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Triple Helix Model in Startup Incubators: The Case of Tehnopol Startup Incubator

Master Thesis
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Introduction **5**
2. Literature Review and Theoretical Framework **8**
2.1. Triple Helix 8
2.2. Science Parks & Incubators 11
2.3. Startups 13
2.4. Startup Lifecycle 14
2.5 The Effects of Organisational Management Models on Triple Helix-based Science Parks and Incubators from a startup perspective 17
3. Methodology: **21**
4. Results of Interview **23**
4.1 Motivations and Expectations from the Incubation Program 24
4.2 Overcoming Challenges in Startup Incubation Programs: Tehnopol Incubator 26
4.3 The Role of Resources and Services in the Success of Startups at Tallinn Science Park Tehnopol Incubator 28
4.4 Impact of Incubation Programs on Startup Development Stages 30
4.5 Startup Goals and Milestone Achievement in Incubation Programs 31
4.6 Incubator Support in Customer Acquisition, Funding, and Collaboration 32
4.7 Triple Helix Influences and Incubator Organizational Management Impact on Startups 34
4.8 Challenges and Effectiveness of Tehnopol Startup Incubator 35
5. Conclusion **38**
6. Acknowledgements **39**
References **40**
Appendix A. List of Interviewed Startups and Founders **45**
Appendix B. List of questions for the interview. **46**

Abstract

The effectiveness of startup incubators has been debated in the literature on entrepreneurship and innovation. This study aims to examine the perceived value and effectiveness of Triple Helix-based science park startup incubators on the growth and success of startups during their incubation period. The research was conducted through semi-structured interviews with startup entrepreneurs who are current and past participants of the Tehnopol Startup Incubator to understand their experiences, challenges, and the incubator programme's impact on their startups' development lifecycle. The findings emphasise the significance of personalised assistance, mentorship, networking opportunities, and setting realistic goals for participating startups. The study also identifies areas for improvement and offers suggestions for enhancing the quality of incubator programmes. Several key lessons can be drawn from this research that can assist policymakers, incubator managers, and other stakeholders design more effective mechanisms for supporting startups, nurturing innovation, and promoting economic growth.

Keywords: startup incubators, startups, Triple Helix, science park, startup development, innovation, entrepreneurship

JEL Classification: L26, M13, O31

Triple Helix mudel startup-inkubaatorites: Tehnopoli Startup-İnkubaatori näitel

Üldkokkuvõte

Ettevõtlust ja innovatsiooni käsitlevas kirjanduses on vaieldud startup-inkubaatorite tõhususe üle. Selle uuringu eesmärk on uurida Triple Helix-il põhinevate teadusparkide idufirmade inkubaatorite tajutavat väärtust ja tõhusust idufirmade kasvu ja edu osas. Uurimistöö viidi läbi poolstruktureeritud intervjuude abil Tehnopol Startup Inkubaatoris praeguste ja endiste osalevate iduettevõtete ettevõtjatega, et mõista nende kogemusi, väljakutseid ning inkubaatori programmi mõju nende ettevõtete arengutsüklile. Uuringu tulemused rõhutavad personaalse abi, mentorluse, võrgustikuvõimaluste ja realistlike eesmärkide seadmise olulisust osalevatele iduettevõtetele. Uuring tuvastab ka valdkonnad, kus saaks programmide kvaliteeti parandada ning pakub soovitusi inkubaatoriprogrammide tõhustamiseks. Uuringu tulemused võivad aidata poliitikakujundajatel, inkubaatorite juhtidel ja teistel huvitatud osapooltel kavandada tõhusamaid mehhanisme idufirmade toetamiseks, innovatsiooni arendamiseks ja majanduskasvu soodustamiseks.

Introduction

Entrepreneurship has become significantly crucial over the last few years. Hart, 2003 defines entrepreneurship as the "process which including founding and continuing to create new firms". One reason for this importance is the positive effect of entrepreneurship on the economy from the perspective of development and growth. For instance, according to Landes (1998), this positive effect of entrepreneurship could be reducing poverty while increasing economic competitiveness. For measuring the rising rate of entrepreneurship and its effect on economic competitiveness, self-employment or the percentage of startups formed each year could be used as an indication (Thurik, 2002).

Moreover, Naude (2008) highlights that the rate of startups is becoming incredibly important for the economies due to their higher growth tendency of growth and ability to stimulate the innovative and adaptable development of organisational structures. In academic literature, a startup is considered a new company or initiative founded by an entrepreneur to identify, develop, and verify a scalable business model. As a result of these essential benefits, startups have a supercritical role in many countries to create job opportunities and foster innovation and economic growth.

Estonia is one of those countries where startups have a vital role in economic development. According to the Invest in Estonia (2022) and State of European Tech (2022) report by Atomico, for the investments per capita out of European countries, Estonia has raised the highest number. For instance, reports show that in Estonia, comparing 2020, in 2022 - investment levels increased by 2 % points and became a 3.6 % share of GDP. Even though 2022 was a challenging year considering the complex economic situation - supply chain disruptions, post Covid-19 period, and the effect of continuous wars (f.e, Ukraine - Russia), the Estonian Startup Ecosystem showed its sustainability and resilience, which led Estonian startups to made remarkable results. Considering this critical role of startups, one of Estonia's priorities is to stimulate the development of entrepreneurial traits in the country's younger population. Based on the StartupBlink - Startup Ecosystem Report (2022), Estonia is ranked 13th globally, 7th in Europe and 5th in the EU. Estonia's remarkable startup ecosystem outperforms most of its Nordic counterparts despite its relatively low population (Finland, Denmark, Norway, and Iceland).

In recent decades, as stated by Lofsten (2002), constructing a scientific or research park to attract businesses and contribute to the growth of the regional economy has become an increasingly widespread practice. In accordance with this initiative, Tallinn University of Technology (TalTech), the State of Estonia, and the City of Tallinn developed Science Park Tehnopol relying on Triple-Helix principles to encourage business development and global economic expansion. It should be highlighted that Tehnopol is considered the most significant and influential Science Park in the Baltics, which can be seen in the considerable impact on the Estonian economy by assisting the growth of Estonia's startup and small and medium-sized firms (SMEs).

As stated before, Tehnopol has been built following Triple Helix principles, where strong collaboration between academic institutions, industry and government is considered one of the main strategies. The Tehnopol Startup Incubator has been selected as a case study for this thesis due to its distinctive approach to fostering innovation and assisting early-stage entrepreneurs, specifically its emphasis on the Triple Helix model. The incubator is an excellent example of how close collaboration between academic institutions, businesses, and the government can facilitate the growth and development of technology-based enterprises.

Using the Tehnopol Startup Incubator as a case study, this research aimed to gain insight into how the Triple Helix concept operates in practice and its effects on the startups supported within the incubator. The comprehensive analysis provides valuable insights into how other incubators or science parks may apply this methodology to create an effective innovation ecosystem that enables entrepreneurs and society.

Although numerous studies have mainly been conducted on the Triple Helix innovation model and how it has been utilised in the startup ecosystem, there is still a research gap about the impact of Triple Helix on Startups. It is essential to understand how the collaboration of academia, industry, and government influences the effectiveness of incubation programmes and startups. Moreover, mentors and professionals play a significant part in most startup incubation programmes; however, their position in Triple Helix-based incubation programmes is unclear in the academic literature. This research will also help to gain valuable insight for understanding the role of mentors in supporting the Triple Helix principles from the perspective of startup incubators and startups and how they contribute to the success of these programs.

In addition to emphasising the Triple Helix model, the Tehnopol Startup Incubator stands out for its robust international network, comprehensive support services, and targeted approach to high-growth sectors. The case study will highlight the incubator's accomplishments and provide helpful insights for other startup ecosystems looking to create original, long-lasting solutions to global problems in this industry by examining these parameters.

To facilitate the development of concepts, the Tehnopol Startup Incubator offers a growth programme that provides mentorship, workshops, workspace, training, a marketing and communication plan, and free cloud space; however, there should be an ideal level of MVP or prototype with only a 2 % participation option. This study examines the influence of Startup Incubator organisational structures on the development cycle of startups, focusing on Tehnopol startups as the chosen case for qualitative analysis.

The research also contributes to understanding how the principles of the Triple Helix-based innovation ecosystem are practical from the startup's perspective. The article will determine the main characteristics of the Triple Helix ecosystem, the startups and their development lifecycle, and the elements of Science Park-based Startup Incubators and their organisational management structures. It will also suggest how the aspects of the ecosystem could influence the startups. Therefore, to achieve the purpose of the given research aim, the research questions formed below

RQ.1: *How do startups participating in a Triple Helix-based Science Park startup incubator program perceive the program's value in its impact on their growth and success?*

RQ.2: *What factors make startup incubators effective in supporting the development and growth of startups, and how do these factors impact the startups from the perspective of startup founders?*

To address the research questions outlined above and advance knowledge in the field, the following objectives will be pursued in this study:

- To find essential themes and knowledge gaps, perform a comprehensive study of the literature on the Triple Helix concept and its use in startup ecosystems.

- Use a qualitative methodology to determine and examine the Tehnopol Startup Incubator ecosystem's essential elements, particularly the Triple Helix strategy and how it affects startups.
- Analyse the Tehnopol startup ecosystem as a case study to learn more about the interaction between startups and incubators and the stages of the startup development lifecycle.
- Gather detailed information by conducting semi-structured interviews with the incubator manager and the founders or co-founders of startups participating/participated in the Tehnopol Startup Incubator.
- Evaluate the effects of the organisational model and the incubator programme on the startup development lifecycle using theme analysis to analyse and analyse the information gathered through interviews.
- As conclusion, offer suggestions and improvements to the incubators based on startups' difficulties.

The article's structure is the following: The first section examines the essential principles of the Triple Helix approach, Science Parks, Startups, Startup Incubators, and the Startup Development Lifecycle as described in recent academic literature. The second section thoroughly examines the research strategy and methods, including a review of the data gathering and used methodological analysis. The third section presents the study's findings, including interview results and outcomes. Finally, the conclusion reviews the findings, emphasising key findings and making recommendations for future research and practice.

2. Literature Review and Theoretical Framework

2.1. Triple Helix

The Triple Helix is a model of innovation, with each of its three spheres representing a unique set of connections and relationships between academic institutions, industry, and government. (Etzkowitz & Leydesdorff, 1995).

According to Henry Etzkowitz and Loet Leydesdorff (1995), the Triple Helix model would be the most effective strategy for fostering national and international innovation in the 21st century. The Triple Helix model is an innovation and economic development approach focusing on university-industry-government relations. It proposes that the success of a nation's innovation system is dependent on interactions between the three main actors: universities, companies, and the government. For example, as Godin and Gingras (2000) demonstrate, the Canadian government has prioritised developing and fostering more important linkages between universities and businesses over the last two decades by implementing new laws and strategic initiatives in that manner.

The first model is the "statist model," in which institutional spheres are unconnected; neither dominates nor is affected by the others. The "statist model," which was particularly common in the Soviet Union, France, and different Latin American / countries, was characterised by government autonomy and dominance over industry and academia (Etzkowitz, 2002). Zhou (2008) emphasises the "Statist model" as a "government-driven Triple Helix" by the Communist Party in his study of the development of entrepreneurial education in China. Furthermore, Cai (2020) explains that the government supervises academia and industry in the statist model. The government anticipated serving as an idea generator and funding source for innovative projects.

Etzkowitz (2002) states that the laissez-faire model separates industries, academia, and government. The interaction between these spheres could only be witnessed in a limited capacity due to solid limitations. Etzkowitz (2002) uses interaction to illustrate how the United States is intended to operate. Furthermore, Etzkowitz and Cai (2020) observed that the laissez-faire model was visible during the emergence of Silicon Valley when the presence of the government and the university was critical and prominent. However, as startups grew into mega-corporations, these disciplines were primarily forgotten and eclipsed by industry in a relatively short period.

Finally, Triple Helix's "Balanced model" is unique because spheres can comply and collaborate. According to Etzkowitz (2002), the global tendency is towards a balanced paradigm that "moves from one of the unchangeable borders between various institutional domains and organisations to a more adaptable overlapping system in which one takes the function of the other." Furthermore, Ranga (2013) observed that the most conducive conditions for creativity are created at the sphere intersections because the balanced structure offers the most valuable insights for

innovation. Nonetheless, the research is being conducted to develop a model that accounts for the balanced interactions between the three spirals of academia, industry, and government. Even the most efficient innovation system can deplete resources if the sectors are significantly imbalanced. Scott (2017) discovered that in Silicon Valley, the combination of a remarkably successful private sector and an inadequate public sector makes it difficult to keep an adequate educational infrastructure to satisfy businesses' talent demands. At the start of the 20th century, New England's economy lost a significant portion of its traditional economic base. As a result, an attempt was made to correct the regional imbalance by establishing horizontal innovation governance structures. A more severe crisis prompted this during this period, which resulted in the collapse of a significant part of New England's conventional economic system (Cai, 2020).

Historically, economic growth frameworks have emphasised capital accumulation as the primary driving factor. According to Audretsch and Keilbach (2008), emerging business ideas and models cover a broader range of growth factors, including intellectual capital, knowledge, innovation, and even subjective characteristics like an entrepreneurial mindset.

Furthermore, Carayannis (2009) added a fourth helix to Etzkowitz's three helixes in this setting. (i.e., governments, industries, and academia). The academics characterised this helix as the "media and culture-based public." The fourth helix is associated with the media, entertainment sectors, society, ethics, lifestyles, and the arts. Thus, Galvao (2019) defined the hypothesis of significant explanatory power, which focuses on how the media shapes and presents culture and values, as well as public reality, and affects each national innovation system. Promoting a knowledge-based advanced economy necessitates a mindset of long-term innovation.

Several studies have emphasised the importance of universities to the triple helix idea. Universities are essential as "sources" and "stimulators" of regional economic development. According to Pugh (2017), universities serve as "sources" and "stimulants" of economic development within the framework of the triple helix concept. However, according to Etzkowitz (2008), universities must have suitable conditions, such as high-quality professional teaching and research, because this is closely related to producing knowledge and technology beneficial to economic activities.

An approach to a knowledge-based economy is described by Campbell (2009) as a Triple Helix. In contrast, a Quadruple Helix describes a "knowledge-centred society" and a "knowledge-driven democracy." Campbell (2009) also stated that the Quintuple Helix model was developed in response to the changing nature of the information age. Quintuple helix theory is based on interactions between society and nature and is related to socioeconomic transformation as well, according to Carayannis (2012). According to Cai (2022), this may be associated with a developing mindset. A developing mindset will more likely recognize the relationship between socially responsible innovation and civil society participation in policy initiatives.

2.2. Science Parks & Incubators

Incubators are crucial to the growth and development of startups. Incubators can provide startups access to essential resources, including funding, mentoring, and networking. This literature review aims to compare and contrast the various varieties of incubators, including Triple Helix incubators located in science parks.

Wield (1992) describe science parks as property developments facilitating commercial, academic research activities. Universities and higher education institutions are a repository of scientific knowledge, research, and cutting-edge technology. The scientific park is envisioned as a platform for university researchers to monetise their findings or as a location for companies to acquire academic skills and research findings. The foundation of the science park idea is that scientific understanding logically contributes to technological innovation.

According to Bakouros (2001), Europe had a surge in establishing scientific parks throughout the 1980s and 1990s. Storey (1998) claims that as of the mid-1990s, 310 scientific parks were created in 15 nations of the European Union, with 14,790 enterprises employing 236,278 individuals. Moreover, the goal of scientific parks is to enable researchers at the local university to market their research ideas and to offer well-established firms and small companies that are utilising and inventing complex technology with distinguished housing (Löfsten, 2002).

Often, either a government organisation or a private entity owns and runs traditional incubators. Traditional incubators are designed to support startups in various industries and offer

various services, including mentoring, networking, and funding access. However, these incubators may not focus on R&D or technology-based startups.

In contrast, science park-based incubators are typically situated within science parks, intended to foster innovation and collaboration among government, industry, and academia. Their generally focus are on technology-based startups and offer various services, including access to laboratory facilities, research expertise, specialised mentoring, and networking opportunities.

According to Mustar (2009), incubators located in scientific parks are especially effective at fostering the growth and development of technology-based startups. These incubators provide access to the necessary resources, tools, and expertise for developing and commercialising innovative technologies for startups. In addition, the Triple Helix model can facilitate collaboration between startups, government agencies, industry partners, and academic institutions, thereby fostering the growth and success of startups. Similarly, Carayannis and Campbell (2009) argue that science park-based incubators effectively foster innovation and entrepreneurship, because they are intended to facilitate collaboration and the exchange of knowledge between startups, government agencies, industry partners, and academic institutions, which can result in the development of new products, services, and business models.

In addition, Lofsten and Lindelof (2003) suggest that science park-based incubators can assist startups in overcoming barriers to accessing resources and networks. For instance, Science - park incubators offer startups access to various resources, such as laboratory facilities, research expertise, and specialised mentoring and networking opportunities. In addition, the Triple Helix model can facilitate collaboration and knowledge exchange among startups, government agencies, industry partners, and academic institutions, thereby assisting startups in overcoming the obstacles associated with commercialising their innovative ideas.

The literature generally indicates that science park-based Triple Helix incubators can effectively nurture the growth and development of technology-based startups. The main reasons are their ability to provide startups access to success-critical specialised resources, expertise, and networks. Furthermore, the Triple Helix model can facilitate collaboration between startups, government agencies, industry partners, and academic institutions, thereby fostering the growth and success of startups.

2.3. Startups

Ries (2011) states that a startup is a temporary organisation working towards a scalable, repeatable, and sustainable business model while functioning in an atmosphere of high uncertainty. Meanwhile, Blank and Dorf (2013) describe a startup as a "temporary organisation formed to seek a consistent and competitive business strategy." Furthermore, the European Commission (2020) defines tech-enabled startups as combining rapid development, high dependence on product, operations, and financing innovation, an extreme emphasis on new technological advances, widespread use of novel business strategies, and frequently cooperative networks. An innovative technology startup is typically founded by an entrepreneur or a collection of entrepreneurs. Several studies have found that high-tech and innovative products and services in new areas are the primary focus of tech startups. By inventing market-disrupting breakthroughs that frequently generate new industries, startup companies in the technology sector have significantly added to job creation and economic growth on a regional and national scale. (Al-Mubaraki, 2017).

Following, Ranga (2013) think Triple Helix environments are ideal for businesses operating in weak entrepreneurial ecosystems. Collaboration between the government, industry, and universities in these areas has the potential to bring the need for more resources and infrastructure, which could improve the process of growth and success of startups.

Likewise, Barrie (2019), startups working in knowledge-intensive sectors like telecommunications, software, and biotechnology are especially well-suited for Triple Helix environments. The cooperation between the government, industry, and academia may assist in commercialising innovations necessary for these industries and engage crucial advancements in research and development.

Furthermore, Zhou (2017) contends that Triple Helix environments are particularly ideally suited to startups working in cutting-edge technologies. Government, industry, and academic institutions must contribute considerable knowledge and resources to develop these technologies. Cooperation between these groups of stakeholders could potentially help startups overcome these hurdles.

However, some academics concluded that the Triple Helix model would not be appropriate for startups in particular industries. For instance, Zhuang (2021) contends that Triple Helix contexts may not be as beneficial for startups operating in more traditional sectors like manufacturing and construction because these sectors depend less on R&D and developing technology.

2.4. Startup Lifecycle

Several researchers have proposed startup lifecycle models. For instance, The Startup Lifecycle development model was described as having four stages by Passaro et al. (2016). (Fig.1). The first stage of *Ideation* begins with idea generation, during which founders concentrate on knowing customer needs to solve potential issue problems. Entrepreneurs are responsible for offering solutions to both current and potential problems. This implies that entrepreneurs see opportunities where others see obstacles. As a result, at that point, there is a need for technical resources to help founders study and evaluate the viability of a potential idea. According to Passaro et al. (2016), for a startup company to be successful, it must have adequate technological resources, a culture that promotes entrepreneurship, and suitable personal capabilities. In this phase, academic institutions, government, and local authorities are critical drivers of an entrepreneurial culture.

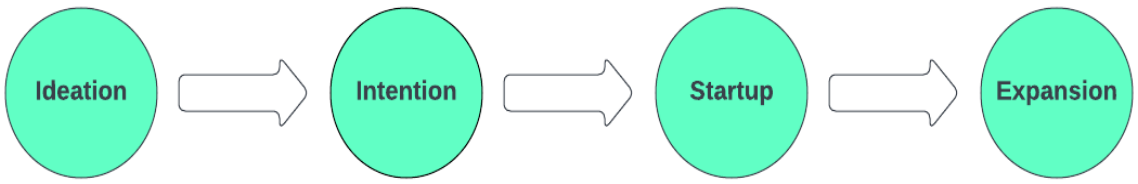

Figure 1 - Startup Development Lifecycle Model

Source: *Passaro (2016).*

According to Passaro et al. (2016), the second stage - the *Intention* stage - is crucial for startup founders because it allows them to validate the market potential. Picken (2017), for example, stated that the difficulty for each entrepreneur is to identify and validate the business concept to comprehend the essential needs, market size, and opportunities of customers. Furthermore, founders are beginning to show an interest in potential customers and can capture their focus. Consequently, they have to identify possible financial resources and investors. To accomplish this, they must establish relationships with various business actors in the startup ecosystem (such as science parks, incubators,

venture capitalists, etc.) and obtain adequate resources and support for developing prototypes or minimum viable products. (MVPs).

The third stage is the *Startup* stage, which indicates that the business concept has been thoroughly evaluated and successfully launched. Early-stage entrepreneurs commit to running their own companies. As a result, startup creators could be classified as early-stage entrepreneurs. Moreover, Startup Incubators or Accelerator Programs are required for startup companies to obtain technological and physical resources such as co-working spaces. Passaro et al. (2016) noted that startups must reach out proactively to customers, suppliers, and even external partners during this stage. To be effective in a new business venture, a startup company must have an entrepreneurial spirit, a willingness to take risks, self-assurance, and leadership skills. Entrepreneurs should be able to make their first sales once the new (novel) product or service has been presented to the market.

Lastly, the startup company should be ready to operate a large business independently by the Expansion stage. On the other hand, however, Passaro et al. (2016) advise startup founders to learn how to manage high turnover, inspire and organise employees, interact with new clients and suppliers, and seek foreign markets and partners. Customer acquisition, back-end scalability upgrades, new hires, and internationalisation are all critical initiatives for long-term development.

In contrast to Passaro et al. (2016), Salamzadeh and Kawamorita (2015) determine that a startup's lifecycle has three stages, the first of which is called *Bootstrapping*. (Fig.2). During the *Bootstrapping* stage, entrepreneurs concentrate on activities that will turn their idea into a profitable company while keeping the level of risk in mind. (Salamzadeh & Kawamorita, 2015). To get their businesses off the ground, aspiring entrepreneurs must establish their ideas and teams before pursuing outside investment or relying on their resources.

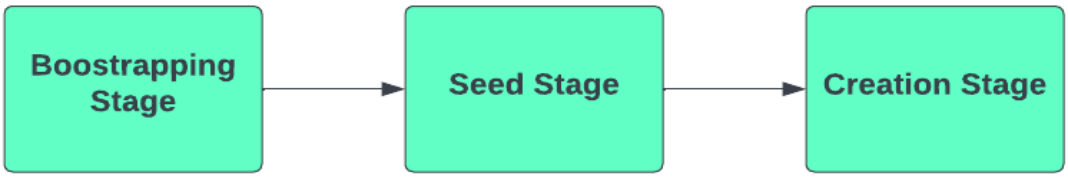

Figure 2 - Lifecycle of Startups

Source: *Salamzadeh, Aidin & Kawamorita, Hiroko. (2015).*

Salamzadeh and Kawamorita (2015) state that the second - *Seed Stage* is typically called an increase in startup investment. Furthermore, this stage is referred to as being challenging because it

is necessary to seek assistance, such as accelerators, startup incubators, or development centres, to create a prototype and join the market. As a result, most startups risk failing during the seed stage because they require assistance obtaining the necessary resources for ongoing development.

In the final stage, known as *Creation*, the startup has a completed product on the market. It is beginning to generate a profit, allowing them to hire more employees. Nonetheless, Salamzadeh and Kawamorita (2015) stated that a startup firm is already in the final stages of development. Thus, they are mainly focused on growing their funding sources. For example, producing their financial resources requires venture capital, which is a possibility for them.

Furthermore, Thornton, G., and Assocham (2016) proposed three stages of the Startup Lifecycle Model. (Fig.3).

Figure 3 - Stages of Startup Lifecycle

Source: *Thornton, G. and Assocham (2016)*

The Pre-startup stage identifies possible cost-effective products or ideas for the existing market. The next step is to locate initial customers once the product or idea has entered the market. The next phase is "Startup," in which entrepreneurs develop their business model and aim to expand their potential customer base. At this point, there is a strong emphasis on increasing growth capacity to ensure long-term sustainability. In the end, during the "Growth" stage, it is necessary to identify issues preventing the startup from reaching a global scale. Moreover, there may be a decision to sell the startup or to concentrate on acquiring additional resources to grow the brand continuously.

2.5 The Effects of Organisational Management Models on Triple Helix-based Science Parks and Incubators from a startup perspective

Organisational management models are organisations' frameworks to plan, organise, lead, and control activities. These models are frameworks or approaches to guide and structure organisational actions and processes. There are numerous organisational management models. The particular model

of an organisation may be determined by several factors, including the organisation's size and character, the industry in which it works, and its goals and objectives. (Eisenhardt & Tabrizi, 1995). Each organisational structure impacts startups throughout their life cycle growth process. The present section of the paper looks at four popular corporate management models and their connection to Triple Helix-based organisations and startups.

The hierarchical model

This hierarchical model depends on a direct command line from senior executives to lower-level employees. This style of organisational structure emphasises control at higher levels to keep a company stable. It enables rapid decision-making but, if improperly managed, it can result in bureaucracy. The hierarchy model is built on conventional management structures, with roles for each level of authority clearly defined. (Christoph, 1995). Although this structure enables effective communication at all levels, it also slows down decision-making because choices must pass through several layers before being put into action. Hierarchical structure promotes stability, curbs risk-taking, and effectively uses resources within a company's financial limitations. However, it does not foster innovation because it takes longer to make decisions. After all, there are so many levels involved. If the incubator employs a hierarchical structure, there may be a clear line of command and a central decision-maker (Schuh, 2018). This may result in a more centralised and controlled environment for startups, which could be advantageous if the incubator can provide strong guidance and support. It is also restrictive if the startups do not have the freedom or flexibility to follow their objectives and ideas.

The Flat Model

Lately, there has been a surge in the popularity of the flat or team-based organisational structure. The absence of hierarchical levels between managers and employees characterises this organisational structure. Instead, all individuals collaborate as members of a unified team, with each member possessing an equivalent level of influence in the collective decision-making process. The advantages include heightened employee morale due to increased autonomy over the work environment and expedited decision-making processes relative to hierarchical structures. The flat organisational model reduces hierarchical structures within companies, granting employees greater independence in their tasks while remaining responsible to higher-level executives (Lee, 2017). Promoting cooperation between departments and open communication has enhanced employee job

satisfaction. Implementing a flat organisational framework result in a hierarchical system's absence, providing an adequate infrastructure for all members to participate in decision-making processes. This approach enhances the pace of operations but may also result in ambiguity and uncertainty due to the absence of clear directives or guidance (Rishipal, 2014). Nevertheless, the effectiveness of this system is contingent upon establishing trust between managers and their respective teams. This factor may present challenges depending on the prevailing company culture or size. For instance, if the incubator adopts a flat organisational structure, in that case, there will likely be a reduction in hierarchical levels and an increase in the degree of autonomy granted to lower-level personnel concerning decision-making. Establishing a decentralised and collaborative environment for startups may prove advantageous, provided the incubator can cultivate a robust sense of community and teamwork among its constituent startups (Eisenhardt & Tabrizi, 1995). However, it could be problematic if the entrepreneurs do not have access to the resources and assistance they need to succeed.

The Lean Model

The lean organisational structure, characterised by self-organising teams operating without centralised control from management or executives, has effectively streamlined bureaucratic processes while offering necessary guidance as required. According to Sinha (2019), the lean management framework emphasises optimising processes to ensure that only essential tasks are executed efficiently. The system prioritises eliminating unnecessary steps or expenses linked to operations while upholding the quality benchmarks established by higher-level leadership groups. Lean methods enable companies to achieve cost savings while maintaining productivity by eliminating redundancies across all departments involved in production cycles (Klein, 2022). Combining these factors makes this approach appealing to optimise revenue and reduce costs.

If the incubator adopts a lean model, its emphasis is likely on optimising efficiency and minimising waste, focusing on ongoing enhancement, and simplifying procedures (Tritoasmoro, 2022). This could foster a more agile and responsive ecosystem for emerging businesses. The incubator's provision of tools and support to startups for rapid testing and iteration of their ideas may yield significant benefits. Despite this, it may be easy if the startups require additional time or resources to thoroughly investigate and cultivate their concepts. (Eisenhardt & Tabrizi, 1995). Flat and lean organisational structures offer increased flexibility as team members are empowered to

approach tasks. Improper management of this situation may result in excessive disorder and possible disagreements among team members regarding their respective concepts.

Agile Management

The Agile Management framework is a project management methodology that prioritises rapid adaptations informed by input from customers or team members. (Kerzner, 2017). This approach enables teams to promptly adjust their course of action in response to customer feedback or shifts in technology trends. The method additionally fosters teamwork by providing space for innovative thinking within initiatives and promoting transparent communication among all project stakeholders. (Kerzner, 2017). The Agile methodology facilitates collaboration among team members by subdividing tasks into smaller units, enabling each individual to make valuable contributions utilising their respective skill sets throughout the project (Noteboom, 2021). However, it is essential to note that the approach may have a disadvantage regarding reduced emphasis on long-term planning, given that each iteration typically spans a few weeks or months.

For example, agile project management methodology by the incubator. In such a scenario, the emphasis could be placed on rapidly providing value and accommodating changes via iterative development and frequent feedback and evaluation. (Mota, 2022). This could facilitate a more agile and flexible ecosystem for startups. The incubator's provision of tools and support to startups may yield benefits by enabling them to respond promptly to evolving market conditions and customer demands. However, it may be challenging if the startups perceive a necessity for increased independence or adaptability to pursue their objectives and concepts.

Theoretical Summary

Overall, the literature review highlights the importance of organisational structure and management in the success of startups (Figure 4).

The Startup Development Lifecycle Stages

The Organisational Management Models	*The Hierarchical model*	*The Flat model*	*The Lean Model*	*The Agile Management*
The Ideation Stage	Due to the organisation's rigid structure and centralised decision-making, creativity and ideas are limited.	Since it has no hierarchy or defined responsibilities or roles, it can foster creativity and ideation in a more democratic and inclusive environment.	Emphasises speed, flexibility, and customer input, which early-stage startups need. It encourages startups to test and validate their ideas rapidly, which can improve resource efficiency and time to market.	Startups often don't have a product or business plan yet, in this stage It helps create new ideas in a flexible, adaptive, and iterative manner. It can help the startup try and validate new ideas, pivot fast, and capitalise on opportunities.
The Intention Stage	It may help a startup decide on its value offering and market positioning. The hierarchical model can provide stability and guidance that startups require to establish themselves at this stage.	It may become a limitation as the startup grows and structures. Startups may need clear roles and a hierarchy at this point to complete tasks efficiently. The flat model may not provide the structure and direction needed to attain these goals.	Lean Management encourages product and service iteration based on customer input. This improves startups' offerings and chances of success.	The startup has a better idea of its goals but is still defining its vision, mission, and business plan. Agile management can help the company iterate its plans and ideas as it learns more about the market and opportunity.
The Startup Stage	Hierarchical models can help handle complex operations and processes during growth and scaling. Startups may profit from the hierarchical model's clear lines of authority, accountability, and decision-making.	As the startup firm grows and becomes more complex, the flat model may pose problems. Startups may need help to delegate tasks and make choices, resulting in delays and inefficiencies. The flat model's unclear lines of power can also cause confusion and a lack of accountability, hurting the startup's performance.	As the startup scales, Lean Management may become limited. Lean Management may also struggle to keep up with the startup's growing intricacy.	Agile management can help the startup quickly adapt to market and consumer changes. At this point, the startup may find it harder to combine the speed and agility needed for rapid innovation with the stability and consistency needed to grow a sustainable business.
The Expansion Stage	As the startup expands, a hierarchical model may help manage a bigger, more complex organisation. However, as the organisation becomes more bureaucratic, hierarchical models may slow decision-making and reduce freedom for startups.	As firms grow, the flat model may be helpful. Startups may have clear goals, objectives, and strategies by this time, which can help them make decisions and achieve results. In this stage, the flat model's emphasis on cooperation and teamwork can foster team unity and purpose.	As the startup matures and grows in size and complexity, Lean Management may also not work. The startup may need a hierarchical management plan to ensure smooth operations and company goals.	The startup aims to reach and affect more people. The startup may need more structured processes and systems to scale and be consistent, making Agile management less efficient.

Figure 4 – Effect of The Organisational Management Model of Incubators on Startups

Source: *Literature Review: Section 2.5*

The results of the literature analysis indicate that an Agile management approach could be highly advantageous for startups in science parks, particularly those working with tech startups. Agile management is a methodology known for its adaptable nature, swift response to changes, and collaborative approach. This approach benefits startups, allowing them to adapt quickly to the dynamic and uncertain technological innovation environment. The effectiveness of lean management, which prioritises value maximisation and waste minimisation, or a hybrid model that integrates agile and hierarchical structures features, may vary depending on the particular focus and requirements of diverse science park startup incubation programmes. The traditional hierarchical model promotes stability and control but can impede innovation and decision-making speed. The flat and lean models offer increased flexibility and autonomy but require strong teamwork and communication.

The incubator's choice of organisational structure and management should align with the needs of startups in their development lifecycle stages. Proper implementation and management of the chosen approach are crucial for success.

The impact of the organisational management of incubation programs on startups requires careful consideration, balancing support and guidance with the freedom and flexibility to pursue their objectives and ideas.

It is essential to highlight that the optimal management framework for science park startups should be able to adjust and react to their specific circumstances and needs, cultivating a nurturing environment that expedites progress and advancement

3. Methodology:

This master's thesis methodology will entail collecting and analysing data on startup incubators' impact on startups' growth and development using qualitative research methods. The accomplishment of this objective will be facilitated through various methods for gathering data, such as comprehensive interviews and questionnaires.

Semi-structured interviews conducted with the Founders/co-founders of multiple startups to obtain comprehensive insights into the experiences and viewpoints of these individuals. The interviews conducted in person or through video conferencing, with the proceedings being recorded and transcribed for subsequent analysis. The author's objective was to collect data through the experience of the Founders within the Tehnopol Startup Incubator. Although the questions were

structured before (Appendix B), the interviews conducted with the founders and co-founders of the startup were semi-structured. According to the Ruslin (2022), due to its ability to facilitate obtaining comprehensive information and details from interviewees while taking into account the study's focus, the semi-structured interview is considered one of the most crucial and effective methods for qualitative research. The primary objective was to obtain comprehensive insights and facilitate the exchange of perspectives and encounters about the incubator. The study included conducting interviews with current and past participants of Tehnopol Startup Incubator who held the position of Founder or Co-founder to minimise any potential sampling bias. Therefore, collecting extensive and detailed data was essential, so, participants has chosen by author in accordance with "Purposeful sampling" method. This sampling technique was selected following the qualitative research methodology to identify and select participants with the most diverse information possible considering the limited resources - including the time constraints, both Founders who are currently participating and those who have completed the Technopol Startup Incubation program (Patton, 2014).

Through personal interactions with participants, the author obtained insights that would have been inaccessible through other methods. As qualitative method the Semi-structured interviews is beneficial when investigating the connection between performance and outcome. A structured questionnaire was created to ensure a focus on the primary topic and to gather as much relevant data as possible within the time constraints. In addition, the author obtained permission from each interview subject to record the sessions to collect in-depth data. However, considering the relationship between startups and incubators, the statements provided by participants were regarded as confidential and kept private for analysis and generating results in this thesis. Various steps will be implemented to guarantee the credibility and consistency of the study. The research methodology will involve the utilisation of sources such as interviews. (Creswell, 2013).

In order to get the most accurate transcription possible and to streamline the analysis process, Otter AI is used to transcribe recorded interviews. This AI-powered transcription service ensures that no vital information is wasted during transcription by enabling more efficient and accurate conversion of spoken to written words. However, the Transcripts provided by "Otter.AI" were double-checked, and the author edited the parts that needed adjustment. It will ensure that analysed data is accurately presented. The information obtained from the interviews and questionnaires will be analysed using a

thematic analysis methodology. (Braun & Clarke, 2006). The process will involve meticulously examining and analysing the participants' feedback. It will require the identification of recurring themes and trends that arise from the collected data and thoughtful consideration of how these may be connected to the research questions and aims of the study.

4. Results of Interview

The primary objective of the current research was to examine the impact of Startup Incubation Programs based in Triple Helix Science Parks on startups that participate in the programs and eventually graduate. The study was designed to address targeted research inquiries and to determine the primary factors that facilitate the successful outcome of startups in this specific environment. Prior studies have investigated the Triple Helix model and its impact on innovation ecosystems. For instance, Piqué's (2018) research explored the development of innovation ecosystems within the Triple Helix framework. Flechas (2022) analysed to examine the influence of the Triple Helix model on the overall quality of startup ecosystems.

Nevertheless, a thorough examination of the existing academic literature has exposed a need for more comprehension regarding the precise impacts of Science Park - Startup Incubation programmes based on the Triple Helix model on the startups. The objective of this study was to contribute to the current pool of knowledge by analysing the distinct attributes and consequences of startups that take part in these specialised incubation initiatives. The research was conducted to offer significant perspectives for policymakers, practitioners, and researchers who promote innovation and entrepreneurial triumphs in the framework of Triple Helix-driven initiatives.

The author contacted 40 startup founders and co-founders to conduct interviews to procure qualitative data for the research. Among the participants, six individuals provided affirmative responses to the interview request, whereas eight individuals declined and 22 did not respond. Figure 5 provides a detailed breakdown of the interview requests and their respective outcomes.

Method	Request sent	Accepted	Declined	No Response
Via mail	32	5	8	15
Via LinkedIn	3	1	0	2
Via Website	5	0	2	3

Figure 5 – Interview request outcomes

Figure 5 illustrates the diverse approaches utilised by the author to solicit potential interviewees, which include email, LinkedIn, and website contact forms. Results indicate that email was the most effective communication mode, generating the most significant count of affirmative replies. Nevertheless, it is crucial to recognise the constraints of this methodology, given that a considerable proportion of the reached individuals did not respond to the interview solicitations. These discoveries could potentially have implications for upcoming studies. It may be necessary to consider alternative approaches to enhance the response rate and obtain more extensive information regarding the topic at hand.

Moreover, the author attempted to procure more comprehensive data to substantiate the study by contacting Tehnopol Science Park - Incubator through email and LinkedIn. Despite all of these efforts, there was no response. The limited accessibility of primary data in the study highlights the need for additional research to investigate the distinct experiences and consequences of startups engaging in Science Park - Incubator programmes based on the Triple Helix model.

4.1 Motivations and Expectations from the Incubation Program

Startup incubation programs are expected to help build successful businesses and provide entrepreneurs with the necessary resources, skills, and networks to accelerate their growth and success. In the context of the present study, the focus is on Tallinn Science Park Tehnopol, a triple helix-based incubator in Estonia. The study aims to analyse the expectations from the incubators on startups and motivation from the founders' perspective to join.

The startup founders interviewed had different expectations when they joined the incubator. Some expected to gain new skills and competencies, while others expected a magic key to help them succeed. According to the results, the reality of the experience may not always meet expectations considering the founders' perspective.

Startups are expected to find mentors to develop fundraising and strategic planning knowledge and improve their competencies during the incubation program.

"My expectation of getting the new context is to find mentors to develop this part of my competencies for my startup that I am not currently using in my everyday life, related to fundraising. strategical planning - business knowledge."

This expectation was met as the incubator provided mentorship and workshops on these topics. The pre-incubation workshops on finance investments, prototyping technology, and other related topics were valuable for developing competencies.

"Tehnopol Incubator had pre-incubation days, two days' workshop, where they organised a free workshop for finance investments prototyping technology by good speakers; that was very valuable, and we ensured, okay, we are the best place to be, considering we are the first-time startup founder."

One founder compared their expectations of incubation programs with their experience in an accelerator program. According to their experience, the incubator was less intensive but still helpful in pushing startups forward and making valuable contacts within the startup community. They found that the difference between the two was insignificant, except that the accelerator program was more advanced. This suggests that startups in different stages of development may benefit from several types of programs and that incubation programs can provide a valuable alternative to accelerator programs.

"I have been previously to TechStars, which is an accelerator program. My expectations were formed based on my experience there, so I knew what to expect. Compared with the accelerator, the difference was not huge. However, I would have liked to see the more intensive incubators. So, in a way, it pushes the startups forward more. It was lighter than that compared with the accelerator."

Furthermore, a founder has indicated that the visibility and reputation of the Tehnopol incubator programme influenced their decision to join Technopol. The incubator's prominence and standing could be defined by its connections with academic, governmental, and industrial stakeholders by the Triple Helix fundamental principles.

The other founders emphasised the advantages of obtaining certification as a startup and joining the Tehnopol incubator programme. This would facilitate their engagement with universities,

industries, and venture capitalists. The argument proves that the incubator's associations with the Triple Helix stakeholders may have impacted the founder's determination.

"I would say that we benefit from becoming a member of this incubator. We realise that through this period, to gain an advantage, we have, how to say, a certified startup. After this, it is much easier to approach. University of Taltech and it is much easier to approach industry and venture capitalists because we are certified, which gives credibility – because we are already part of Tehnopol Incubator Program."

Overall, founders' motives behind enrolling in incubator programmes varied, from winning competitions to getting insightful feedback to aiming for a prestigious incubator's reputation. Their expectations were diverse, but all of the founders of the startups believed that their participation in the incubator was beneficial.

4.2 Overcoming Challenges in Startup Incubation Programs: Tehnopol Incubator

The founders who participated in the Tallinn Science Park Tehnopol Startup Incubator encountered various challenges throughout the incubation process. In comparison, some startup founders faced difficulties with their business models or target customer base, and others met legal complications or disagreements with their co-founders. This part looks at how the Tehnopol incubator assisted startups in overcoming these difficulties.

The Tehnopol incubator played a significant role in facilitating connections between startups and various stakeholders, such as potential partners and investors, thereby serving as a valuable bridge. Additionally, the incubator offered crucial assistance for startups by providing legal consultations and paying associated costs.

"What incubator helped us is - acting as a bridge between different connections. In addition, we had a case when we needed to get consulting on legal stuff, Tehnopol helped us get that consulting, and they also covered all the expenses."

The above statement demonstrates incubators' significance in providing startups with networking opportunities and resources.

Additionally, the incubator assisted the startups in developing their business plans and determining their market potential. The incubator's mentors assisted startups in choosing the appropriate target market and changing their business plans, as necessary.

"We have pivoted during the incubation program because we have changed our business direction. So many things are transforming extremely fast. The incubator was like a risk assessment during that period and helped us understand our business model. "

The incubator programme helped foster common knowledge growth and a more defined vision within startups. Moreover, it assisted founders in keeping their focus on their primary goals in the face of all the opportunities and distractions that come with starting a new company. This validation is consistent with studies highlighting how incubators help startups is crucial to gain clarity and concentration.

"Incubators have helped us a lot to define what we are doing because we must have this kind of common understanding of what we are doing and how we will do it, and incubators format will help define this framework for your startup. If you are building up something, there are many possibilities. The incubators are improved greatly in this issue because keeping your startup focused is crucial. Exactly. If you are building something up, there are 360 degrees of possibilities to go in some direction. To keep your focus to keep your target in front."

It is interesting to point out that the Tehnopol incubator also acted as a neutral third party to ensure that conflicts between startup co-founders were settled peacefully. It shows the value of incubators in handling potential organisational issues that may emerge during the startup journey (Bishal, 2020).

"Halfway through the incubation program, we split ways. we were in the situation -okay, now we cannot work together anymore. During that time, the incubation program was super helpful. They were like a neutral third party that we needed to resolve the situation."

As a result, the Tehnopol incubator helped startups succeed by establishing connections, enhancing business plans, encouraging concentration and clarity, and resolving conflicts. These results allow us to comprehend how well triple helix-based startup incubators work to address problems encountered by entrepreneurs and promote startup growth.

4.3 The Role of Resources and Services in the Success of Startups at Tallinn Science Park Tehnopol Incubator

The Startup Incubator at Tallinn Science Park Tehnopol provides various resources and services to facilitate startups' growth and development. According to the founders, mentorship, networking, legal counselling, office space, and access to external experts were beneficial in accelerating their startups forward.

Mentorship

Founders identified the incubator's mentorship programme as a highly beneficial service. Mentors provided valuable guidance on crucial areas such as marketing, sales, investment, and other essential aspects for startups.

"Incubators are primarily for first-time startups because they do not know anything. So, this mentorship, coaching, and office space, because they also give you office space to work from meeting rooms, like a general coffee office setup, is there for you. The mentors here also, who can help you like from different fields like marketing, sales, as well as investment."

This proved to be particularly advantageous, especially for amateur entrepreneurs. St-Jean & Audet (2012) has demonstrated the significance of mentorship within startup incubation initiatives, as it has a favourable effect on the advancement and maturation of startups.

Networking

The significant networking opportunities provided by the incubator was critical for achieving startup success. The incubator facilitated workshops and other events to foster relationship-building among founders, mentors, and external experts. The provision of networking opportunities by incubators is crucial for startups to establish connections, cultivate partnerships, and attract investors.

Legal Counselling and Office Space

The incubator's provision of legal counselling and office space facilitated the growth and development of startups. The provision of legal counselling has facilitated the ability of startups to navigate the intricate legal landscape of their respective industries effectively. Additionally,

providing office space has created an environment conducive to collaborative efforts, focused work, and the cultivation of team-building skills.

"We are currently in Tehnopol Premises using the co-working space provided by Incubator. This office space enables us to have face-to-face meetings and avoid Zoom meetings, giving us a team feeling and a concentration time to deal with our startup."

Access to Experts in specific fields

The expertise and knowledge of mentors can be highly advantageous for startups, especially within the Triple Helix framework. Cooperation among academia, government, and industry is imperative for achieving favourable outcomes.

The collaboration and interaction among academia, government, and industry are fundamental components of the Triple Helix model. Tallinn Science Park Tehnopol Startup Incubator's collaborative approach is reflected by its mentors' diverse backgrounds, which can offer startups a unique advantage. Mentors having academic expertise can assist startups in developing innovative strategies based on current research and knowledge.

According to the incubator's website, mentors are carefully selected experts based on their experience and skills. They work closely with startups to provide guidance and support throughout incubation. For example, some of the mentors at Tehnopol include Riina Einberg, who has over 20 years of experience in financial management, and Taavi Kotka, a well-known Estonian entrepreneur and former Chief Information Officer of the Estonian Government.

Experts with government backgrounds can provide valuable guidance to startups in navigating complicated regulatory environments. In contrast, mentors with industry backgrounds can assist startups in identifying and addressing customer requirements.

"We can reflect our idea and business model to different coaches. These specialists have built IT teams or have a legal marketing background or different expertise. That is how it is the most valuable out of all resources for us."

The incubator facilitates the integration of diverse perspectives and skill sets, enabling startups to enhance their business and industry understandings and contribute to their chances of achieving success.

The Triple Helix framework emphasises the importance of collaboration between academia, government, and industry. Joining a startup incubator based on these principles offers a valuable advantage, providing access to a diverse range of experts with backgrounds in these sectors (Etzkowitz, 2002). The mentors available at the Tallinn Science Park Tehnopol Startup Incubator can impart valuable insights and guidance to startups, thereby facilitating the development of a more comprehensive understanding of their business and industry. By utilising the knowledge and advice these mentors provide, fledgling businesses can enhance their likelihood of achieving success and effecting beneficial change within their respective industries.

Internal Recourses

The founders appreciated the incubator's internal resources and services, including Amazon Web Services, job advertisement platforms, and meeting rooms. These utilising resources and services which provided by Tehnopol Startup Incubator facilitated cost savings and operational efficiency for startups while enhancing their overall success.

In conclusion, the resources and services given by the Tallinn Science Park Tehnopol Startup Incubator, such as mentoring, networking, legal advice, office space, and access to specific experts, were significant to the success of startups.

4.4 Impact of Incubation Programs on Startup Development Stages

The startup founders who were interviewed underlined the impact of the Tallinn Science Park Tehnopol Startup Incubator on the progress of their startups through various development stages. According to Passaro (2016), these are the Ideation, Intention, Startup, and Expansion stages. One founder mentioned that their startup progressed from the prototype stage to the MVP stage, moving between stages of Intention and Startup, crediting the incubator for this progress.

"Before joining an incubation program, we had a prototype where we were at Intention(2nd) stage; we now have MVP to consider our stage between 3 and 4. The incubator helped us to level up the stages."

Similarly, another founder indicated that their startup was in the Intention stage before joining the incubator and has since progressed to a stage between Startup and Expansion. Incubators facilitate the continued growth of startups by offering resources, mentorship, and networking opportunities to

address challenges and promote development. The founders confirmed the incubator's value in assisting their startup's growth from the ideation and market validation phase to the startup phase. This finding validates the concept that incubators can effectively accelerate the development of startup firms across various developmental phases by providing tailored resources and assistance.

In summary, the input provided by the founders shows that the Tallinn Science Park Tehnopol Startup Incubator has benefited the progression of their respective startups during the developmental phase. The resources, mentorship, and networking opportunities provided by the incubator have played a crucial role in supporting startups' progress from the Ideation and Intention stages to the Startup and Expansion stages.

4.5 Startup Goals and Milestone Achievement in Incubation Programs

The founders of the interviewed startups provided insights into what they wanted to accomplish during their incubation program, their strategies for achieving these goals, and how they achieved them.

A common theme among the founders was the incubator's mission of accelerating them to establish significant milestones and motivating them to strive towards particular objectives. Several founders have reported significant product development and market validation improvements during incubation.

"The program helped to set the milestones. We generally tried to follow them. So, it was more milestones regarding the activities we were about to perform. We were laying out the timetable and characterising what we would do next. This helped us focus on the goal and ensured we were on track."

As an illustration, certain nascent enterprises have effectively created a minimum viable product or garnered a particular clientele, which they ascribed to the backing and direction furnished by the incubation centre. However, not all founders were successful in setting up and accomplishing milestones. Some encountered challenges due to external factors or failure to brainstorm effectively and measure progress.

"In this program, we had to put ourselves some objections and milestones. We were not too good at it. Moreover, the reason was that we were influenced greatly by factors from third parties that failed us."

This highlights the significance of adaptability and resilience in the entrepreneurial journey, as startups face numerous obstacles and unpredictable situations.

The results gathered from the founders' responses emphasise the incubator's significance in facilitating the establishment of goals and the achievement of these objectives by offering support, guidance, and structure to the entrepreneurial process. However, the previously reported statement also exposes diverse levels of accomplishment in achieving stated goals, indicating entrepreneurship's dynamic and complex nature.

To summarise, incubation programmes have a significant impact on assisting startups in establishing objectives and attaining milestones. External factors and the adaptability of a startup may influence the achievement of indicated objectives.

4.6 Incubator Support in Customer Acquisition, Funding, and Collaboration

The founders of startups have reviewed their experience with the incubation programme at Tallinn Science Park Tehnopol. They have highlighted the programme's role in supporting customer acquisition, market expansion, and access to funding and investment opportunities. Additionally, they have emphasised the programme's value in fostering interaction among participating startups.

The incubation programme facilitated customer acquisition and market expansion through enhanced visibility and networking opportunities for the startups. The founders were obligated to seek customers and broaden their markets actively, while the incubator provided guidance and encouraged them to demonstrate the value of their startups. This underscores the significance of founders assuming accountability for their enterprises and actively pursuing prospects.

Regarding funding and investment, the incubator was more active in facilitating connections with potential investors and organising pitching events. This allowed startups to access funding and receive valuable feedback from investors.

"The privilege they provide is we can pitch for the potential investors or have it on this incubator. Okay, they are not guaranteeing anything. Moreover, this is our initiative, and it all depends on us.

If we already complete our goals by the end of the incubator period, we have the ambition to ask for VC money. This is not a set-top target, and Tehnopol gives no money. They just provide opportunity."

Nonetheless, the programme did not guarantee investment success, emphasising that it ultimately relied on the startup's drive and progress in achieving the objectives mentioned in the previous chapter.

The incubation programme fostered interactions and collaborations among startups primarily through providing workshops, co-working spaces, and networking events.

"Basically, with Tehnopol, my networking can be done in two ways. One way I need to work with these more startups from this same batch who joined me six months ago at the same time as me. We meet at a joint workshop and get to know each other's business progress, or we go into technical if your startup is doing well and you are eligible to pitch in front of investors, then you go and talk with investors. If I go and work from a co-working space, I might be able to meet more startups and do some networking, but that is totally on me."

The founders acknowledged the significance of networking with other startups and participating in such endeavours to foster the expansion and advancement of their firms. This shows the importance of networking and collaboration in cultivating a conducive environment for fledgling enterprises within an incubation initiative.

In conclusion, the incubator initiative assisted in customer acquisition market expansion, financing, and collaboration. However, the programme's success in these areas depended on the entrepreneurs' initiative and the extent to which they utilised the resources offered.

4.7 Triple Helix Influences and Incubator Organizational Management Impact on Startups

This part of the study aimed to assess the impact of the incubation programme at Tallinn Science Park Tehnopol on participating startups by analysing the organisational management model and the role of the Triple Helix (comprising academia, government, and universities) in the programme.

Founders identified the incubator programme's management as agile, lean, and responsive, with minimal hierarchy. They emphasised the effectiveness of quick communication and the autonomy of incubator staff in making decisions. This methodology is to the dynamic characteristics of the startup environment and promotes the ability to adjust and be flexible. Implementing agile and lean management methodologies within the incubator setting enables startups to concentrate on their fundamental operations and obtain immediate support as required.

The Triple Helix concepts played a significant part in the incubation programme, according to the founders, and had a beneficial effect on the growth of their startups. Furthermore, it facilitated collaboration and access to resources, networks, government, academia, and industry support for startups. For instance, the founders claimed that being a part of the Tehnopol incubator increased their legitimacy and visibility in the market, which made it easier for them to approach universities, business partners, and investors.

Additionally, the Triple Helix ideas helped establish connections between entrepreneurs and government officials, academic institutions, and industry players. This was especially evident when startups met with municipality council members, received assistance from university students, and collaborated with manufacturers and industry stakeholders. For example, a founder referenced a collaboration with the Estonian Ministry of Culture that originated from their affiliation with Tehnopol. One of the founders described a story about connecting with an electric scooter manufacturer due to their collaboration with the Tehnopol.

However, the effects of the Triple Helix principles varied between startups, with some reporting minimal or no direct influence. This implies that the advantages of the Triple Helix relationship depend on the startup companies' concentration areas and alignment with the program's goals.

As a result, using Tehnopol Startup Incubator as example, the research points to the if Triple Helix based startup incubator's organisational management approach as being agile and lean, which may explain how well it supports the growth of businesses. The Triple Helix principles benefit startup development when actively implemented into the incubation programme by encouraging cooperation between academia, government, and industry stakeholders (Flechas, 2022). However, it is essential to acknowledge that the level of impact differs among firms, suggesting that the incubation

programme could benefit from customising its approach and offerings to meet the needs of various startups.

4.8 Challenges and Effectiveness of Tehnopol Startup Incubator

The founders evaluated the effectiveness of the Tallinn Science Park Tehnopol Startup Incubator and identified multiple challenges. Their responses provide invaluable insights into the effectiveness of the incubator programme and recommendations for improvement.

Challenges

Time management and unrealistic expectations set by the incubator are two primary difficulties that startup founders must overcome. Some founders believed they were required to attend numerous workshops and activities, leaving them with little time to focus on their primary business activities. Moreover, the incubator may have set unrealistic expectations regarding the programme's outcomes, such as the promise of investment readiness within six months.

Effectiveness

On a scale from one to ten, the founders rated the effectiveness of the incubator programme with an average of **"7"**. The founders highlight responsiveness, networking opportunities, and mentoring as crucial effectiveness aspects. In addition to gaining access to the various services and resources offered by an incubation programme, startups can advance to the next stage of development by participating in it. The various stages of a startup's development present unique challenges, and incubation programmes can be tailored to meet these requirements. This may involve transitioning from the idea stage (Ideation) to product development, from product development (Intention) to market launch (Startup), or from a small, growth-oriented operation to a more significant, more extensive business (Expansion) as shown from the experiences of Founders in Fig.6. Consequently, participation in an incubation programme can be a crucial step on a startup's growth path.

The perceived weaknesses of the programme include a gap between the incubator's advice and the particular circumstances of the startup, a lack of mentor diversity, and the need for customised programme durations.

Startup	Stage Before Incubation Program	Stage After Incubation Program
FUNKI	Intention	Startup
Hoplocal	Intention	Expansion
Rent & Go	Ideation	Startup
EATB4	Startup	Too new to assess
NutriDecode	Ideation	Intention
WasteLocker	Ideation	Startup

Figure 6 – Effect of Incubation Program on Startup Development Stages considering Passaro (2016) Startup Development Lifecycle Model

Recommendations

Based on the founders' feedback, the following recommendations are suggested for Tehnopol Startup Incubator and similar incubation programs:

- Address time management issues by streamlining workshops and activities and allowing startups to choose which events to attend based on their needs and priorities.
- Set realistic expectations for entrepreneurs by presenting the potential outcomes of the incubation process more transparently and without overpromising results.
- Organise regular events where startups can interact with potential investors and industry partners to increase networking opportunities.
- Improve mentoring by increasing the diversity of mentors' backgrounds and areas of expertise to meet startups' specific requirements and challenges.
- Customise programme durations to better reflect the requirements and progress of each participant.
- Enhance the commercialisation potential of research projects by fostering collaborations between academic researchers and business professionals.

The following table summarises the points raised by the startup founders concerning the effectiveness of the incubator program (Fig.7):

Startup	Effectiveness (1-10)	Suggestion
№1	6	Consider startup-specific challenges
№2	7	No suggestions
№3	8	Improve networking opportunities with investors and business partners
№4	7	Diversify mentors and their backgrounds
№5	7	Too new to assess
№6	6	Tailor program durations, and enhance the commercialisation potential of research projects between universities and businesses through the incubation program

Figure 7 – Founder Perspectives on Tehnopol Startup Incubator Program Effectiveness and Suggestions

Tehnopol Startup Incubator and similar programmes may be able to improve their effectiveness and better support the growth and development of participating startups by implementing these recommendations.

5. Conclusion

The research indicates that the Tehnopol Startup Incubator plays a crucial role in fostering the growth and development of startups by providing resources, networking opportunities, and mentorship. Nonetheless, it highlights the need for incubators to respond to each startup's particular needs and consider their unique challenges and growth trajectories.

Participants rated the effectiveness of the incubator programme as moderately to highly impactful in addressing RQ.1. Their responses indicate that they value the incubator's support in a variety of areas; however, there is room for improvement. The founders identified time management as a common challenge that incubator programmes could address by providing more flexible schedules or by integrating digital resources.

Regarding RQ.2, the founders highlighted several factors that contribute to the effectiveness of incubators in assisting entrepreneurs. One crucial aspect is the requirement for more individualised assistance, considering each startup's unique difficulties and complexities. Incubator programmes could benefit from implementing a more customised approach to mentorship and support, with specialised mentors or subject matter experts available to address the specific needs of each startup.

In addition, the founders emphasised the significance of setting reasonable expectations and providing investors with targeted networking opportunities. Incubator programmes could implement more effective communication strategies and organise networking events to assist entrepreneurs in establishing connections with potential investors and forming important relationships for their future growth.

Additionally, incubators can increase their value by incorporating diverse mentors and fostering collaboration between entrepreneurs, academic institutions, and business organisations. This will help create a supportive and inclusive environment that encourages more people to join the programme. Such collaboration will also give entrepreneurs access to the necessary resources and expertise to succeed in their businesses. Incubators can facilitate knowledge exchange, enable startups to access specialised resources and create opportunities for interdisciplinary collaboration. This is done by connecting startups with experts from different fields.

In conclusion, this study highlights the significance of triple helix-based startup incubators in fostering the growth and development of startups. By resolving the identified challenges and focusing on the critical success factors, incubator programmes can become even more effective at nurturing startups and facilitating their success.

6. Acknowledgements

First and foremost, I am incredibly grateful to my supervisor, Prof. Kadri Ukraniski. I am thankful for her invaluable advice, continuous support, and patience during my master's thesis research and preparation. Her immense knowledge and extensive experience have always encouraged my academic research. I would also like to thank the founders/Co-founders of all the startups for accepting to participate in an interview and supporting my research with their contribution

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Appendix A. List of Interviewed Startups and Founders

№	Startup	Position	Interviewee	Involvement Status	Duration of Interview	Platform used for interview
1	FUNKI	Co-founder & CEO	Sirli Rosenvald	Alumni	21:54	MS Teams
2	Hoplocal	Founder	Parmeet Sawhney	Active	30:11	MS Teams
3	Rent & Go	Founder & CEO	Merili Milku	Alumni	41:45	MS Teams
4	EATB4	Founders	Mart Helmja Ermo EERO	Active	40:48	MS Teams
5	NutriDecode	Co-Founder	Lauri Kapp	Alumni	43:51	MS Teams
6	WasteLocker	Founder & CEO	Mark Skljarov	Alumni	25:04	MS Teams

Appendix B. List of questions for the interview.

1. Could you tell me about your startup, its idea, and what inspired you to start it?
2. What motivated you to join an incubator program, and what were your expectations?
3. How do you see the incubator program supporting your startup's growth and development?
4. How would you describe your experience in the incubation program?
5. Did you face any challenges during the incubation program, and how were they resolved?
6. What resources and services do the incubator program provide that you find most valuable for your startup?
7. Were any specific resources or services the incubator provided that were particularly helpful for your startup?
8. What stage do you consider your startup to be in, and how do you think the incubator program can help you move to the next stage? (Ideation, Intention, Startup, Expansion)
9. What are your goals for your startup while participating in the incubator program, and how do you plan to achieve them?
10. How did the mentorship and networking opportunities provided by the incubator help your startup?
11. How do you see the incubator program helping you acquire new customers or expand your market?

12. Did the incubator provide any opportunities for funding and investment, and how did they impact your startup?
13. Did you have any interactions or collaborations with other startups in the incubation program?
14. How do you perceive the organisational management model of the incubator program, and do you think it will impact your startup's development?
15. What do you think is the role of the academia, government, and universities - role principles in the incubator program, and will it benefit your startup's development? Does it reflect the management?
16. Based on your experience so far, how would you rate the effectiveness of the incubator program in supporting your startup's growth and development?
17. What could be your rate if you could rate your experience with the incubation program from “1-10”? What is the reason behind that rating, and what they could do better to get a “10” from you?

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18/05/2023