



Open innovation in start-ups -A comparative study

How can start-ups utilize open innovation networks to improve product innovation in the refinement stage?
-Comparing the Agriculture and High-tech industries

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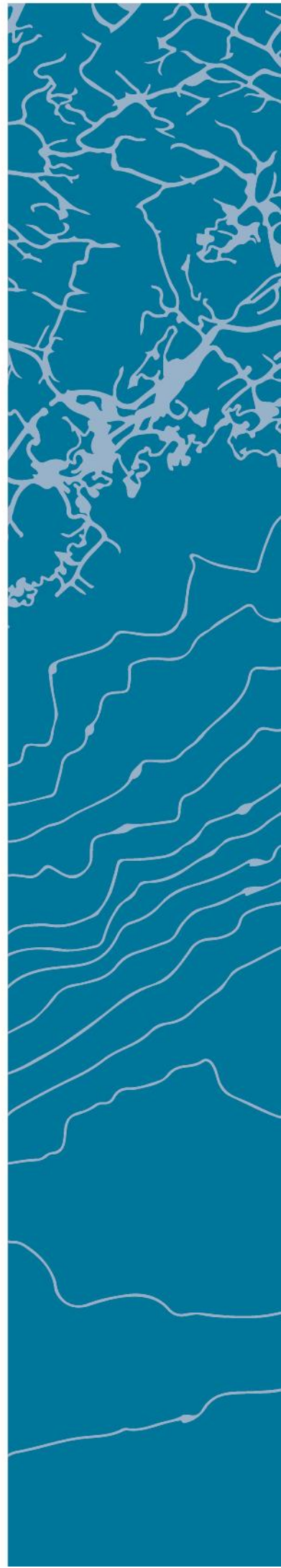
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Abstract

Each year approximately 305 million new start-ups are created. approximately 90% of them are estimated to fail. This number is large, but also natural given the challenging circumstances start-ups encounter. However, if start-ups were better equipped to handle these challenges, there would be potential to decrease the failure rate. The most common reasons for start-up failures are: lack of market demand (42% of cases), lack of capital (29%), wrong team (23%) and insufficient marketing efforts. The most widespread reason for failure will be the focus in this thesis, lack of market demand. Lack of market demand can occur for a number of reasons, but mostly due to poor product- market fit or marketing efforts. The biggest problem of the latter is product- market fit as it is more complex and because achieving it can mean inventing a new product and (or) spending resources tailoring the (current) product. The angle focused in this thesis is trying to solve the problem by seeking to improve product innovation in start-ups. However, innovation is a process that require large amounts of resources and one of the most substantial challenges start-ups have, is a lack of resources. Product innovation is sought enhanced through the use of open innovation networks, because they provide benefits like time savings, cost savings, increased innovativeness and risk reduction. To investigate the manner, eight entrepreneurs working in start-ups were consulted to provide relevant insight. Through systemizing their feedback and combining it with relevant literature ,frameworks for effective utilization of OI networks were developed.

Preface

This thesis marks the end of five years of the Master of Science in Economics and Business Administration at University of Agder. Before I begin, I would like to thank my supervisor, Andreas Erich Wald, for his guidance and support. I would like to thank those who participated in my interviews, who have been a tremendous help with my research. Lastly, I would like to thank my friends and family for their support during working on this thesis.

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1.0 Introduction

1.1 Topic

Start-ups have essential roles in society and are defined as “a company, a partnership or temporary organization designed to search for a repeatable and scalable business model” (Blank, 2012). They provide jobs, enhance competition, and contributed to economic growth. Start-ups are however difficult to manage and have a lot of challenges that need to be overcome to provide successful results. Many of these challenges come due to lack of resources (human and financial), market fit and difficult work and business environments; common difficulties that come with smallness and newness (Spender et al., 2017, p.20-23). To overcome these challenges, being innovative is a necessity. Innovation can be defined as *"carrying out of new combinations that include the introduction of new goods, new methods of production, the opening of new markets, the conquest of new sources of supply and the carrying out of a new organization of any industry"* (Schumpeter, 1983, p.6). However, innovation is a process that require large amounts of resources and one of the most substantial challenges start-ups have, is often a lack of resources (Kask & Linton, 2013, p.518).

For start-ups to stay innovative within their resource limits, the concept of open innovation can be ideal. OI is defined as *“a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization’s business model”* (Chesbrough et al., 2014, p.12). Furthermore, its main benefits are: time savings, cost savings, increased innovativeness, risk reduction and larger knowledgebases, factors that can be complementary to start-up performance (Thirlway, 2016). OI as a topic of research is trending among businesses and researchers, as OI implementations repeatedly provide positive results and become more widely implemented (Taylor, 2019). However, the research on OI practises in start-ups remains lacking (Spender et al., 2017; Bogers et al., 2018). Because of the potential OI has to positively influence start-ups and the gaps in the current research, I believe “OI in start- ups” is a relevant subject to research.

1.2 Thesis aim

Each year approximately 305 million new start-ups are created (Mason, 2021). approximately 90% of them are estimated to fail. This number is large, but also natural given the challenging circumstances start-ups encounter. However, if start-ups were better equipped to handle these challenges, there would be potential to decrease the failure rate.

The most common reasons for start-up failures are: lack of market demand (42% of cases), lack of capital (29%), wrong team (23%) and insufficient marketing efforts (Katoshev, 2020). Researching the most common reasons for failure, could lead to better understanding of why they occur and to potential solutions. Due to limitations regarding this thesis, only the most widespread reason for failure will be investigated: lack of market demand. Lack of market demand can occur for a number of reasons, but mostly due to poor product- market fit or marketing efforts. The biggest problem of the latter is product- market fit, because achieving it can mean inventing a new product and (or) spending resources tailoring the (current) product (Mkrtchyan, 2018). This process of “*developing new products, changing design in existing products or using new materials or components in the manufacturing of existing products*”, is referred to as product innovation (Cambridge university, 2021). As product innovation is essential to acquire market demand, it is likely to be important to reduce start-up failure rate.

Product innovation happens in all stages in the start-up life- cycle, however, is crucial and the main focus in the refinement stage (Segal, 2021.). In the refinement stage, start-ups receive and solicit feedback from early adopters and other important sources. The product innovation done in the refinement stage can be crucial for the next stages in the start-up cycle and provides a foundation for further investments and interest in the company. Thereby, I believe improving the efforts and methods in this stage can benefit start-ups. The information used to make the refinements needed on company products and innovation can come from several sources. Examples are Consultants, customers, and VC’s. The sources incur different levels of cost and time-investment. It is ideal for start-ups to minimize these costs (Skok, 2020). I have chosen to focus on one type of informational source in this thesis, Open Innovation networks. The reasons are that they have low costs financially and timewise, and because external input and networking is crucial for start-up success (Leminen et al., 2020, p.5; Mason, 2021). These networks can be diverse and comprehensive but can also include sole individuals without any competence. The common factor is that they are relevant for the company’s innovation. Based on the above reasoning I believe the following research question can contribute to decreasing start-up failure rate: “How can start-ups utilize OI networks to improve product innovation in the refinement stage?”.

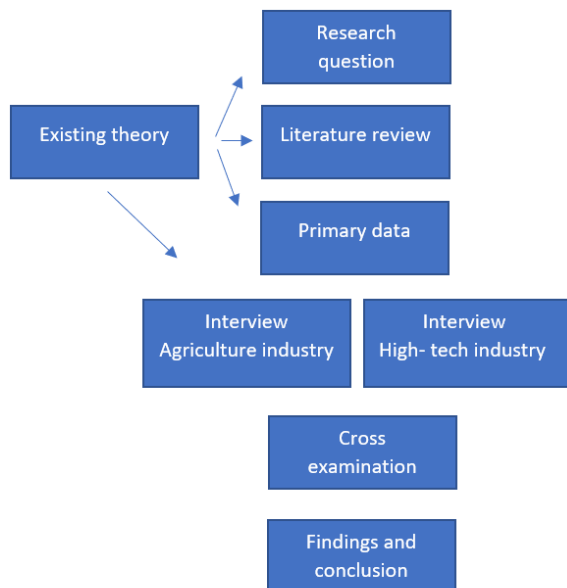
1.3 Thesis contribution

The research question seeks to fill a gap in the research on Open innovation in Start-ups. To locate gaps in research, literature on Open innovation in start-ups have been studied on google scholar and The University of Agder's research base. Both research bases were reviewed through searching for the keywords "Open innovation", "start-ups", "open innovation networks" and "innovation". The search results were analysed, and relevant articles were read to provide the insight needed to determine what knowledge was missing. Studies regarding start-up success rate and OI networks have been done (Di Pietro et al., 2018; Spender et al., 2017). Di Pietro, F., Prencipe, A., & Majchrzak, A researched the effect of inputs from crowd-equity investors on start-up performance and failure rate. The research shows that start-ups utilizing the OI potential of the crowd equity investors have decreased failure rates. Furthermore, the research shows that more experienced entrepreneurs and those with solid industry and managerial expertise showed to be less likely to engage in OI and that the presence of professional investors decreased OI usage. This thesis contributes by exploring the potential effects of other OI networks and dynamics between the different networks a start-up can use, by not limiting itself to one type of OI network. In addition, it could increase the priority on OI in start-ups.

The research question further contributes by specifying on one given stage in the start-up cycle and one type of innovation. No studies specifying in the refinement stage were found. This illustrates a major gap in research as it for the reasons mentioned can be one of the vital stages to the success of start-ups. Research indirectly about product innovation combined with OI have been found, however none of them have product innovation as the main focus (Edison et al., 2018; Marullo et al., 2018). Furthermore, the start-up viewpoint when analysing and discussing contributes, because most papers use the perspectives of larger companies, when researching OI and start-ups (Spender et al., 2017; Usman & Vanhaverbeke, 2017; Chesbrough & Tucci, 2020).

1.4 Structure of the thesis

The thesis structure can be illustrated through the research model.



Firstly, theory was used to determine the research question. Thereafter The literature review was conducted to provide insight into the current consensus of the research topic and do determine how to structure thesis in a way that could provide reliable and valid results. Based on the literature, in depth interviews were conducted to gain primary data on the agriculture and high-tech industry. Thereafter primary data is displayed and cross-examined. Finally, the data and theory are discussed, and a conclusion made.

2.0 Literature review

2.1 Literature base and research question

The thesis aims at filling a research gap and contributing to solving the problem “high start-up failure rates”. The research topic Open innovation in start-ups was identified through a combination of personal interest, what topics had a lack of research (hence, research gaps) and what could contribute to solving the problem. several measures were made to provide a relevant research question. Firstly, credible research databases were looked through, among them google scholar and Oria. Literature back to 2010 was reviewed through relevant search words, example wise: open innovation, start-ups, innovation, and small businesses.

The searches had relatively few relevant results, but some essential ones. Example wise, (Spender et al., 2017) is a review article discussing the current consensus of the research on open innovation in start-ups. They reviewed 41 articles and made observations both when it came to generally agreed on conclusions and on what methodologies and research designs were most common. From this article, relevant both primary and secondary literature was

derived and used to gain understanding of the topic when it came to the commonly agreed on perspectives, research models, research design and what gaps needed to be filled.

Several topics are found to be repetitively researched within the subject of OI in start-ups.

Among them are the role of start-ups networks, start-ups ecosystems and their impacts on OI processes, the entrepreneurial dimension in start-ups OI processes and the role of financing and financial institutions. These topics provide foundations for further research and an

existing research base on the topics with relevant and applicable information. Therefore, I believed touching on one or more of these subjects in my research could provide the information necessary to make more specific conclusions. Providing specific conclusions can be very important to contribute to the research aim, as an exploratory research design would be less likely to conclude on applicable and useful knowledge for start-ups (Robert ,2021).

The subject: role of start-up networks, seems to be the most suitable topic to meet the research aim. The reason is that OI networks have benefits that favour start-ups a lot. Among them are time savings, cost savings, increased innovativeness, risk reduction and larger knowledgebases (Thirlway, 2016). These benefits help compensate for some of the direst challenges for start-ups: lack of resources (human and financial), market fit and difficult work and business environments; common difficulties that come with smallness and newness (Spender et al., 2017, p.20-23).

The research on open innovation networks provides several important findings. (West and Gallagher, 2006) concludes on a large importance of OI networks on performance in companies' innovation processes. Furthermore, (Soetanto and van Geenhuizen, 2015) state OI network's importance in the efforts of obtaining resources (like financial and human resources) and to the introduction of new products in markets. These conclusions indicate OI networks being large assets, especially in a start-up context. However (Spender et al., 2017) calls for more research on their effects on company processes to provide more specific applicable results.

Spender et al. (2017) points out that for start-up companies as well as for other actors involved in the innovation processes it is vital to understand how the structure and processes of the network affect their own processes and outcomes. Hence, a focus on the effects of the open innovation networks becomes a suggested focus for further research.

The current state of the research within open innovation networks has several key findings. An example is the importance of structural factors in the networks of start-ups. Networks,

according to La Rocca and Snehota (2014), networks are where innovation happens. Innovation processes and network structure are mutually shaped, meaning that network actors identify the needs for new products or services, develop them, accept or reject them, and adjust their relationships in the process. Furthermore, (Soetanto and van Geenhuizen ,2015) researched the effect of network features the capacity of new businesses to raise capital. They discovered that the four factors they reviewed: network size, density, tie strength, and multiplexity had an impact on ability to get financing. Tie strength and multiplexity, on the opposite. exhibited declining rewards. As a result, they came to the conclusion that relationships are generally beneficial as long as they are not too strong or complex.

Wang and Fang (2012) discovered that network structure has an impact on the innovativeness of new businesses. They looked at the effects of start-up network centrality and cooperative network (i.e., the strength of network linkages) on inventive performance in particular. They discovered that network centrality has a favourable impact on inventive performance, but cooperative networks have a negative impact. Furthermore, they discovered that when uncertainty is larger, both the positive and negative effects of network centrality and cooperative networks are bigger. Furthermore, (Di Pietro et al., (2018) and Spender et al., (2017) researched the effect of inputs from crowd-equity investors on start-up performance and failure rate. The research shows that start-ups utilizing the OI potential of the crowd equity investors have decreased failure rates. Furthermore, the research shows that more experienced entrepreneurs and those with solid industry and managerial expertise showed to be less likely to engage in OI and that the presence of professional investors decreased OI usage.

The actors most relevant for start-ups OI processes can be summarized as incubators, large corporations, VC firms, higher education systems and others. Example wise (Kaufmann and Schwartz 2008) found that a technological incubator in Israel failed to aid entrepreneurs in creating a strong first network, demonstrating the relevance of networks in the creation of (biotechnology) enterprises. Furthermore, (Ferrary and Granovetter ,2009) investigated the success story of Silicon Valley, and their findings revealed that when assessing successful firms, venture capitalists prefer to invest at the seed stage rather than the pre-seed stage. They also demonstrate the VC's position as a creator of possible specialized interactions with other agents in the network that establish a distinct innovation dynamic.

Overall, network structure has an impact on businesses' innovativeness, employment development, and capacity to obtain finance. While a larger network, a central location, and a balanced portfolio of long- and short-term relationships appear to be beneficial, the strength and complexity of the network's relationships have a positive effect below a certain threshold but a negative effect above (Di Pietro et al., 2018; Spender et al., 2017). Furthermore, the context, particularly environmental uncertainty, has an impact on the causal relation between network structure and the performance metric under consideration. The consensus on network research shows an explorative focus and can provide a good foundation for more practical research. It does, however, remain narrow and unspecific when it comes to what effects network have on processes and types of performance. The majority of the papers on the topic are published after 2009. Several of the papers are based on qualitative studies with the goal of developing theories. The results of the analysis can be used to guide future research.

From a methodological, empirical, and theoretical standpoint, it appears that a refinement of the available knowledge is required. Some observations and research gaps are made from the literature reviewed. Start-ups are a type of organization that exists only for a short period of time. Their very nature is ad hoc and fluid. The implications of decisions or events in the early stages of a start-up lifecycle for the results in later stages needs to be better understood for start-ups to be able to excel and develop more in a profitable and sustainable manner. Furthermore, the effects OI networks provide start-ups remain generally researched, the most specific case is the measure of network centrality and cooperative network on innovativeness. Providing research on more specific metrics could be beneficial for the research base and for practical implication.

From reviewing the research base, I have spotted three relevant gaps: More specific research on OI network's effect on performance is needed, in addition research specified to the start-up life cycle is lacking and finally there is no industry directed research found yet. Industry specific factors can affect the results in research and relevance of types of OI networks significantly and thereby they should be reviewed.

When concluding on a research question there were however other factors that also needed to be taken into consideration because of the thesis aim: reducing start-up failure rate. The RQ needed to solve a problem or explore a topic that could complement the aim. Therefore, literature in other topics as: start-up failure rate, start-up innovation, marketing, product development and consumer theory was reviewed to locate the most relevant reason for start-up failure rate and to direct the research to finding possible solutions.

The most common reasons for start-up failures are lack of market demand (42% of cases), lack of capital (29%), wrong team (23%) and insufficient marketing efforts (Katoshev, 2020). Researching the most common reasons for failure, could lead to better understanding of why they occur and to potential solutions. Due to limitations regarding this thesis, only the most widespread reason for failure will be investigated: lack of market demand. Lack of market demand can occur for a number of reasons, but mostly due to poor product- market fit or marketing efforts. The biggest problem of the latter is product- market fit, because achieving it can mean inventing a new product and (or) spending resources tailoring the (current) product (Mkrtchyan, 2018). This process of “*developing new products, changing design in existing products or using new materials or components in the manufacturing of existing products*”, is referred to as product innovation (Cambridge university, 2021). As product innovation is essential to acquire market demand, it is likely to be important to reduce start-up failure rate.

Product innovation happens in all stages in the start-up life- cycle, however, is crucial and the main focus in the refinement stage (Segal, 2021.). In the refinement stage, start-ups receive and solicit feedback from early adopters and other important sources. The product innovation done in the refinement stage can be crucial for the next stages in the start-up cycle and provides a foundation for further investments and interest in the company. Thereby, I believe improving the efforts and methods in this stage can benefit start-ups.

Based on this reasoning and the gaps located in the current research on OI networks, I decided on the following research question: “How can start-ups utilize OI networks to improve product innovation in the refinement stage? ». The question will address the agriculture and high-tech industries as they currently are two highly relevant industries and because they represent two contrasts in the scope of industries which thereby when compared can provide relevant insight (Bukhari, 2011) (James lind institute, 2019).

2.3 Specified literature

When it comes to locating relevant literature for the research question, several topics needs covering. Including Start-ups, the refinement stage and open innovation networks. Literature on Open innovation networks and start-ups are already covered in the previous section and there is no specific literature on the refinement stage. Thereby the focus should lie on Product innovation. Furthermore, there are other types of knowledge that needs to be considered to

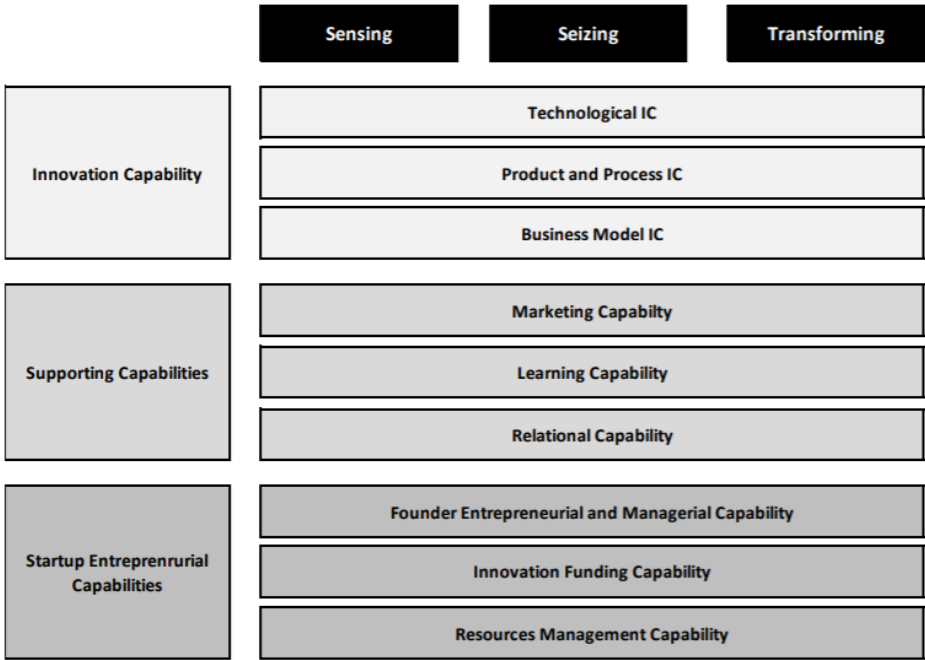
provide relevant answers to the research question, like Industry specific factors. The relevant literature on the topics is limited and therefore, obtaining relevant knowledge about this will be prioritized in the collection of primary data.

This process of “*developing new Products, changing design in existing products or using new materials or components in the manufacturing of existing products*”, is referred to as product innovation (Cambridge university, 2021). Regarding product innovation, the literature review has one main goal, providing tools and literature to aid identifying what good product innovation is. The thesis findings will be based on what can positively contribute to product innovation. Therefore, understanding what good product innovation is in the respective industries becomes important.

according to Hu & Aziz (2016), there are many studies that indicate several types of frameworks for the process of new product development. Idea screening, commercial launch for establishing a preliminary market, and business or technical assessments are some (Hu & Aziz., 2016)). To design and develop the product, it is explicitly suggested to concentrate on the later phases of new product development (Hu & Aziz, 2016).

According to Hu and Aziz (2016), simultaneous product creation needs a vast quantity of data and competence. Su, C., Chen, Y. & Sha, (2006) that information is a valuable asset in today's digital economy, and that knowledge management aids enterprises in their development. To ensure market acceptability, Su, C., Chen, Y. & Sha (2006) emphasize the significance of linking technological competency to consumer wants in order to produce product innovations by integrating the "know-how" of processes or engineering. Daneels (2002) has a similar perspective and underlines the need of managing knowledge in the creation of new product developments. Even while the relevance of knowledge management is recognized when it comes to technology advancements, the potential of consumer knowledge management has not been thoroughly explored Su, C., Chen, Y. & Sha, (2006). The literature provides indications on what factors can be important for defining what good product innovation is, but no frameworks for defining it was found in the review of the literature.

However, (Hanchi & Kerzazi, 2020) discusses the current standing and relevance in research on innovation capabilities in start-ups. They use a dynamic capabilities approach to study innovation as an isolated capability in start-up firms. Through the study of 125 articles within the fields of dynamic capabilities, innovation management, entrepreneurship, and small business literature. Hence, it functions as an updated display and overview of relevant literature for innovation capability in start-ups. Their findings and summarization of the literature divide the most relevant innovation capabilities for start-ups into three different categories with relevant display of context as showed below.



Framework 1. Innovation capabilities, 2020, by Hanchi & Kerzazi.

they have created a comprehensive and synthetic Innovation capabilities framework that can function to “support qualitative research and detailed case studies” and “provides entrepreneurs with a simple and realistic multidimensional method to evaluate their start-ups’ innovation capabilities and recognize their strengths and weaknesses” (Hanchi & (Kerzazi, 2020). In this thesis the framework and the respective article will be complementing the efforts to evaluate product innovation.

Product innovation happens in all stages in the start-up life- cycle, however, is crucial and the main focus in the refinement stage (Segal ,2021.). The refinement stage can be defined as “the stage where start-ups receive and solicit feedback from early adopters and other important sources, seeking to refine and increase their product(s) performance” (Segal, 2021.). No specific relevant literature researching the refinement stage in start-ups could be found.

Therefore, primary data will be collected to provide the knowledge needed to answer the research question.

3.0 Methodology:

3.1 Introduction

To obtain relevant data to answer the research question, an appropriate research methodology needs to be used. This thesis has a large and specific knowledge- gap to fill. The methodology has the aim of providing and handling the information needed in a scientifically appropriate manner. Because this is a comparative study between the agriculture and high- tech industries, data from both is essential.

3.2 Method

The research methodology used is determined by the study's research question, and the research design employed. There are three sorts of research designs: descriptive design, exploratory design, and explanatory design. Depending on the study's goal, the three designs are applied in different ways. Because there was limited secondary literature relevant for the research question and for accurately interplay with the RQ, I chose a descriptive design .Descriptive designs are frequently used to gather data and explain the characteristics of objects, situations, and occurrences. (Sekaran, 2016, p.43) (Researchconnections, 2017). In the first stage of the study, I used secondary data and literature reviews in order to provide and gain more knowledge about the topic. Later, I collected primary data to produce more relevant information. In this way the knowledge gaps relevant for the research question were filled. Furthermore, I collect data and try to explain how OI networks can contribute to enhanced product innovation in start-ups. Finally, I processed and evaluated the information gathered and sought to answer the research question.

3.3 Data collection

I chose semi -structured in- depth interviews to provide relevant primary data. There are several reasons for this. Firstly, in- depth interview's serve as the best tool for obtaining complex and tacit information and knowledge (Adams, 2015). Secondly, usage of quantitative would be difficult, as to obtain information relevant to this end, one would most likely have to conduct longitudinal studies, which surpasses the limitations of this thesis. Thereby a qualitative approach or a mixed method would be the relevant options. Because interviews better describe complex and diverse subjects, I chose to prioritize the qualitative approach. thirdly, throughout the interviews, relevant subjects and topics that are off script may appear.

Therefore, to be able to capture these while still maintaining focus on information relevant for the research question, I chose to make the interviews semi- structured.

3.4 Sampling

To provide reliable and valid research output, relevant data for the research question needs to be provided. To meet this end, the sources of information need to be credible. In the context of the research question that means considering several factors. The research question calls for data specific to start-ups in the refinement stage, and within the industries of agriculture and high tech. This entails finding start-ups that match the respective definitions of the industries and start-up stage. Or that have recently, been in such a context. Furthermore, the interview subjects need to have a large amount of information available about the start-up. Therefore, founders and co-founders are seen as appropriate interviewees. I chose to conduct Four interviews for each industry, lasting about an hour each. Furthermore, to capture the true nature of the start-up's and to learn from mistakes as well as competence, it does not matter if the start-up was successful or not.

3.5 Interview guide

When developing interview questions, the information relevant for the research question and problem was located and sought mapped to obtain the optimal output. There were several sections of the interview guide, these will be reviewed shortly to provide insight in what information was sought gathered. Furthermore, the interview guide can be found in the appendix. The interview guide was separated into several bulks in order to obtain the optimal interview output. It was divided into 4 phases. Introduction, Open question, Name generator and reflection phase.

3.5.1 Introduction phase

In the introduction stage I provided key information about my research in order for the subjects to provide more relevant answers. Furthermore, I focused on creating an ideal social setting. the subjects needed to feel comfortable, but simultaneously take the manner seriously.

3.5.2 Open question phase

The open question phase had two main subjects. Start-up information and Product and product changes.

3.5.2.1 Start-up information

The objective of this section was exploring the characteristics of the start-up in order to provide context to the rest of the questions asked and get insight in the company's innovation processes.

3.5.2.1 Product and product changes

The key objectives in this section were obtaining information about the company products and their current conduct of product innovation.

3.5.3 Network analysis phase

This phase aims to identify important OI networks and to describe their key qualities. Furthermore, it is divided into two sections. First OI networks are explained, and the subjects are asked to list their most influential ones. Secondly each network is explored through a list of mapping questions to measure key characteristics.

3.5.4 Reflection phase

Here the subjects are asked questions about how their perception of network availability and usage. Based on their knowledge of their company and industry, they could provide relevant suggestions that are worth investigating.

3.6 Execution of the interviews

The interviews were conducted through using the platform «zoom», because of the covid- 19 situation. This format does not provide as good output as face-to-face interviews, but the possibility for picking up on non-verbal cues is still there. This approach positively differs from interviews by telephone. As one can easily make the interview subject comfortable and give make them understand in a more precise way what information I was looking for and not. The relation becomes better and thereby also the output. I focused on creating a professional setting to make them take the manner seriously, while simultaneously keeping them comfortable through a listening and respectful attitude. I am not experienced at conducting interviews, thereby the quality of the information gathered increased as I learned, and I was able to more efficiently direct them in the direction relevant for the research. The interviews lasted between 30 minutes and 1 hour, depending on efficiency.

3.7 Validity and reliability

In order for the research to obtain the appropriate degree of reliability and validity, some standards for scientific methods and approach must be satisfied. The phrases' reliability and validity are both used to describe the quality of research. The phrases are frequently used to describe how effectively one can measure one or more phenomena (Gripsrud et al., 2010, p.51). The validity of a measurement is determined by how well it measures what it is supposed to measure. Even if a measure has a high degree of reliability, this does not imply that it has the same level of validity. A systematic error occurs when something is measured with a high degree of precision and reliability, and yet we measure something else than what was intended. (Gripsrud et al., p. 51, 2010).

The degree of certainty of which the results of a research are dependable is referred to as reliability. In other words, would the results be the same if the study is replicated using the same or a different methodology? This means that for the study to be reliable, the random errors that occur must be as few as feasible. It is critical to offer a detailed account of the study's implementation in order for it to be reliable. Furthermore, the study must explain how the selection procedure was carried out, as well as how the analysis was carried out (Gripsrud et al., 2010, p. 52).

Avoiding systematic errors can be even more difficult when conducting qualitative research. Interviews, even when semi- structured can be very unpredictable and hard to analyse accurately. The probability for systematic errors will therefore be high. In order to minimize systematic errors several measures were taken. The literature on the relevant subjects were thoroughly went through in the literature review to ensure relevant information was included. Furthermore, the interviews had a broad timespan, so that the interviewer had the time to ask respondents additional questions to gather desired in output. In addition, Appropriate tools like name generator and name interpreter were used in order to identify and measure the OI networks in the most accurate way. The same measures contribute to increased validity. The validity of the research is further complimented by the efforts to gather information about the start-ups and their business before utilizing the name generator. They provided relevant context and insight and further complemented the process of analysis and conclusions.

3.8 Data analysis

3.8.1 *Transcription*

The interviews were anonymous and transcribed word for word through a recording from a microphone. The microphone was not connected to the internet and thereby applied with GDPR rules (Codex, 2020). The transcription was analysed through the use of common qualitative analysis.

3.8.2 *Coding*

For coding I used an inductive approach. When performing heuristic or exploratory research and knowing little about the study issue, the inductive coding approach is often used (Delve, 2009). You don't have a codebook in this scenario, so you're starting from scratch with your data. The qualitative data was examined, and different codes were marked with colour. Thereafter the codes were categorized. The categories took base in the questions but was also dependent on what important information repeatedly was mentioned or had enough data. They were ordered in themes as categories and subcategories. Categories representing overarching themes and subcategories representing supportive themes. The qualitative data was structured in a meaningful way that could provide relevant support to the thesis. The overarching categories depended a lot on the interview questions and the sections of the interview guide. The categories differed especially from the open question phase to the network analysis phase. Examples of categories used were Approach to innovation and Product performance in the open question phase and Contribution to product innovation and Input relevance in the Network analysis phase. In the end, the coding was displayed in categories or themes with key sub-categories.

3.8.3 *Network analysis*

To analyse the start-ups networks and their key advantages I utilized network analysis (Wald, 2014 p. 5-10). Network analysis is a collection of methods for depicting and analysing inter-actor relationships and the social structures that result from their repetition. Network analysis aids in determining the most influential person or persons in a group, defining the features of user groups, forecasting appropriate goods for users, and identifying CM targets, among other things. In my thesis I decided to use a name generator to locate the most important actors in the social networks and a name interpreter to measure the networks.

3.8.3.1 *Name generator*

A name generator is used to locate relevant actors in a social network. This can be done in different ways (Wald, 2014, p.7). In my interview guide I chose to explain in-depth what

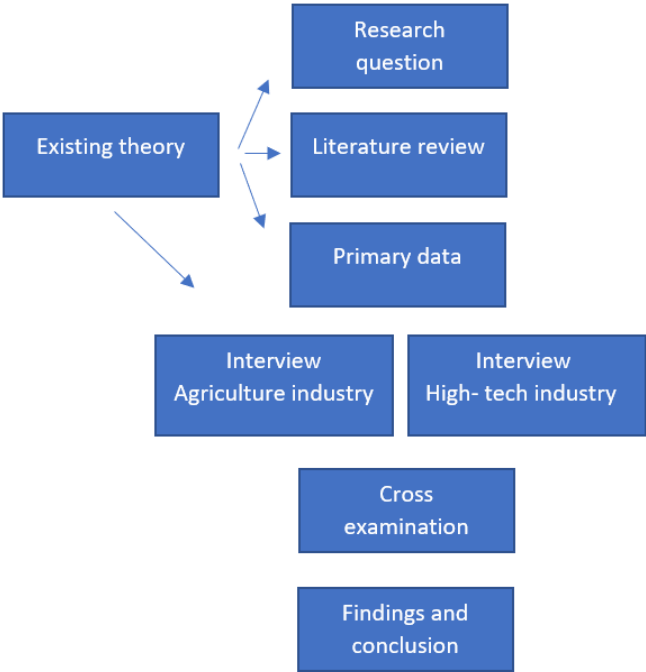
actors I was looking for and thereafter I asked the respondents to mention their most important actors, with the maximum of five.

3.8.3.2 Name interpreter

A name interpreter is used to identify important attributes of the different actors in a social network, in addition to relations and dynamics between them (Wald, 2014, p.7). For this end I created a set of questions about each actor (alter egos) identified with the name generator, designed to measure the relationship with each actor and what it contributed with to the main actor (ego/the respondent). The name interpreter did not address relations between the alter-egos, because the information the interview subject has about that is very limited.

3.9 Overview

The scientific method explained above can be illustrated through the following research model. After the data collection the results will be cross examined, followed by a discussion and conclusion



4.0 Results and cross examination

4.1 Key interview findings

Here the most important topics from the open question phase and some information retrieved from the name interpreter is summarized. Later, the network analysis will be gone through separately.

4.1.1 Analysis

In this section the themes from the open question phase is summarized. This is done through summarizing and then comparing the two industries and listing key differences and similarities.

4.1.1.1 Collaborative network

This theme includes important information about the companies' role in their networks and their collaborators.

Agriculture industry

The companies often have the role as the producer, selling their product both b2c and b2b to actors. Their b2b bargaining power is often limited but provides opportunities for large quantities/amounts of sold product and marketing.

The b2c market can provide large profit margins but also reduced quantity of sales.

Favourably b2b business can also reduce marketing costs.

Furthermore, free and/or cheap labour is used in the form of utilizing social care companies and volunteers.

High tech industry

The high-tech industry mostly includes b2b conduct. The companies have developed tech that other retail actors and producers can utilize to enhance and improve production, product, and sales. Their networks are usually small at this stage, consisting of few potential customers and some test-projects. Partly this is because of the secrecy required when operating in the high-tech industry.

4.1.1.2 Approach to innovation

This theme focuses on the companies' methods for innovating.

Agriculture industry

There is little system in the approaches to innovation, however the companies have their ways of staying innovative. Example wise, they have discussion partners and sources of information they systematically use when looking to innovate. So even though their methods

are less theoretically definable, their methods will most likely provide good contributions to their innovation performance.

High tech industry

The tech companies mostly consist of people from the younger generation. They are familiar with innovation theory and utilize this when seeking to innovate internally. There is however little system and methodology for how the companies proceed when doing so. They perform activities such as brainstorming and customer analysis, but in a more unstructured way than ideal.

4.1.1.3 Product performance

This theme highlights what factors are important for the companies' product performance.

Agriculture industry

Product performance is hard to measure because some of the start-up's haven't sold any products yet. Some of the respondents does however show promising sales results and good reflections to why these occur. Products in the agriculture industry are often similar and chosen marketing angels and design becomes a priority. The respondents report design to be one of the key metrics to their products performance.

Pricing is another relevant factor contributing to separating from their competition.

Norwegian agricultural companies often compete with suppliers from abroad. They have lower prices, but reduced product quality. Thereby the Norwegian companies report benefiting on pricing their products high, to ensure consumers perception of superior quality.

High tech industry

The performance of the products are hard to measure. The technology functions in all the start-ups, however it is hard to determine how well they would function when fully implemented, due to customer perceptions and other factors relevant for performance. Th. On a technical level, their products perform well, but in the refinement stage, it becomes hard to determine the future. The secrecy needed in these start-ups becomes a hinder to receiving customer feedback, which is vital for estimating future growth potential and thereby what refinement is currently needed.

4.1.1.4 Product innovation

This section focuses on the companies' ways of innovating their products.

Agriculture industry

The companies show a high level of innovative thinking. They adapt their products and their production in many cost-efficient and profitable ways. Most of the innovation is done within the companies and focus on pricing, design, and marketing. However, they have a large focus on effectivization on production and trialling of new products. Some of the start-ups also try entirely new solutions and seek to create new market segments. Their process when it comes to innovation, might not be systemized, but they provide plenty of innovative solutions and thinking.

High tech industry

The secrecy is a large obstacle when it comes to their product innovation and marketing potential. Thereby design, functionality and pricing become difficult. Should the companies decide to go public with their product, without a sufficient patent, this opens the possibility for the creation of more competition and copycats. This does however depend on the level of disruptiveness the technology has. One respondent mentioned the risk of larger companies within similar sectors, copying their technology and bleeding them out through low-cost strategies. This is a reality, especially in the tech industry as there could be few or no competitors in the market entered. Product innovation therefore becomes very delicate.

4.1.1.5 Network availability

This theme focuses on the companies' potential networks and their utilization of these.

Agriculture industry

Some of the companies have large networks, and some have very narrow ones. This highly depends on their experience within the sector and previous networks. This indicates that they have sought external networks to a small extent. The networks available to them are large, however few of them take benefit of them. One respondent reported a large number of networks, a lot of them being arrangements with other companies within the same sector and through retail actors. Selling goods through retail actors can be an efficient way of acquiring network and marketing value.

High tech industry

There are a lot of networks available to the companies within the high-tech industry.

However, networks including non-disclosure agreements is recommended. Example wise, incubators, mentors, and accelerator programs. Regarding potential customers, focus groups and interviews provide to provide secure and valid feedback if conducted right. Otherwise,

two of the respondents have gone public and they report a large number of external actors used, most of them being cost-free. They report most of them emerging from their incubator, accelerator, and mentor networks. Thereby prioritizing being included in such networks is recommended.

4.1.1.6 Other important networks

This section focuses on what networks the companies think could benefit them, which they are currently not using.

Agriculture industry

The start-ups report large numbers of important networks they could have used. This complements the reflection from the network availability section. This supports a recommended increased focus on prioritizing networking and not relying too much on personal relationships. The government and other private arrangements could benefit the companies a lot. Furthermore, the potential for free relevant relationships and feedback is enormous. This potential is used to a small extent.

High tech industry

The respondents mention plenty other possible sources of information, collaborators, and customer segments. They seem to have been mindful of the value of external networks. They do however report little self-initiative when it comes to reaching out to these. This makes sense when it comes to the risk of technology exposure. However, creativity reaching other safe beneficial networks then becomes a priority. Furthermore, companies who have already gone public could favourably have spent more time locating and contacting relevant networks on their own.

4.1.1.7 Other benefits

This theme includes what other benefits the companies have in respect to the research question.

Agriculture industry

Having competitors as collaborative partners can provide great insight and becomes a valuable asset because of the low risk in the companies' business contexts.

Having a retail partner provides a lot of resources, insight and feedback for the companies and can serve as a safe way of acquiring demand in the refinement stage.

High tech industry

High-tech companies often have little competition in their market. This can be utilized to its fullest and some companies will have an enormous growth potential. Furthermore, the potential for cutting costs and making small investments is large in the tech industry.

4.1.1.8 Other challenges

This theme includes what other challenges the companies have in respect to the research question.

Agriculture industry

When the companies have many strong ties, this can affect their business negatively because of their bias and that they might provide less direct and applicable feedback.

High tech industry

The choices tech companies are faced with in the refinement stage are difficult and the cost of networks and feedback can be large. They will on average have to rely on less information than in other industry before making business decisions and therefore they are exposed to increased risk.

Furthermore, in many cases, patents are required before launching. This makes the whole process a lot more difficult, as there is less room for trial and error in the refinement stage.

4.1.2 Key differences and familiarities

Collaborative network	<ul style="list-style-type: none">- High tech companies mostly conduct b2b business, while agricultural companies do a lot of both.- Agriculture companies mostly have the role as producer.- High tech companies often have small networks due to required secrecy.- Agriculture companies often have opportunities for free labour.- Agricultural companies often have limited bargaining power due to large competition, in contrast to high-tech companies.
Approach to innovation	<ul style="list-style-type: none">- The agricultural companies have little system of innovation, however, have their ways of doing it, meanwhile tech companies usually have that competence because of the updated education and their topics of education.- Both industries show very innovative tendencies, regardless of level of knowledge of innovation approaches.- Both industries could benefit from more systemized approaches when seeking to innovate.

Product performance	<ul style="list-style-type: none"> - The agricultural industry often has easier ways of predicting and measuring product performance due to similar actors often exist in the market. - Tech companies often create new market segments or enter markets with little competition, thereby measuring product performance becomes difficult. - The agricultural companies report design and pricing to be very important to product performance. - The secrecy required of tech companies makes it difficult to measure other metrics than products technical functionality.
Product innovation	<ul style="list-style-type: none"> - Agricultural companies show a high level of innovative thinking, they find many ways of cutting costs, effectivising production and improving marketing, pricing, and design. - Agricultural companies often test entirely new products and solutions, partly because the financial risk of it often is low and they can easily find networks to beta test. - Secrecy is a large obstacle for innovation for tech companies, pricing design and functionality becomes difficult. - Going public can positively affect tech companies' product innovation but can also have large risks. - Tech companies can easily be squeezed out by more liquid companies. - Tech companies show high levels of innovativeness tech-wise, but often less when it comes to adaptiveness to customer and market needs.
Network availability	<ul style="list-style-type: none"> - The agricultural companies use a small portion of their network potential. The networks are often based on personal relationships, which indicates: the more experience, the larger network. - Selling products to retail actors can provide great customer feedback and networking for agricultural companies. - There are a lot of network arrangements both public and private available to Norwegian the Norwegian agriculture industry, they are under-used by the respondents. - Based on required level of secrecy, the available number of networks for tech companies vary.

	<ul style="list-style-type: none"> - There are however a lot of “safe” networks available to companies who haven’t gone public. Example wise: incubators, mentors, customers and focus groups; actors that can include non- disclosure arrangements. - Tech companies mention most of their network coming from incubators and accelerators.
Other important networks	<ul style="list-style-type: none"> - Agricultural companies have a lot of networks available to them. These are under-used, and they should rely less on personal relationships. - The potential from networks, both private and public ones are enormous for agricultural companies. - The tech companies seem mindful of available networks but show little initiative for reaching out. - Creativity in finding networks that are safe for informational leaks becomes important for tech companies. Less for companies that are public, but nevertheless, relevant before they went public.
Other benefits	<ul style="list-style-type: none"> - The opportunity of having competitors as collaborative partners in the agricultural industry can provide good insight. - Having a retail partner can provide resources, insight, feedback and acquire market demand for agricultural companies. - High tech companies often have little competition in their markets, which can be exploited.
Other challenges	<ul style="list-style-type: none"> - Agricultural companies often have a lot of strong ties which can compromise the validity of the feedback they receive. - Tech companies have a difficult time in the refinement stage, because of the risk of information leaks. They will thereby often also need to make decisions based on less information than in other industries. - Tech companies will more often need patents, which can cost a lot and decreases room for trial and error.

4.2 network analysis

4.2.1 Definitions

Contribution to product innovation: ▲

The OI network is perceived by the ego to contribute positively to its company's product innovation.

Diversity: ●

The OI network is perceived by the ego to possess a diverse set of competencies and is able to assist the ego in a broad spectrum of problems.

General input relevance: ■

The OI network is perceived by the ego to provide relevant inputs for the company's growth, innovation and regarding its problems in general.

Input frequency: ◆

The OI network provides frequent inputs to the ego, meaning the ego receives inputs at least once per second week.

Strong tie: ↔

The OI network is perceived to involve a strong personal relationship with the ego.

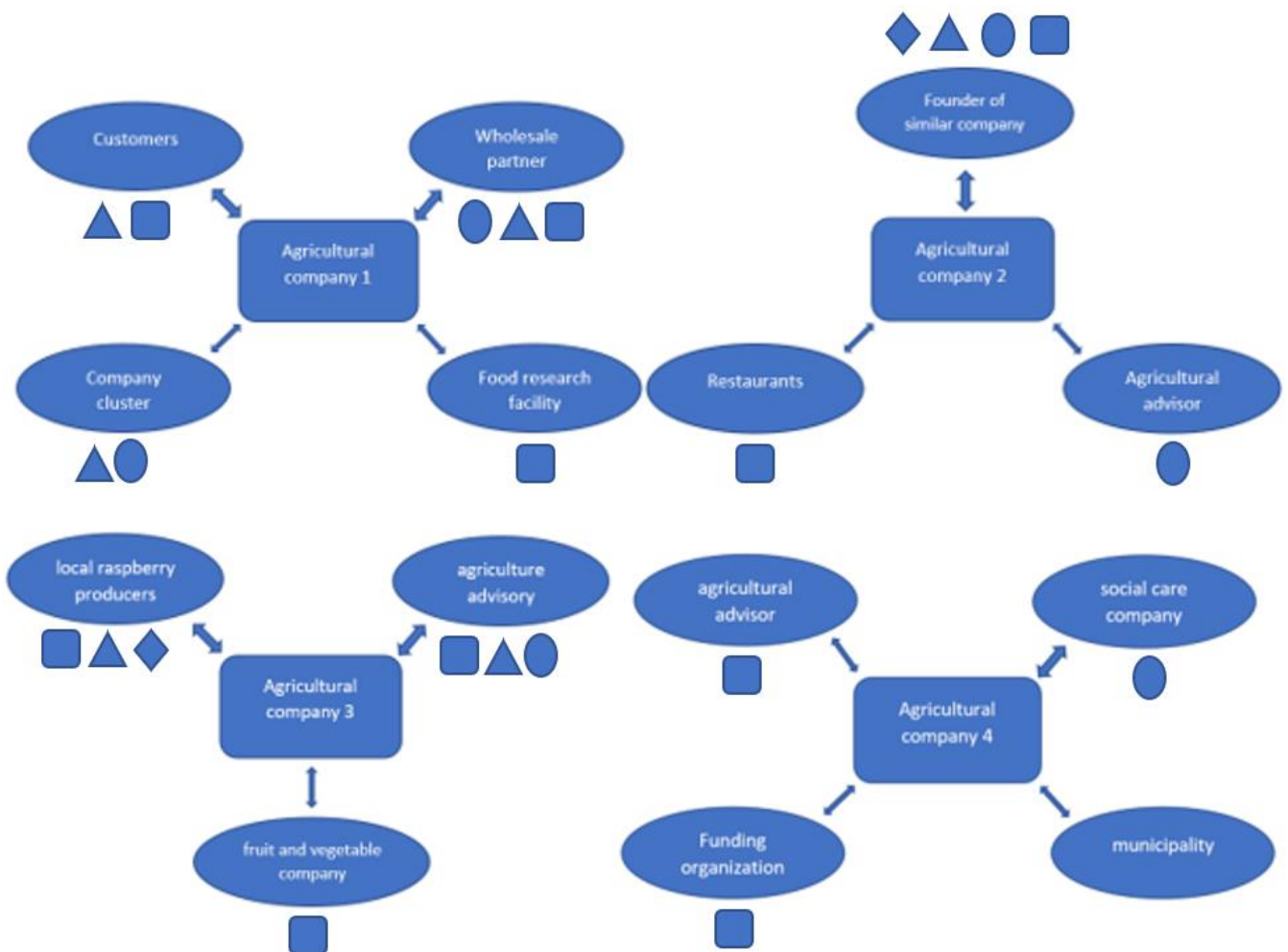
Neutral or weak tie: ⇄

The OI network is not perceived to involve a strong personal relationship with the ego.

4.2.2 Agriculture companies

4.2.2.1 Company information

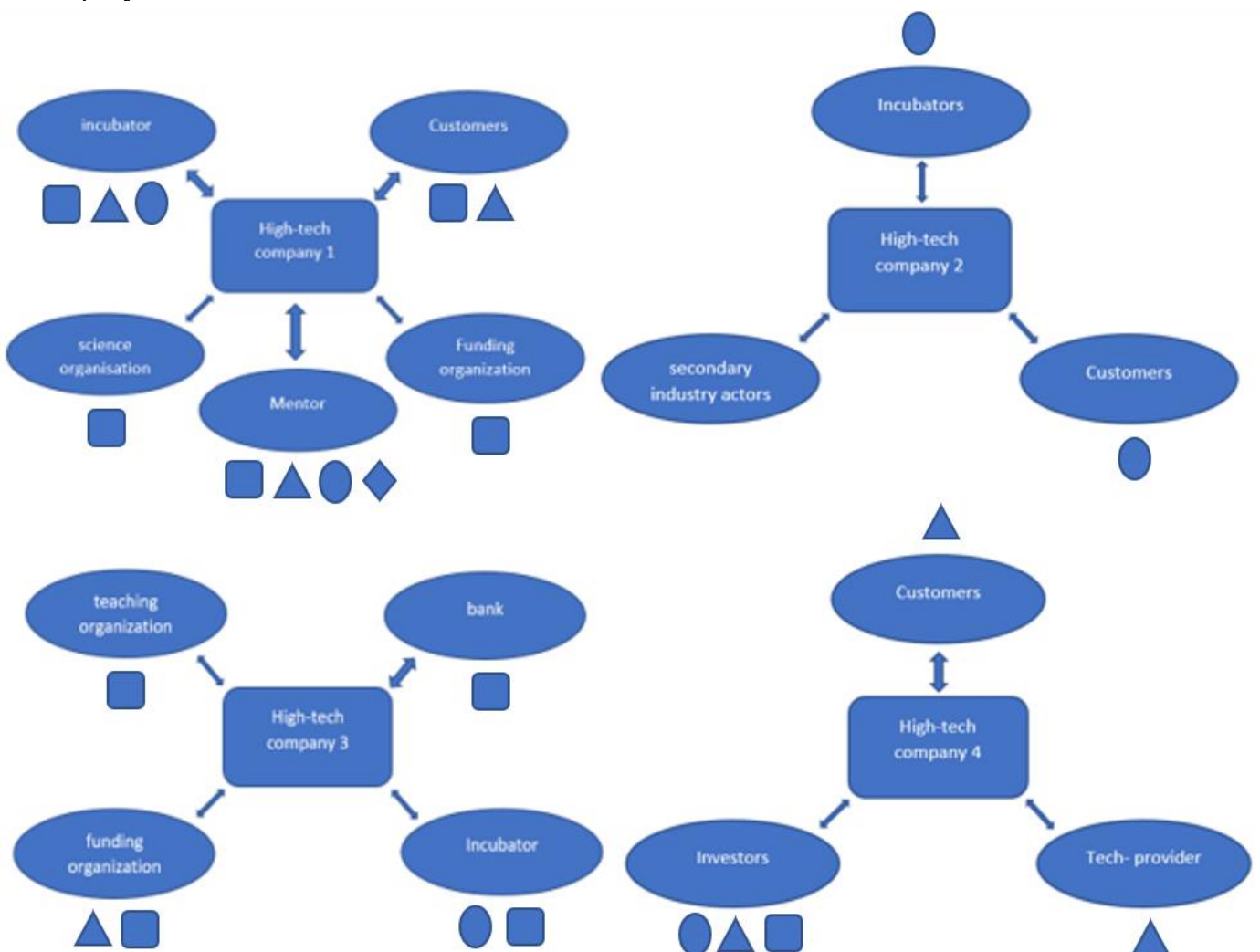
The agricultural companies all operate or aim to operate in both b2b and b2c markets. Agricultural company 1 is a farm selling a variety of products and services. They have a broad network and frequently test new products in their respective market. Company 2 is a producer of vegetables who also plan to provide other innovative services on their facility. They mainly target the local market and focus strongly on product quality. The third company is also a farm, focused on selling berries. Furthermore, they provide other products and frequently test new innovative solutions, both regarding production and innovation of products. Company 4 is a farm that focuses on selling meat from animals and on social services. They are targeting the local market and promote the concept of having an ethical farm that care about their customers. This also supplements their reputation as a social care provider.



4.2.3 High-tech companies

4.2.3.1 Company information

High-tech company 1 has the largest network cluster of the tech companies and have gone public with their services. They are beta-testing a simple product with the assistance of their collaborators. Their solution is a simplified and automated way of selling an existing product. Furthermore, they have their own brand and a great possibility of disrupting the market they are entering. High-tech company 2 is mainly a tech provider, but also provides an additional package to their customers. Their technology is largely disruptive and as they have not gone public, secrecy is a great priority for them. Thereby their network cluster is relatively small and the input they can obtain as well. High-tech company 3 have gone public and currently communicating with customers on how they can improve their software and to identify the degree of demand. Company 4 also provides a software with a package but have not yet gone public with their product. They are currently refining their product through dialogue with their customers and tech providers. Their product is unique and the market potential large. The company clusters are illustrated below.



4.2.4 Key differences and similarities

One could say the networks of the agriculture companies and High-tech companies are very similar, but there are some key differences. The industries contain different dynamics and perspectives on business, which in turn result in different types of networks and information prioritized. Firstly, there are different perspectives on the relevance of the customers as OI networks. Only one of the agricultural companies have mentioned the customers as an important source of input, while three of the high-tech companies have. This can be due to the knowledge available about the markets of entry. The high-tech companies have relatively little knowledge about the markets they are entering, while the agriculture companies are entering markets many have succeeded in before and where there are plenty of prior information about the target customers. There is however one more important factor here. The companies have different business when it comes to b2c and b2b markets. From the research provided one can see that the agriculture companies often collaborate with a wholesale partner or other actor that does most of the market research for them, in other words, their main source of income comes from selling b2b. Whereas the tech companies need to be able to sell in their products to the end consumer to a larger extent. Both because they focus more on the b2c markets and because when they operate b2b they need to be able to prove demand of the end customers. Thereby customers become a more important source of information for the tech companies.

When operating as a start-up in the tech industry in general, there will be less prior knowledge in general as well and the entrepreneurs are younger on average as well. This promotes the relevance of the role of a mentor and other sources of experience-based knowledge to a large extent. Most of these entrepreneurs are not experienced with start-ups in general, which is natural because of the age group mostly initiating tech- start-ups. They do not only need the competence and knowledge for starting a company, but also about how to handle the emotions and tasks put upon them when facing the challenging environment of working in a start-up. Thereby OI networks as mentors, incubators and investors become popular and relevant choices for them as sources of learning and support. On the contrary the sample of agriculture companies contain older and more experienced people, which can be reflected in their valuing of networks. They mostly value guidance about the industry, example-wise agriculture advisory services. This can however be a downside. Most of the entrepreneurs in the agriculture industry does not have prior experience when it comes to start-ups and the nature of working in one, and even though they do have more life experience, this setting is

unique (Grant & Zhang, 2019, p.6). If they plan to succeed, they should also value experiential knowledge that can be subtracted from mentors, incubators and investors. This point can be strengthened by the fact that all of these actors, except one score high on general input relevance.

One potential problem that can be seen in both the high tech and the agriculture industry is the lack of high input frequency. This represents how often the company receives input from their different OI networks, and only one OI network in the entire sample have scored high on this. This can indicate that the companies use to little input from their key networks, which can be a large weakness. Being able to think for yourself is important, however utilizing these networks can save a lot of time, provide great insight and save costs. All these are factors that are very relevant for start-ups.

Another factor to note is that most similar companies and mentor-like networks score high in input diversity. This means they provide a broad spectrum of information. This shows that the actor is able to assist on several aspects of the business of the company. These actors often also score high on general input relevance. One could then argue that actors that are flexible like these can be very valuable because of broad insight they provide. This can save a lot of time, as there will often be a lot of unanswered questions when working in a start-up. One might contact the network regarding one problem and end up solving it and several others. Networks that have this combination of attributes is likely to be very valuable. Another point to note is the difference in strong and weak ties.

The agriculture industry shows a much larger number of strong ties. Meaning they have stronger personal relationships with the actors they mention. This can be both an advantage and disadvantage depending on how the relationship is managed. If one manages to stay focused on business, and staying objective when required to, having strong ties can be a great advantage. However, this is easier said than done, and having strong ties with less important actors, can even be a disadvantage. The human component does remain relevant, and thereby one should think twice and be mindful before allowing a strong tie to be made rather than keeping the relationship purely professional.

When it comes to relevance to product innovation, several actors are highlighted. In the agriculture industry these are mostly companies in the same industry. The companies seem to gain a lot of knowledge from these, despite them often being their competitors. Company 1

also reports the customers being an important contributor to their product innovation. From the interviews the agriculture companies also speak to customers and have gained insight from them, however only one of the companies valued the input of the customers enough to mention them as a key OI network regarding product innovation. Different adjustments made by the companies on their products were also due to customer feedbacks, example wise regarding pricing and design. This indicates that the end customer is less prioritized than it should be. Another point to regarding this is that the agricultural industry has a lot of competition in most market segments. Thereby the importance of differing from the competition should be higher in order to penetrate the market. The end customer is a perfect source of information for making adjustments to this end, whereas when asking the competition for advice, you are less likely to receive feedback that can achieve this level of differentiation. Taking advice from similar companies can benefit greatly, but it will most likely not be enough to utilize the potential of the companies' products and thereby profitability and success.

In the high-tech industry actors contributing to product innovation are mostly incubators and different types of investors. Otherwise, customers and one tech provider.

There are two things their actors have in common. Either there is a strong tie or the OI network is financially incentivised to contribute to the company. Example- wise the mentioning of incubators and mentor as contributors to product innovation, is otherwise markable. These actors only have emotional motivations of contributing to the companies' growth. Thereby the strong ties are likely to be the reasons for the output regarding product innovation. Having strong ties in these types of networks might therefore be beneficial.

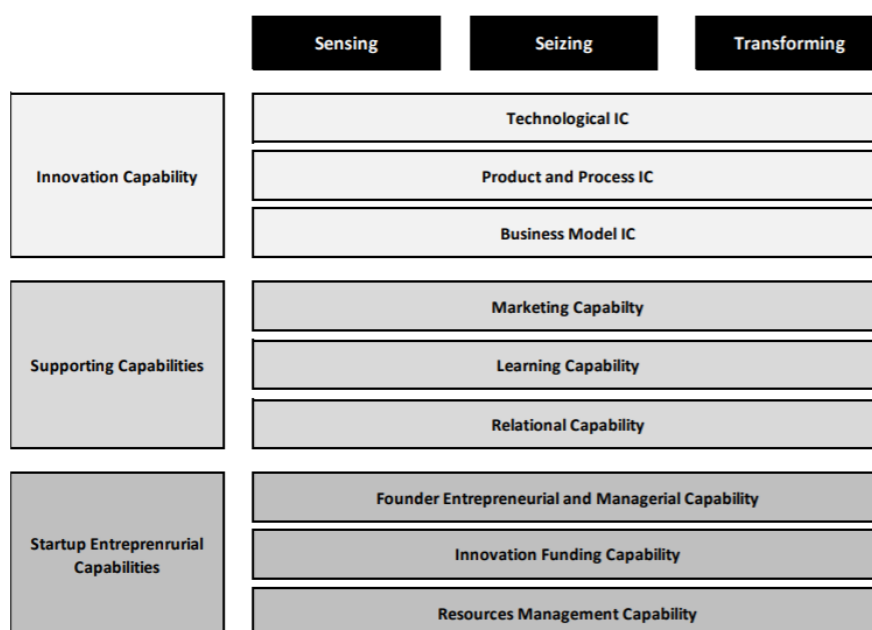
The high -tech companies do in general have fewer actors that contribute to their product innovation than the agriculture companies. This can be due to the element of required secrecy. This point can be further complemented by the actors the tech companies mention as their contributors to product innovation. Incubators, mentors, tech providers and possibly customers all have non- disclosure agreements, which provides a safe environment for discussing products. Utilizing these types of networks thereby becomes vital for tech companies to complement their product innovation when secrecy is required. One could therefore argue that such companies should seek strong ties with the mentioned actors.

5.0 Discussion

The discussion will have several key aims. Firstly, I will aim to provide recommendations on what OI networks should be included for start-ups in the respective industries to optimize product innovation. This will be done through the usage of (Hanchi & Kerzazi, 2020) framework. Their framework aims to evaluate start-ups through a dynamic capabilities approach. The framework provides a way of systemizing and evaluating a start-ups innovational capabilities. Their findings will be used as a base for what OI networks a start-up needs in order to optimize their innovational capabilities. The framework will be used to optimize product innovation and not general innovational capabilities, as the thesis aims to optimize product innovation. One could see the capabilities prioritized as key performance indicators for product innovation.

5.1 Product innovation: key performance indicators

Framework 1 illustrates a set of innovation capabilities. An innovation capability can be defined as “A firm's ability to identify new ideas and transform them into new/improved products, services or processes that benefit the firm.”(Aas & Breunig, 2017). This definition can be applied to all the below categories. This thesis will focus on the “sensing” and “seizing” aspects of the process by providing suggested OI networks in the respective contexts and relevant advice on how to utilize them. The sensing aspect will be addressed through the identification of relevant networks. The seizing aspect includes how the networks should be utilized. For example, when it comes to choosing determining whether to have strong or weak ties with an actor.



Framework 1. Innovation capabilities, 2020, by Hanchi & Kerzazi.

What capabilities are relevant depends on each individual start-up, industry and start-up stage, but there are some common denominators that will be consistent regardless of industry and start-up. When taking into consideration industrial factors and start-up stage, more precise suggestions and recommendations can be made. The stage in focus is the refinement stage. In this section I will determine the key performance indicators of start-ups in the high-tech industry, the agriculture industry, and start-ups in general. This will be done through identifying which innovation capabilities are the most relevant in each context.

5.1.1 Agriculture industry

When it comes to the agriculture industry Technological IC is mostly important for already scaled companies and effectivization of production, thereby not relevant for the refinement stage. Here Product and process innovation capability become vital, because of the focus the sampled agricultural companies have on product innovation. They mainly innovate when it comes to pricing, packaging, and design. As supporting categories, relational capability and learning capability is important. They need networks that can provide the information needed to enhance product and process innovation. They can achieve this by cooperating with Networks that are incentivised to teach them about the innovation capability and through utilizing strong ties to provide additional output from the network. Lastly when it comes to start-up entrepreneurial capabilities, the agriculture industry has a huge need, that based on the agriculture sample, is not being utilized. Therefore, it demands additional attention. Founder and entrepreneurial capability are vital in any start-up and deprioritizing this aspect will heavily jeopardize any innovation capability. It does not matter how much relevant information you have if you do not use it efficiently. The same goes for innovation funding capability. If you are not capable of achieving capital in many ways, the start-up struggle innovating. Resource management capability becomes a product of the latter and thereby does not require any focus.

5.1.2 High-tech industry

The tech companies' main innovation capabilities will be technological innovation and product and process innovation. Most importantly technological innovation because of their level of disruptiveness and lack of competition in the markets they are entering. More specifically the combination of mapping potential customer needs and providing functioning technology to meet them. As supporting capabilities, learning capability and relational capability again become the most important. Strong ties are vital to receive the feedback and inputs necessary to innovate optimally, especially when secrecy is required. Furthermore,

High tech company 3 underlines that handling and developing technology is complex and requires a lot of trial and error, thereby learning capability becomes important. Regarding the start-up entrepreneurial capabilities all of these become equally, if not more important in the high- tech industry. The environment in the technology sector is more unpredictable than in the agriculture industry and therefore, acquiring resources and managing them well is vital.

5.1.3 The average start-up

When it comes to the average start-up the framework must be adapted to the generalised aspects relevant for most start-ups. The innovation capability all start-ups need is Product and process innovation capability. The need of Technological innovation capability is not relevant in enough start-ups to qualify as a key performance indicator for general start-ups. Learning capability and relational capability is important in all start-ups because of the nature of working in one. Furthermore, all start-up entrepreneurial capabilities will remain as relevant constant for general start-ups as in the high-tech and agriculture industry. The average start-up ends up having the same key performance indicators as start-ups in the agriculture industry.

5.1.4 Adjusted framework

Agriculture industry and general start-up	<ul style="list-style-type: none"> • Innovation capability: Product and process • Supporting capability: Relational and learning • Start-up and entrepreneurial capability: Founder and entrepreneurial & Innovation funding
High- tech industry	<ul style="list-style-type: none"> • Innovative capability: Product and process & Technological • Supporting capability: Relational & Learning • Start-up and entrepreneurial capability: Founder and entrepreneurial & Innovation funding

(Hanchi & (Kerzazi, 2020)

5.2 Ideal network cluster for start-ups

When determining what OI networks are relevant for start-ups, several factors have to be put together to provide relevant conclusions and insights. The interview subjects have some points of view, while theory provides another perspective. The adjusted version of (Hanchi & (Kerzazi, 2020) framework is there to complement defining the start-ups needs regarding product innovation. The relevant capabilities will be combined with theory and a framework of relevant networks will be put together based on which ones fill the companies needs.

Furthermore guidelines and goals for interacting with each network will be included to add the seizing aspect of the framework. As the actors all are chosen to enhance product innovation, it is a given that they provide a good contribution to product innovation.

Furthermore a high input frequency is advised when interacting with all key OI networks, as their feedback is very relevant and utilizing them fully is beneficial.

5.2.1 Agriculture industry

The innovation capabilities and priorities for the agriculture industry are:

- Innovation capability: Product and process
- Supporting capability: Relational and learning
- Start-up and entrepreneurial capability: Founder and entrepreneurial & Innovation funding

When constructing an ideal network cluster in the respective industry the main innovation capability in focus is product and process. However, the Supporting capability and Start-up and entrepreneurial capability remains very important. In other words, the entire network cluster should contain an appropriate balance of weak and strong ties, be focused on the start-up learning and contribute to enhancing start-up and entrepreneurial capabilities, while having product innovation as the overall goal. The complementing capabilities remain important for the start-up to operate optimally regarding product innovation and thereby become a priority as well. The Tie strength for the key OI networks will always be a well- managed strong tie, as the companies receive greater input diversity, however there is a limit to how many strong ties a company can manage and in practice, the start-up will struggle to maintain the relationship professionally and not being affected by the bias that comes with a strong tie. Thereby strong ties should be reduced to the actors where it is extra beneficial to have one and where personal experience and input diversity is a priority. When a strong tie is recommended, a diverse base of information should be sought from the OI network.

There are several key actors where strong ties are recommended. Firstly, Mentors. Mentors provide start-up and entrepreneurial capability and are also reported to contribute to product innovation. None of the sampled agricultural companies worked with a mentor and their input regarding this innovation capability was very narrow. Thereby a mentor could benefit the companies greatly. It is important for even more experienced entrepreneurs to see through the barrier of overvaluing their own experience. This is a common bias that is illustrated in (Di Pietro et al., 2018; Spender et al., 2017). Furthermore, the agriculture companies show great results from working with similar companies. They report high input relevance as well as good contribution to product innovation. They all had strong ties with the mentors they worked with, which is also recommended as there is a lot of information to gather from working with them. Example wise Entrepreneurial and start-up capabilities and Learning capabilities. It will be easier to learn from an actor that is willing to explain things in depth and provide some subjective views on the matters. Thereby a strong tie can complement this dynamic further and make the network more relevant. One should note that picking a mentor that has knowledge within the relevant industry should be a priority.

The agriculture industry is a very competitive industry and to stand out, there is a large need to innovate their products. To test innovations and discover new ways of innovating, having a continuous dialogue with customers is vital. Without the unique feedback customers provide, innovating successfully will be a lot more difficult. Only one agricultural company lists customers as a relevant OI network, which means the rest are missing out on innovative potential. Then comes the question of what relationship to have with them. Agriculture company 1 underlines that it can be difficult to get objective replies from their customers. Having a strong tie with customers can result in biased replies and thereby a lack of honesty. What companies need to innovate is their customers most honest and brutal truths about their products. Thereby a weak tie with customers is recommended. When companies chose having a weak tie with an OI network high input relevance should be sought and systemized interactions with clear agendas should be prioritized.

High- tech companies are dependent on incubators because of their need of secrecy and non-disclosure agreements. Even though this often is not the case in agriculture companies, incubators provide a good variety of perspectives, experience and guidance that can help inspire innovative decisions. In addition, getting opinions of other entrepreneurs on products and solutions can inspire positive changes. Furthermore, one can learn from watching other

people's products and services. Having a strong tie with an incubator can enhance learning and Start-up and entrepreneurial capability.

Agricultural company 1 is a member of a company cluster, where they discuss matters in the market with non-disclosure agreements. This type of insight can be similar to what is gained in an incubator, but the information received I them have different focus.

Incubators are more diverse while a company cluster is very market- specific. Both networks provide Start-up and entrepreneurial capability, however when focusing on the refinement stage, a company cluster becomes less relevant. The network becomes very important in later stages of the start-up cycle but should not be a priority in the refinement stage, as the focus should lie on innovativeness and building the company. One consideration to make however is that the environment in an incubator often consist of almost exclusively young people. This can be uncomfortable if the entrepreneur is of an older generation. Should this be the case, a working with a cluster of similar company can function as a good substitute.

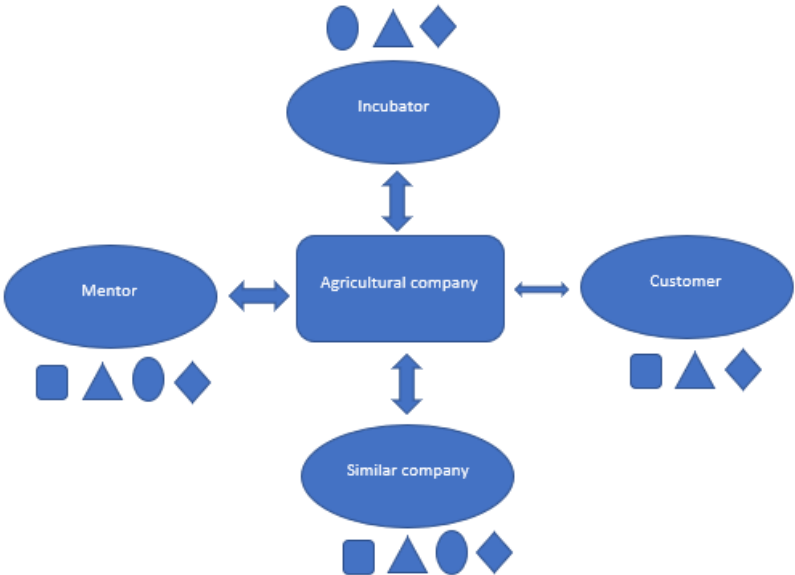
Working closely with b2b actors as wholesale partners is important, but those networks does not qualify as a key network when it comes to product innovation. If the product is good enough and adapted to the end consumer, selling it b2b may not be difficult. Investors show promising contribution to product innovation in the high-tech industry. However, to get the full potential out of a relationship with an investor one would have to make them a network with a strong tie. This can be problematic due to the professional nature of the relationship. Thereby the option with an investor as a key OI network would be with a weak tie. Without the possibility or recommendation of having a strong tie, the Networks value in terms of product innovation sinks drastically. Having investors in the start-up network is important, but they do not qualify as key contributors to product innovation in the agriculture industry.

Three out of four companies mention agriculture advisors as a key OI network.

However only agriculture company 3 has them marked as an actor who contributes to their product innovation. This can be due to several factors, but one stands out. Company 3 mentions the network as a strong tie. The job of an agriculture advisor is to provide advice about agriculture for companies starting up in the agriculture industry. More input than that cannot be expected when a relationship like this remains professional. However, one cannot expect a relationship like this to be anything more than professional, it is not natural as an advisor to advice on other aspects of the business and they might not even be competent to do so. Agriculture advisors could provide essential insight when it comes to the industry, but it is

not within their expected competence to be capable of contributing to product innovation. Their job is to provide already existing information about the industry to a company, which could lead to product innovation, but it cannot be expected to. Agriculture advisors are mentioned as a key network by 3 out of 4 respondents, however there are more important actors to focus on when prioritizing product innovation.

Thereby key OI networks and guidelines for interaction recommended for agriculture companies are the following:



5.2.2 High-tech industry

The innovation capabilities and priorities for the high- tech industry are:

- Innovative capability: Product and process & Technological
- Supporting capability: Relational & Learning
- Start-up and entrepreneurial capability: Founder and entrepreneurial & Innovation funding

The innovation capabilities relevant in the high-tech industry differ slightly. Technological innovative capability is added because of increased priority on development of technology and less on fine-tuning products to customer needs.

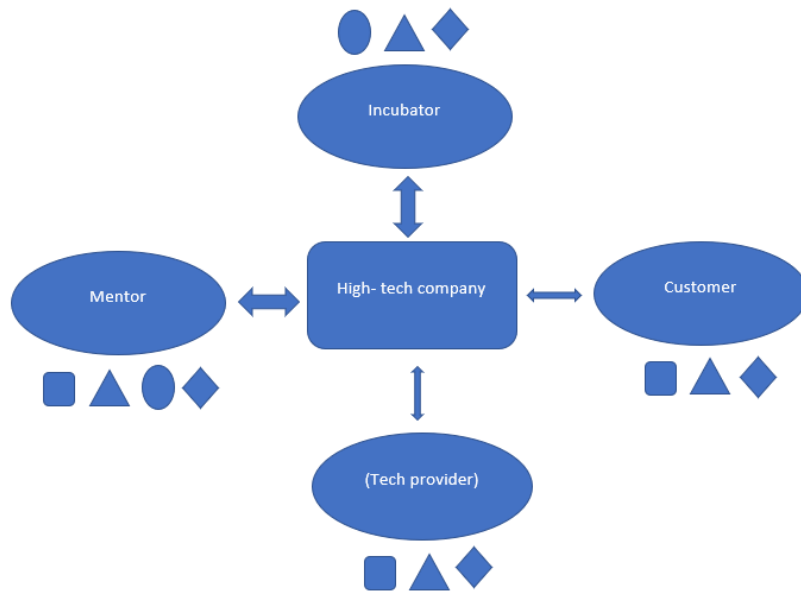
The rest remains the same. The combination of strong ties, high input relevance and diversity in OI networks remain strong, but they become harder to obtain in the respective industry due to secrecy often being a requirement. Incubators, mentors, and investors therefore become key OI networks. Regarding incubators and mentors, a strong tie is recommended as they do not have any financial incentives to provide in depth knowledge, contribute to learning and

otherwise be strongly invested in the start-up's products. Investors will be financially incentivised and due to the greater risks and uncertainties high-tech start-ups face they are likely to contribute to a satisfactory degree. The relevance of the investor's competence depends on their background. Should the investor have prior experience in the high-tech industry, they could contribute to the start-up's technological innovative capability, but otherwise, they might be limited to providing support in the Product and process innovation capability and the rest of the mentioned capabilities with their experience. The Tie strength to investors should however remain weak. The relationship should be professional due to the nature of such a relationship. Having a strong tie with investors can risk the possibilities of future investments and investor's objective view on the start-up.

The benefits of making the relationship less professional is not worth the risks that it includes. Thereby an investor will only be relevant to the product innovation of the company if they have tech-insight because the relationship is limited to having a weak tie. Thereby investors relevance is too dependent on competence to be included as a major contributor to product innovation. However, Innovation funding can be especially important in the high-tech industry, as developing technology can be expensive. Therefore, requiring knowledge of and learning how to obtain financing should be a priority when consulting mentors and incubators.

Not all tech start-ups provide their own technology. Two of the four companies interviewed had a tech provider that took care of the technological aspects. Then the tech provider becomes a vital OI network for Technological and Product and process innovation capabilities. Therefore, technology provider will be added as a key OI network which is only relevant for companies that have one. Furthermore, the end customer becomes important to be in dialogue with. The start-ups are often entering new markets and less competitive markets and determining if there is a demand and how to adapt to it becomes vital for their success. In addition, when receiving feedback from customers, the possibility of a non-disclosure agreement is there. The tie strength to customers should in addition stay weak to ensure objective perspectives.

There by the ideal network cluster for the high- tech companies are:



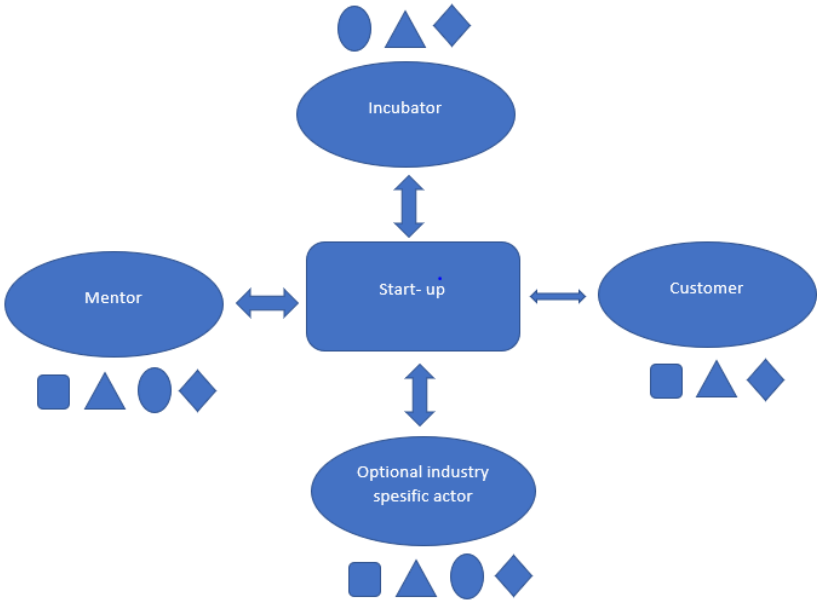
5.2.3 The average start-up

The innovation capabilities and priorities for all industries are:

- Innovative capability: Product and process
- Supporting capability: Relational & Learning
- Start-up and entrepreneurial capability: Founder and entrepreneurial & Innovation funding

When addressing start-ups in general there are more factors to consider, but some common denominators will exist. Firstly, some conclusions are similar to the ones made in both the high tech and agriculture industries. They both have three key OI networks in common: mentors, incubators and customers. These will remain common in the suggested network cluster here as well, because of their major overall contribution to the start-up innovation capabilities. Furthermore, when addressing start-ups in general there are more considerations to take into account. The start-ups will have different types of teams and operate in a wide range of industries, which one would think affects what outer Networks should be sought to a large extent. one could for example not suggest a connection with an agriculture advisor or tech provider for the average start-up. But the important thing to note is that the agriculture and high- tech industries are two industries on opposite sides of the spectrum. And regardless of this, they have three out of four OI networks in common on their ideal OI network cluster. The differences are that similar companies are mentioned for the agriculture industry versus the option of having a tech provider as relevant OI network. The common denominator

between the Tech provider and Similar companies is that they provide very industry specific feedback on the product. Thereby in addition to the core three OI networks, a fourth regarding industry specific feedback should be added when addressing the average start-up. Consulting a similar company cannot be done in every industry, nor can consulting a tech provider. Which actor suits collecting industry specific knowledge depends a lot on each individual start-up and industry. Therefore, it will remain as an open network, where an industry specific actor of choice should be inserted by the company utilizing the framework. However, specifics on how to utilize it will remain the same as in the agriculture industry, because a strong tie is ideal, and one should aim to achieve all the attributes if a strong tie is made with an industry specific actor.



6.0 conclusion

The results of the discussion are three different recommendations of core open innovation networks and guidelines of how to utilize them. The recommended OI networks turned out to be very similar, which is markable. Two different industries on the different sides of the industry spectrum got almost identical results on what OI networks were relevant. This is contradictory to my expectations after researching the industries and the subject of open innovation. These findings provide insight that is easily applicable in real life scenarios, and which can contribute positively to start-ups product innovation.

One should however note that exclusively relying on a network cluster as suggested, can limit the company. Every scenario is different in the start-up industry and all start-ups should consider the specifics of their individual situation mindfully.

The thesis aim was contributing to reducing start-ups failure rate. When utilizing the following recommended network clusters as a network core, start-ups can improve their product innovation capabilities, supporting capabilities and entrepreneurial capabilities drastically. The result is in alignment with the thesis aim and hopefully it can contribute to more start-ups succeeding.

7.0 Recommendations for further research

This thesis has aimed to identify core OI networks to improve product innovation and thereby decrease start-up failure rate. The agriculture and High-tech industries were researched and, in the future, investigating other industries and dynamics can provide better insight.

Furthermore, I analysed the companies through using a Dynamic capabilities approach, which can have limitations. Evaluating networks from different angles could provide other results.

The research was also conducted in Norway, which can be very different from other start-up environments. Should one for example compare the American and Norwegian start-up cultures, one would see two completely different business environments. Researching Open innovation networks in other countries or comparing start-up cultures could provide more applicable insight for start-ups not operating in Norway and for companies looking to conduct business internationally. The method used for researching was only qualitative. Applying a mixed method of both quantitative and qualitative method could provide more accurate results and reveal other relevant variables. Otherwise researching OI networks when focusing on other variables than product innovation or more variables simultaneously could provide different results that more accurately display what networks companies should prioritize.

8.0 limitations

There are several limitations to note regarding the thesis. One is that the time limit of it is relatively small, which can affect accuracy of results. Furthermore, the sample size per industry was four interview respondents. This might not be sufficient. Normally eight in depth interviews for a thesis would be enough, but when addressing two completely different industries, there is a possibility that four per industry is not enough. When interviewing agricultural company four there were some complications with the interview, as the respondent had to leave early. Thereby the quality of the name generator and interpreter data became reduced. In addition, the interviews contained questions regarding subjects that did not end up being used in the thesis. If the interview guide was more specific, the quality of the respondents' replies could have been increased and it would have been easier to conduct more in- depth interviews. Furthermore, the attributes of the networks were based on qualitative

data. I believe they could have been more accurate if based on qualitative data. Thereby I believe a mixed method could have provided increased validity and reliability.

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10.0 Appendices

10.1 interview guide

Could you tell me about your start-up?

-what was the idea behind the company and what do you do?

-Do you have any collaborators? If so, how would you describe/ what is your role in the collaborative network (the network)?

-What is your company's approach to innovation? (Clarification: is it systemized or more just occurring naturally?)

-How have you organized it? (Ask if there is a system)

Could you tell me about your product?

-What market need are you looking to fulfil?

-what do you think your customers appreciate about your product?

-In what ways do you think your product could be improved?

Have you made any changes to your product(s)? what are they?

-What smaller and larger adjustments have you made to your product to end up with the one you currently have?

-Have you previously aimed to sell (a) completely different product (s)?

As i have mentioned, my thesis focuses on Open innovation networks. Shortly explained, they are:

individuals and organizations outside a company that can help the company solve problems and find new ideas for creating growth. (Adding additional explanation if necessary)

Could you mention the OI networks you have found/find most important?

-what/any companies?

-what/any individuals or communities?

Please tell me about the role and your relation to X network/actor: the interaction, challenges, advantages and similar. (Go through each mentioned relevant actor on the list)

- Were there any challenges with working with X? (Clarification: for example, regarding the context or communication)

- did you find it hard to use or implement the information/input obtained from x actor?

- Do you think there are any advantages in talking to people/actors like X? what are they?

- Has actor X contributed to improving your product? How?

- If not: do you they could contribute to improving your product?

Have you systematically reached out for inputs from people outside your company to improve your product?

-Where have you looked?

-How difficult have you found it obtaining these inputs? (Asked if «yes» on the above question)

Are there other sources you think you could receive relevant input from regarding your product?

-like X or X (unmentioned OI networks)

10.2 discussion paper

Discussion paper: International -Olav Gerard van Ditshuizen

Thesis presentation

The research question of my thesis is “How can start-ups utilize OI networks to improve product innovation in the refinement stage?” and I discuss this in the light of the agriculture and high-tech industries. In my thesis I discuss theory and literature from subjects and fields relevant for my research question. Among them are innovation, start-ups, Open innovation, and Product innovation. In my thesis I interview 8 companies, 4 within the agriculture industry and 4 within the high-tech industry. These are two very different yet relevant industries in today's business environments and their development is key to provide a better future for people around the world, especially in less developed countries (Goedde, 2020). The aim of my thesis is contributing to reducing start-up failure rate, through providing research on how start-ups can utilize often very cheap and efficient resources in the form of OI networks (Ennomotive, 2021). These cheap resources are in my thesis connected to how companies can use them to better their product innovation in the refinement stage and in general, which can provide important repercussions for the rest of the company and be a determining factor for success. Through the combination of theory and literature from the respective subjects, and primary research conducted, I make several conclusions on how start-ups can utilize these networks to better their product innovation and thereby additionally increase their chances of success.

International trends and forces

Ethics

When a company expands globally, it must not only grasp the purpose, vision, goals, policies, and strategies of the company, but also consider the legal and ethical difficulties that arise in international commerce (UOT, 2016). In order to make their long-term growth into a foreign environment a success, corporations must face major moral and ethical issues as well as decision-making. Outsourcing, working standards and conditions, workplace diversity and equal opportunity, child labor, trust and integrity, supervisory oversight, human rights, religion, politics, the environment, bribery and corruption are just a few of the ethical issues that arise frequently in international business (Anyanwu & Lawrence, 2014). Businesses that trade worldwide are expected to follow all federal and state rules, as well as environmental laws, fiscal and monetary reporting rules, and civil rights legislation.

The demand for trained individuals who are knowledgeable with worldwide markets, business processes, cultural concerns, and ethical challenges in international companies has grown due to the fast rise of international business. Thereby, the international business education I get at the University of Agder and other educations within this field can be very essential for individuals seeking to conduct business internationally.

Corporate social responsibility

There is a relationship between corporate social responsibility and the success of a business (Forbes, 2020.). This topic brings up the issue of being socially responsible in order to achieve, which is especially important in today's quickly changing global society. In order to respond to this question, a basic corporate goal must be reinterpreted in foreign contexts. This simply indicates that if a corporation serves the community, it will profit as well.

The global corporate environment necessitates a new level of social responsibility on the part of decision-makers. They have a responsibility to society, consumers, workers, suppliers, and the environment in addition to shareholders in terms of profit. Because managers' actions have an impact on society, it's critical to strike a balance between the company's interests and the demands of the community (Newsroom, 2017.). Working on a global scale necessitates businesses being socially conscious and earning the confidence and respect of the communities in which they operate. To benefit the community and employees, as well as to increase economic prospects, the corporation should implement positive environmental awareness and community relations plans and policies. Socially responsible businesses are distinguished from those that are not by their potential to improve the quality of life in their communities.

Coronavirus

In many nations, pandemics are at the forefront of national risk-management systems. Pandemic influenza, for example, is at the top of the UK National Risk Register's natural hazards matrix, and new infectious illnesses are labeled as a major concern (NHS, 2021). Each outbreak of a potentially hazardous virus, viewed as a medical condition, motivates authorities to ask a logical set of questions and dust off a menu of response choices that may be executed in stages as needed. Reality, on the other hand, is more upheavalous, as national governments and supranational agencies balance health security, economic imperatives, and social imperatives based on flawed and developing intelligence. It's a governance issue that might have long-term ramifications for communities and corporations. On top of that, they must account for human behavior.

When a harsh legislative reaction is considered essential, business will undoubtedly be harmed, with both immediate and unexpected long-term ramifications. Hundreds of millions of people have been affected by travel restrictions and quarantines, leaving Chinese firms short on labor and components, interrupting just in time supply chains and prompting sales warnings throughout the technology, automotive, consumer products, pharmaceutical, and other industries (Bingham, 2020). Commodity prices have fallen as a result of a drop in China's raw material demand, and companies are considering reducing output. Chinese consumption has dropped significantly as a result of the mobility and work disruptions, putting pressure on multinational companies in a variety of industries, including aviation,

international education, infrastructure, tourism, entertainment, hospitality, electronics, consumer and luxury goods.

International trends and forces: discussion

When it comes to start-ups all around the globe, most will be affected by these forces. This because of an increasing pressure to go global, and because the same principles and trends affect smaller markets and companies only operating locally and nationally as well. Start-ups will have to perform more ethically than before, when it comes to labour, product considerations, how funding is attracted and especially when going international (Pouli, 2021). These factors as well as other trends and factors like the corona virus and corporate social responsibility also makes it harder to succeed as a start-up. These factors might contribute to an increased failure rate for start-ups, enhancing the relevance of the research aim of the thesis. The corona virus has made the international smaller business environments more volatile and unpredictable, and people will in those times become less inclined to invest in companies (Ratten, 2020). This can result in start-ups struggling a lot more, especially companies within sectors like agriculture or airspace. On the other hand, a lot of start-ups within the tech industry have thrived during the duration of the pandemic. So, for some pandemics can be very profitable and probably enhance more investments and for some, it might be the factor that leads to never launching or bankruptcy.

Tech companies are on the other hand more affected by corporate social responsibility and ethics again. As companies with in for example agriculture can use these as selling points and derive profits from this, tech companies receive more and more guidelines they have to uphold and the focus on privacy and customer rights and the scepticism has never been this large. This goes especially for companies starting social media platforms and similar (Gail, 2020). If they cannot provide their customers with a credible image, this can be the difference between a very successful company and a bankrupt one. Within agriculture on the other hand, the interview objects often provided social responsibility and ethics as some of their main selling points. this when it came to how they treated and slaughtered animals, in regards of pesticides used, and when it came to the way they treated their customers and competition. Some of the companies within agriculture relied a lot on personal relationships when it came to running business and were willing to sacrifice profit margins to uphold this image and sense of identity. This strategy or nature of operating seemingly worked in their benefit and made their consumers and competition return the favour in a lot of instances, meaning they did not lose out on too many profits. The start-ups interviewed in the agriculture industry seemed to follow ethical rights and uphold standards for corporate social responsibility. This might however be because of their relatively small-scale business. There are a lot of criticism to larger agricultural companies, regarding how they treat animals and how they conduct their production, but this seems to not be the case in smaller companies (Eathical Advocate, 2019). When production increases and the need for automation increases as well treating animals well can be a lot more challenging and will of course

crave more resources and thereby decrease profit margin. If customers do not react to this it will be beneficiary to them to continue doing business in this way, however as the global trends are changing it seems like these companies will struggle to maintain business without changing their conduct. At some point it will likely become more profitable to conduct business ethically. This is especially because of the way networks will react to their business conduct. Few companies would want to be associated with someone without ethical standards to their business conduct, it will be less profitable because of the affects it has on the company brand and image.

What could be found, especially in the agriculture industry was that companies chose who to do business with, based on their intentions. This is however in a more local setting, but still relevant. Businesses wanted partners that didn't prioritize profits, but rather personal relationship and creating something people liked. Personal relationship could be the determinant of whether a network was utilized or not and how much value the company got out of it. On the other hand, in the tech industry, networks were more chosen because of the competence and value to the company they could provide.

What the tech industry start-ups could benefit from is having more networks with stronger ties. They tended to have more distance to their collaborative partners, and even though being to close with collaborators has its negative effects, the information acquired, competence and additional network from these closer ties will probably weight up for it. On the other hand, the agriculture start-ups, had many strong ties that benefited them, but their selection of collaborative networks were less based on what collaborations they actually needed to conduct a sustainable business in regards to competence and profits. Basing the network on an incoming flow of personal relationships and/or on what people are liked and not to a too large extent will have its clear downsides.

The agricultural companies need to adapt to the knowledge gained from the pandemic. Demand for locally produced goods increases, but the need for aboard produced products will decrease (Fleischmann, 2020). Thereby, the companies should always have strong bases in their own nation when it comes to network and ways of meeting demand. This not only because of the risk of a prolonged pandemic or future pandemics, but also because the global environment changes rapidly and countries and alliances are becoming more cynical in their way of thinking and conducting business. Regarding tech companies, it seems the demand for their product will be less affected by instability in the global market (Angelucci, 2021). We have seen this in the current pandemic, and it also makes sense based on that there is less shipping and similar activities necessary for running a tech company. Both industries have their different challenges and advantages and have things to learn from each other regarding business conduct.

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