**0.002**
Research_Early_Customers	0.577	16	**0.000**	Growing_Partner_Network_ST3	0.836	16	**0.008**
Research_and_Development	0.812	16	**0.004**	Ecosystem_IP	0.856	16	**0.016**
Early_Customer_Acquisition	0.793	16	**0.002**	Ecosystem_BM	0.911	16	0.120
Growing_Partner_Network	0.827	16	**0.006**	Ecosystem_HR	0.846	16	**0.012**
Intellectual_Property_Safeguarding_ST2	0.851	16	**0.014**	Ecosystem_VC	0.929	16	0.239
Designing_MVP_ST2	0.771	16	**0.001**	Ecosystem_MR	0.922	16	0.185
Designing_a_Business_Model_ST2	0.788	16	**0.002**	Ecosystem_RnD	0.858	16	**0.018**
Recruiting_Additional_Talent_ST2	0.824	16	**0.006**	Ecosystem_ECA	0.893	16	0.062
Developing_a_Legal_Framework_ST2	0.903	16	0.090	Ecosystem_GPN	0.911	16	0.121
Raising_Financing_Capital_ST2	0.859	16	**0.019**	Ecosystem_MVP	0.956	16	0.584
Financial_Management_ST2	0.833	16	**0.008**	Ecosystem_LF	0.913	16	0.132
Research_and_Development_ST	0.894	16	0.065	Ecosystem_FBM	0.877	16	**0.035**
Customer_Acquisition_Marketing_ST2	0.788	16	**0.002**	Ecosystem_CA	0.862	16	**0.020**
Growing_Partner_Network_ST2	0.812	16	**0.004**	Ecosystem_EOA	0.901	16	0.083
				Ecosystem_ECOS	0.909	16	0.114

APPENDIX 7

Normality Test

Tests of Normality							
	Shapiro-Wilk				Shapiro-Wilk		
	Statistic	df	Sig.		Statistic	df	Sig.
Setting_an_Exit_Strategy	0.856	18.000	**0.011**	Expanding_Operational_Activities_ST3	0.802	18.000	**0.002**
Designing_a_Business_Model	0.609	18.000	**0.000**	Establishing_Organizaitonal_Structure_ST3	0.752	18.000	**0.000**
Establishing_Proof_of_Concept	0.598	18.000	**0.000**	Raising_Financing_Capital_ST3	0.737	18.000	**0.000**
Establishing_Founding_Team	0.662	18.000	**0.000**	Financial_Management_ST3	0.662	18.000	**0.000**
Raising_Financing_Capital	0.909	18.000	0.084	Customer_Acquisition_Marketing_ST3	0.584	18.000	**0.000**
Financial_Management	0.876	18.000	**0.022**	Research_and_Development_ST3	0.855	18.000	**0.010**
Research_Early_Customers	0.564	18.000	**0.000**	Growing_Partner_Network_ST3	0.767	18.000	**0.001**
Research_and_Development	0.818	18.000	**0.003**	Ecosystem_IP	0.813	18.000	**0.002**
Early_Customer_Acquisition	0.801	18.000	**0.002**	Ecosystem_BM	0.918	18.000	0.117
Growing_Partner_Network	0.864	18.000	**0.014**	Ecosystem_HR	0.879	18.000	**0.025**
Intellectual_Property_Safeguarding_ST2	0.826	18.000	**0.004**	Ecosystem_VC	0.940	18.000	0.285
Designing_MVP_ST2	0.728	18.000	**0.000**	Ecosystem_MR	0.931	18.000	0.199
Designing_a_Business_Model_ST2	0.728	18.000	**0.000**	Ecosystem_RnD	0.918	18.000	0.119
Recruiting_Additional_Talent_ST2	0.853	18.000	**0.010**	Ecosystem_ECA	0.932	18.000	0.208
Developing_a_Legal_Framework_ST2	0.824	18.000	**0.003**	Ecosystem_GPN	0.907	18.000	0.077
Raising_Financing_Capital_ST2	0.879	18.000	**0.025**	Ecosystem_MVP	0.896	18.000	0.049
Financial_Management_ST2	0.801	18.000	**0.002**	Ecosystem_LF	0.807	18.000	**0.002**
Research_and_Development_ST	0.775	18.000	**0.001**	Ecosystem_FBM	0.878	18.000	**0.024**
Customer_Acquisition_Marketing_ST2	0.688	18.000	**0.000**	Ecosystem_CA	0.916	18.000	0.108
Growing_Partner_Network_ST2	0.705	18.000	**0.000**	Ecosystem_EOA	0.925	18.000	0.155
				Ecosystem_ECOS	0.816	18.000	**0.003**

APPENDIX 8

Mann-Whitney U Test Results

Test Statistics[a]

	Setting_an_Exit_Strategy	Designing_a_Business_Model	Establishing_Proof_of_Concept	Establishing_Founding_Team	Raising_Financing_Capital	Financial_Management	Research_Early_Customers	Research_and_Development	Early_Customer_Acquisition	Growing_Partner_Network
Mann-Whitney U	92.500	88.000	112.500	141.000	134.000	121.000	142.000	132.500	120.000	125.500
Wilcoxon W	263.500	224.000	248.500	277.000	305.000	257.000	313.000	268.500	291.000	261.500
Z	-1.822	-2.149	-1.252	-.124	-.371	-.833	-.089	-.422	-.882	-.671
Asymp. Sig. (2-tailed)	.068	.032	.211	.901	.710	.405	.929	.673	.378	.502
Exact Sig. [2*(1-tailed Sig.)]	.075[b]	.055[b]	.281[b]	.932[b]	.746[b]	.443[b]	.959[b]	.695[b]	.422[b]	.528[b]
Exact Sig. (2-tailed)	.071	.034	.233	1.000	.722	.426	.929	.693	.409	.517
Exact Sig. (1-tailed)	.035	.021	.122	.541	.362	.215	.498	.359	.232	.245
Point Probability	.002	.009	.028	.136	.017	.016	.035	.035	.060	.021

a. Grouping Variable: Country

b. Not corrected for ties.

Test Statistics[a]

	Intellectual_Property_Safeguarding_ST2	Designing_MVP_ST2	Designing_a_Business_Model_ST2	Recruiting_Additional_Talent_ST2	Developing_a_Legal_Framework_ST2	Raising_Financing_Capital_ST2	Financial_Management_ST2	Research_and_Development_ST	Customer_Acquisition_Marketing_ST2	Growing_Partner_Network_ST2
Mann-Whitney U	131.000	103.000	137.000	95.500	106.500	82.000	123.000	96.500	130.000	94.500
Wilcoxon W	302.000	239.000	273.000	231.500	242.500	218.000	259.000	232.500	266.000	230.500
Z	-.489	-1.518	-.264	-1.786	-1.355	-2.225	-.767	-1.774	-.533	-1.848
Asymp. Sig. (2-tailed)	.625	.129	.792	.074	.176	.026	.443	.076	.594	.065
Exact Sig. [2*(1-tailed Sig.)]	.670[b]	.164[b]	.825[b]	.095[b]	.198[b]	.033[b]	.484[b]	.102[b]	.646[b]	.088[b]
Exact Sig. (2-tailed)	.654	.160	.858	.080	.187	.025	.460	.073	.666	.077
Exact Sig. (1-tailed)	.336	.082	.423	.040	.094	.014	.237	.045	.326	.043
Point Probability	.025	.031	.044	.006	.011	.004	.030	.007	.026	.019

a. Grouping Variable: Country

b. Not corrected for ties.

Test Statistics[a]

	Expanding_Operational_Activities_ST3	Establishing_Organizaitonal_Structure_ST3	Raising_Financing_Capital_ST3	Financial_Management_ST3	Customer_Acquisition_Marketing_ST3	Research_and_Development_ST3	Growing_Partner_Network_ST3
Mann-Whitney U	122.000	86.500	91.000	106.500	139.500	140.500	112.500
Wilcoxon W	258.000	222.500	227.000	242.500	275.500	311.500	248.500
Z	-.812	-2.117	-1.915	-1.455	-.188	-.130	-1.161
Asymp. Sig. (2-tailed)	.417	.034	.056	.146	.851	.897	.246
Exact Sig. [2*(1-tailed Sig.)]	.463[b]	.046[b]	.070[b]	.198[b]	.878[b]	.905[b]	.281[b]
Exact Sig. (2-tailed)	.493	.039	.056	.196	.907	.930	.265
Exact Sig. (1-tailed)	.257	.021	.029	.098	.424	.477	.135
Point Probability	.060	.003	.000	.045	.016	.036	.027

a. Grouping Variable: Country

b. Not corrected for ties.

APPENDIX 9

Descriptive statistics – Independent Variables

Establishment stage key business activities - variables		Setting an exit strategy	Designing a Business Mode	Establishing a proof-of-concept	Establishing a founding team	Raising venture financing capital	Financial Business Management	Research early customer pain points	Research & Development	Early Customer Acquisition	Growing partner & immediate network
Delft (N=18)	Mean	2.4444	4.6111	4.5556	4.6111	3.1111	3.5000	4.6111	4.0556	4.0000	3.8333
	St. Error	.29397	.16447	.18475	.14323	.26678	.32590	.18327	.23532	.19803	.24588
	SD	1.24722	.69780	.78382	.60768	1.13183	1.38267	.77754	.99836	.84017	1.04319
Vilnius (N=16)	Mean	3.3125	3.9375	4.1875	4.6250	3.3125	3.1875	4.6250	3.8750	4.2500	3.6250
	St. Error	.35022	.24948	.24527	.12500	.21830	.27717	.17970	.28687	.19365	.23936
	SD	1.40089	.99791	.98107	.50000	.87321	1.10868	.71880	1.14746	.77460	.95743

Validation stage key business activities - variables		Intellectual Property safeguarding	Designing an MVP	Designing a Business Model	Recruiting additional talent	Developing a legal framework	Raising venture financing capital	Financial Business Management	Research & Development	Customer Acquisition/ Marketing Campaigns	Growing partner and immediate network
Delft (N=18)	Mean	3.4444	4.3333	4.3333	3.7222	3.3889	3.7778	4.0000	4.1667	4.3889	4.5000
	St. Error	.18475	.19803	.19803	.25316	.16447	.23647	.19803	.14575	.20031	.16667
	SD	.78382	.84017	.84017	1.07406	.69780	1.00326	.84017	.61835	.84984	.70711
Vilnius (N=16)	Mean	3.5000	3.8750	4.3125	3.1875	2.8750	3.0000	3.7500	3.6250	4.3125	4.0000
	St. Error	.24152	.22127	.17604	.22765	.35208	.22361	.25000	.23936	.17604	.20412
	SD	.96609	.88506	.70415	.91059	1.40831	.89443	1.00000	.95743	.70415	.81650

Growth stage key business activities - variables		Expanding operational activities on multiple levels	Establishing a clear organizational structure	Raising venture financing capital	Financial Business Management	Customer acquisition/ Marketing Campaigns	Research & Development	Growing partner & immediate network
Delft (N=18)	Mean	4.2222	4.3889	4.0556	4.6111	4.5000	3.6667	4.3333
	St. Error	.17255	.14323	.22099	.14323	.20211	.21390	.18078
	SD	.73208	.60768	.93760	.60768	.85749	.90749	.76696
Vilnius (N=16)	Mean	4.0000	3.7500	3.3750	4.2500	4.5625	3.6875	3.8750
	St. Error	.20412	.23274	.22127	.19365	.15729	.17604	.28687
	SD	.81650	.93095	.88506	.77460	.62915	.70415	1.14746

APPENDIX 10

Descriptive statistics – Independent Variables

Ecosystem Support - variables		Intellectual Property safeguarding	Business Model Development	Talent Scouting & team formation	Raising venture financing capital	Target Market research activities	Research & Development	Early customer acquisition	Growing partner and immediate network	Establishing a proof-of-concept/MVP	Developing a legal framework	Financial Business Management	Customer acquisition/ Marketing Campaigns	Expanding operational activities	Establishing a clear organizational structure
Delft (*N=18*)	Mean	4,00	5,16	4,77	4,72	4,38	3,16	3,66	4,38	3,50	4,83	4,11	3,66	3,72	3,94
	St. Error	0,28	0,28	0,23	0,28	0,37	0,33	0,29	0,24	0,24	0,16	0,34	0,28	0,25	0,17
	SD	1,18	1,20	1,00	1,22	1,57	1,42	1,23	1,03	1,04	0,70	1,45	1,18	1,07	0,72
Vilnius (*N=16*)	Mean	3,63	4,50	5,44	5,06	3,88	4,25	4,13	4,63	3,50	4,06	3,75	4,25	4,63	3,19
	St. Error	0,34	0,40	0,22	0,35	0,31	0,28	0,30	0,31	0,32	0,37	0,30	0,31	0,33	0,25
	SD	1,36	1,59	0,89	1,39	1,26	1,13	1,20	1,26	1,26	1,48	1,18	1,24	1,31	0,98

APPENDIX 11

Correlation Analysis Output, Vilnius

Correlations

		Ecosystem_IP	Ecosystem_BM	Ecosystem_HR	Ecosystem_VC	Ecosystem_MR	Ecosystem_RnD	Ecosystem_ECA	Ecosystem_GPN	Ecosystem_MVP	Ecosystem_LF	Ecosystem_FBM	Ecosystem_CA	Ecosystem_EOA	Ecosystem_ECOS
Ecosystem_IP	Pearson Correlation	1.000													
	Sig. (2-tailed)														
Ecosystem_BM	Pearson Correlation	-0.092	1.000												
	Sig. (2-tailed)	0.734													
Ecosystem_HR	Pearson Correlation	-0.405	-0.164	1.000											
	Sig. (2-tailed)	0.119	0.543												
Ecosystem_VC	Pearson Correlation	-0.234	0.256	-0.024	1.000										
	Sig. (2-tailed)	0.383	0.338	0.931											
Ecosystem_MR	Pearson Correlation	0.049	0.266	-0.126	0.081	1.000									
	Sig. (2-tailed)	0.858	0.319	0.641	0.765										
Ecosystem_RnD	Pearson Correlation	**-.501***	-0.037	0.017	**.629****	0.259	1.000								
	Sig. (2-tailed)	0.048	0.891	0.951	0.009	0.333									
Ecosystem_ECA	Pearson Correlation	**-.539***	0.278	0.194	0.274	0.011	0.369	1.000							
	Sig. (2-tailed)	0.031	0.297	0.472	0.304	0.968	0.160								
Ecosystem_GPN	Pearson Correlation	-0.321	0.333	0.453	0.396	0.221	0.400	**.693****	1.000						
	Sig. (2-tailed)	0.225	0.208	0.078	0.129	0.411	0.125	0.003							
Ecosystem_MVP	Pearson Correlation	0.155	-0.033	-0.089	-0.323	0.000	-0.375	0.000	-0.377	1.000					
	Sig. (2-tailed)	0.567	0.903	0.744	0.223	1.000	0.153	1.000	0.150						
Ecosystem_LF	Pearson Correlation	**.575***	-0.042	0.028	**-.520***	-0.139	**-.730****	-.640**	**-.523***	0.373	1.000				
	Sig. (2-tailed)	0.020	0.876	0.917	0.039	0.609	0.001	0.008	0.038	0.154					
Ecosystem_FBM	Pearson Correlation	0.435	-0.106	-0.016	-0.396	0.246	**-.551***	-0.211	-0.336	**.668****	**.580***	1.000			
	Sig. (2-tailed)	0.092	0.695	0.954	0.129	0.358	0.027	0.434	0.203	0.005	0.019				
Ecosystem_CA	Pearson Correlation	-0.257	0.203	0.256	**.533***	0.107	0.431	0.469	0.492	-0.341	-0.445	-0.228	1.000		
	Sig. (2-tailed)	0.336	0.451	0.338	0.034	0.693	0.096	0.067	0.053	0.197	0.084	0.397			
Ecosystem_EOA	Pearson Correlation	-0.458	0.192	0.150	0.417	-0.111	0.203	0.454	0.273	-0.080	-0.399	-0.237	**.719****	1.000	
	Sig. (2-tailed)	0.074	0.477	0.580	0.108	0.682	0.450	0.077	0.306	0.767	0.126	0.378	0.002		
Ecosystem_ECOS	Pearson Correlation	**.656****	-0.149	-0.252	-0.205	-0.304	**-.528***	**-.529***	-0.479	**.510***	**.588***	**.503***	-0.370	-0.201	1.000
	Sig. (2-tailed)	0.006	0.581	0.346	0.447	0.253	0.035	0.035	0.060	0.043	0.017	0.047	0.158	0.455	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

APPENDIX 12

Correlation Analysis Output, Delft

Correlations

		Ecosystem_IP	Ecosystem_BM	Ecosystem_HR	Ecosystem_VC	Ecosystem_MR	Ecosystem_RnD	Ecosystem_ECA	Ecosystem_GPN	Ecosystem_MVP	Ecosystem_LF	Ecosystem_FBM	Ecosystem_CA	Ecosystem_EOA	Ecosystem_ECOS
Ecosystem_IP	Pearson Correlation	1.000													
	Sig. (2-tailed)														
Ecosystem_BM	Pearson Correlation	**.536***	1.000												
	Sig. (2-tailed)	0.022													
Ecosystem_HR	Pearson Correlation	0.099	**.716****	1.000											
	Sig. (2-tailed)	0.697	0.001												
Ecosystem_VC	Pearson Correlation	-0.202	0.313	**.520***	1.000										
	Sig. (2-tailed)	0.422	0.206	0.027											
Ecosystem_MR	Pearson Correlation	0.408	0.461	**.578***	0.333	1.000									
	Sig. (2-tailed)	0.093	0.054	0.012	0.177										
Ecosystem_RnD	Pearson Correlation	-0.313	-0.292	0.069	0.297	-0.240	1.000								
	Sig. (2-tailed)	0.206	0.239	0.787	0.231	0.337									
Ecosystem_ECA	Pearson Correlation	-0.200	-0.040	0.221	0.400	**.493***	-0.033	1.000							
	Sig. (2-tailed)	0.426	0.876	0.378	0.100	0.038	0.895								
Ecosystem_GPN	Pearson Correlation	0.191	-0.008	0.031	0.321	**.478***	-0.086	**.612****	1.000						
	Sig. (2-tailed)	0.448	0.975	0.902	0.194	0.045	0.734	0.007							
Ecosystem_MVP	Pearson Correlation	-0.380	-0.399	-0.112	0.390	0.054	**.534***	0.456	0.245	1.000					
	Sig. (2-tailed)	0.120	0.101	0.657	0.109	0.833	0.022	0.057	0.328						
Ecosystem_LF	Pearson Correlation	-0.070	0.173	0.193	0.011	0.220	-0.204	0.269	0.334	-0.040	1.000				
	Sig. (2-tailed)	0.783	0.492	0.442	0.965	0.381	0.416	0.280	0.175	0.875					
Ecosystem_FBM	Pearson Correlation	-0.375	-0.113	-0.022	**.481***	-0.303	0.389	0.153	0.087	0.466	0.019	1.000			
	Sig. (2-tailed)	0.125	0.656	0.930	0.043	0.222	0.111	0.544	0.732	0.051	0.940				
Ecosystem_CA	Pearson Correlation	0.000	-0.041	0.230	0.094	0.450	0.070	**.681****	0.398	0.427	0.140	0.193	1.000		
	Sig. (2-tailed)	1.000	0.871	0.358	0.710	0.061	0.784	0.002	0.102	0.077	0.579	0.442			
Ecosystem_EOA	Pearson Correlation	-0.369	-0.418	-0.061	0.161	0.033	0.340	**.679****	0.261	**.551***	-0.219	0.285	**.707****	1.000	
	Sig. (2-tailed)	0.132	0.084	0.811	0.523	0.897	0.168	0.002	0.295	0.018	0.382	0.251	0.001		
Ecosystem_ECOS	Pearson Correlation	-0.205	0.079	0.225	0.180	-0.134	0.237	-0.087	-0.126	-0.194	0.210	0.174	-0.091	0.130	1.000
	Sig. (2-tailed)	0.415	0.756	0.370	0.475	0.595	0.343	0.730	0.618	0.440	0.402	0.490	0.720	0.607	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

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