

Master Thesis

Department of Industrial Management and Logistics

Forming a Supply Chain Strategy for a Startup

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Malmö, December 2018

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# Abstract

## **Title**

Forming a Supply Chain Strategy for a Startup

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## **Background**

About 90% of all startups fail to become successful, and the most significant reason is due to premature scaling. Limited research has priorly been conducted in the borderland between startups and supply chain. Explicitly on how a startup should go about defining its supply chain objective and how to measure its performance. Nevertheless, the high-tech startup industry sees potential in gaining insights about this issue. This study will develop a framework to guide startups in choosing a good supply chain strategy and scale it properly.

## **Purpose**

The purpose of this research study is to identify a supply chain strategy for startups to increase preparedness for future growth.

## **Methodology**

To fulfill the purpose of this thesis, a method was developed including two segments. Firstly, a literature review was conducted which resulted in a theoretical framework. Secondly, empirics were collected through interviews and a survey. The method is iterative, thus the resulting framework is developed in close relations with both theory and empirics.

## **Conclusions**

A framework for deciding on a supply chain strategy for a startup is presented. In addition, critical success factors as well as relevant key performance indicators, for a startup to assess when scaling

is presented. In order to determine a supply chain strategy, we propose that the following four factors should be considered: (1) the characteristics of the industry they are operating in, (2) the type of product they are selling, (3) the stage in the product life cycle that the product is currently in, and lastly (4) the stage in the startup life cycle the organization is currently in. The CSFs and KPIs are identified to help a startup scale its supply chain.

**Keywords**

Startup, Scaleup, Supply Chain Strategy, Born Global, High-tech, Manufacturing, Performance Measurements, Critical Success Factors, Scaling Startup

# Definitions

- *B2B* - Business to business (B2B) is a market strategy where one business makes a commercial transaction with another
- *B2C* - Business to consumer (B2C) refers to the transactions conducted directly between a company and consumers who are the end-users of its products or services
- *BG* - Born global (BG) is a company that has targeted a global market from the start
- *CSF* - Critical success factor (CSF) is a management term for an ingoing factor that is necessary for an organization or project to achieve its mission
- *Focal company* - The company that is governing over the supply chain network
- *IPO* - An initial public offering (IPO) is the very first sale of stock issued by a company to the public
- *KPI* - Key performance indicator (KPI) is a quantifiable measure used to evaluate the success of an organization, employee, and such, in meeting objectives for performance
- *Scaling* - A system's ability to expand output on demand when resources are added
- *SKU* - Stock keeping unit (SKU), is a unique code that is assigned to a product to identify it. Each SKU is a distinct item for sale, separating product variations.
- *SME* - Small- and medium sized enterprise (SME), where staff headcount ranges between 50-250, and turnover ranges between 100-500 MSEK or below
- *Startup* - A newly established business
- *Transaction cost* - The cost associated with the exchange of goods or services





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# Chapter 1

## Introduction

*In this chapter, a background to the main problem is given together with a description of the company where this problem has been identified. This is followed by a presentation of the purpose of the study along with the specific research questions that are to be answered. Finally, a disposition of the entire study is laid out.*

## 1.1 Background

A critical moment for a startup is the ability to scale while meeting growing demand. According to Marmer et al. (2011), 90% of all high-tech startups fail, and 74% of high-tech startups fail because they scale their business prematurely. Success in scaling properly might be what stands in the way of becoming a highly successful company. However, scaling might be a challenge for startups today because time is spent putting out fires instead of working pro-actively, such as developing a long-term strategy. Many decisions might be taken ad hoc and correcting mistakes is costly. According to A. Hill and T. Hill (2009), every decision should be taken in accordance with the overall strategy to make the supply chain and the rest of the company functions work in symbiosis. To enable valid, quick decisions, the supply chain strategy has to be aligned with the overall strategy.

While scaling a company, strategies and policies are needed to guide correct and fast decisions. That way, the company can continue to be innovative and successful in a dynamic market, while still pursuing offensive and long-term targets. Through understanding the process of effective scaling, a startup's chances of success might increase.

The authors have had the opportunity to familiarize themselves with Minut who currently is in a growth phase and asks themselves the question "how should our supply chain be configured to support rapid growth in demand?". When gathering initial theory about the subject, the authors found out that very little research has been conducted in the area. More specifically, there is a lack of research about designing a supply chain during the growth phase of a startup and what supply chain strategy a startup should pursue when the firm is experiencing exponential growth in sales volumes.

## 1.2 Company Description

Minut is based in Malmö, Sweden, and has been active since 2014. They have offices in Stockholm, Malmö, and London. 2015 the founders got a grant for going to Shenzhen, China, to attend HAX, a prominent accelerator for hardware startups, to design and produce their first product. They decided on producing a smart smoke-alarm but later pivoted into a smart home-alarm. The product Minut sells is a smart home alarm designed for smaller homes or apartments, and they position themselves as a cheaper and more connected home alarm compared to their larger competitors. The product comprises of a plastic cover, a lithium battery, a circuit board, as well as multiple sensors such as motion, humidity, temperature, and noise. All these components are sourced and assembled in China and then shipped via Hongkong to warehouses in Europe and the US. They have partnered up with a production company in China which produces their product. Minut's volume compared to the total volume of the production company is very low. Right now they



are selling to multiple countries across the world, for example, Australia, the US, Germany, and China. However, their main markets are Sweden and Great Britain (Kjellén 2018).

During the first half of 2018, Minut started shipping products to its Kickstarter backers and has since then (late 2018) delivered over 5000 units. The product, both software and hardware-wise, is ready for large-scale commercial launch and the company hopes to see exponential growth in 2019. To be able to grow, thanks to its investors even faster than organic growth, each function in the company have to be prepared and aligned with the rest of the functions. It is unclear what kind of actions that are necessary to take in order for Minut's supply chain to support rapid growth in demand (ibid.).

### **1.3 The Problem**

Today there are many well-established theories, processes, and methods to determine an appropriate strategy for a company's supply chain. These methods are mainly designed and tested on larger well-established companies. Hence, these theories, processes, and methods are usually not applicable to a startup. However, if the company is facing a growth period, the best time to implement well-established structures is prior to growth, when the startup is still fairly small. This foundation can play an important role in having a successful transition to the growth stage. Therefore, this thesis sets out to develop a set of factors a startup should take into consideration when they are forming a supply chain strategy, and how the startup should go about to successfully support this strategy.

### **1.4 Delimitations**

In order for Minut to benefit as much as possible from the study, their requests and preferences have been taken into regards when setting the focus of the study together with its delimitations. Due to the nature of Minut as a startup, the study has mainly focused on the challenges and critical success factors regarding management of a global supply chain for a startup that is producing a hardware product containing electronic components. Due to geographical constraints and the limited time frame of 20 weeks to finish the study, it has been decided that the authors will only source case companies to interview that are active in the Malmö-Lund region of Sweden. In addition to that, only a few case companies will be selected because of the time constraints.

## 1.5 Purpose of Study & Research Questions

The *purpose* of this research study is to identify a supply chain strategy for startups to increase preparedness for future growth. In order to fulfill this purpose, the following research questions are to be answered:

**Research question 1:** What should a startup's supply chain strategy be during growth?

**Research question 2:** What critical success factors (CSFs) can be identified for the supply chain of a startup?

**Research question 3:** What key performance indicators (KPI:s) are relevant to track in order to measure the performance of a startup's supply chain during growth?

Research question one is constructed in a broader way compared to research question two and three. The reason behind this is to allow insights to be gained in a broader spectrum. A strategy usually includes some critical success factors as well as key performance indicators, thus the reason for choosing our second and third research question.

## 1.6 Project objective and deliverables

The *objective* of this research study is to develop a framework that helps startup's to identify a suitable strategy for their supply chain. The framework takes into account both internal and external factors that are considered to have an implication on a startup's supply chain. When recommending a supply chain strategy, critical success factors have been taken into account based on gathered theoretical and empirical data. Also, relevant KPI:s will be identified to measure the performance of a startup's supply chain.

## 1.7 Report Structure

The report is built upon the following six chapters:

- Chapter 1 - *Introduction*
- Chapter 2 - *Methodology*
- Chapter 3 - *Theory*
- Chapter 4 - *Empirics - Case studies*
- Chapter 5 - *Analysis*
- Chapter 6 - *Conclusions*
- Chapter 7 - *Application of Theoretical Framework*

A visual representation of the report structure can be found in figure 1.1. A more detailed description of the ingoing components of each chapter is given below.

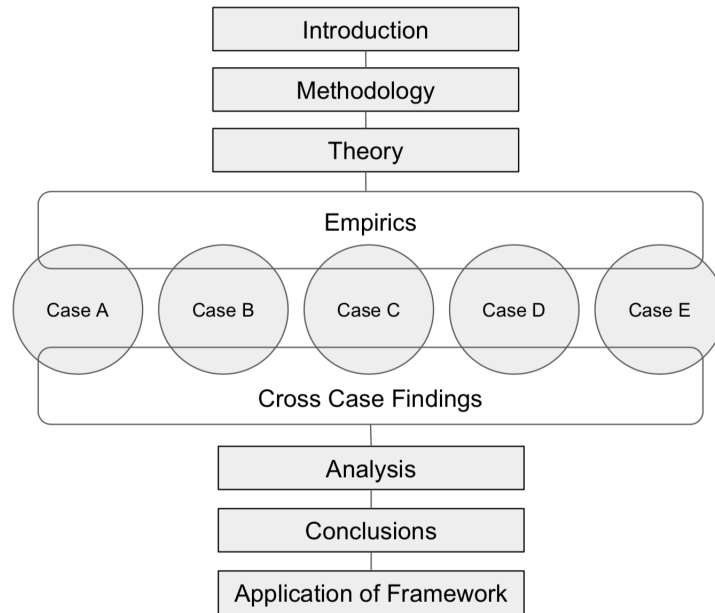


Figure 1.1: Report structure

### **Chapter 1 - Introduction**

In the first chapter, an introduction has been given to the subject that is to be researched together with a presentation of the research questions that are to be answered.

### **Chapter 2 - Methodology**

The second chapter begins with a description of different research strategies that are suitable for a Master Thesis, which is followed by a discussion on the advantages and the disadvantages of a qualitative versus a quantitative research strategy. Secondly, the research design is presented together with a description of the research methods used to collect data for the study. How the collected data is to be analyzed is also explained here. After that, it is discussed how the study is to keep a high level of quality with consideration taken to the criterion of trustworthiness and authenticity. Lastly, a summary of the methodology that is to be used for the study is given.

### **Chapter 3 - Theory**

In the third chapter, the theoretical framework that will form the base for the literature review is presented and described. Before elaborating on the ingoing components of the theoretical framework, an introduction to the global supply chain and supply chain management is given. How to measure supply chain performance is also discussed here. Thereafter, a theoretical background to each ingoing element in the theoretical framework is presented.

### **Chapter 4 - Empirics - Case studies**

In this chapter, findings from the five case companies are presented. An introduction to each case company is given, followed by a description of their supply chain and identified critical success

factors as mentioned by the interviewees. Each company is also placed in the product life cycle curve as well as the startup life cycle curve in order to understand their current context, which may affect their point of view on the matter. The chapter ends with a cross-case analysis to identify common denominators.

### **Chapter 5 - Analysis**

In chapter 5, the analysis of the gathered empirical data and relevant theories from the literature review is presented. A specific supply chain strategy is recommended for each area and identified critical success factors associated with the stage is given. The analysis ends with a presentation of a framework that a startup can use as a tool to determine a suitable strategy for their supply chain.

### **Chapter 6 - Conclusion**

In chapter 6, answers to the research questions of the study are provided based on conclusions drawn from the analysis. Suggestions on future research of the subject are given, as well as a discussion on how this study has contributed to the theory of the subject.

### **Chapter 7 - Application of Theoretical Framework**

In chapter 7, the framework developed in previous chapters is applied to the main case company, Minut. The company is analysed based on the ingoing models of the framework. From this analysis, recommendation of a superior supply chain strategy is made.

## Chapter 2

# Methodology

*This chapter declares the methodology of this study. It aims to explain and motivate which research strategy and research design were chosen as well as discussing the quality of the study in the form of trustworthiness and authenticity. Furthermore, it helps the reader understand how this study was executed to easier follow insights and conclusions made in later chapters.*

## 2.1 Research Strategy

Denscombe (2014) defines a research strategy as “*a plan of action designed to achieve a specific goal*” (p. 3). Several research strategies can be applied to one single research study. However, the best research strategy for the study is one that is (1) suitable, (2) feasible, and (3) ethical. In this subchapter, a research strategy is chosen for the study based on these three criteria.

### 2.1.1 Purpose of Study

The selection of a research strategy depends on the purpose the research study is serving, the characteristics of the study, as well as the research study goals. Runeson and Höst (2009) claim that a Master Thesis can serve either of the four different purposes; *exploratory*, *descriptive*, *explanatory*, or *improving* study. The purposes and their respective aims are described in table 2.1.

Table 2.1: Purpose and aim of study

<i>Purpose</i>	<i>Aim</i>
<i>Exploratory study</i>	Aims to investigate a certain situation or phenomenon and seek new insights in the matter. The generation of new ideas provides a foundation for further research
<i>Descriptive study</i>	Seeks to describe a situation or phenomenon as it is
<i>Explanatory study</i>	Aspires to explain a situation or an issue and the reason behind it, often in the form of a causal relationship
<i>Improving study</i>	Commits to finding a solution to the problem at hand

Different approaches apply to the research methodology depending on the primary objective of the study. Runeson and Höst (ibid.) list the associated characteristics of the research methodology depending on the purpose of the study, see table 2.2.

Table 2.2: Research methodology characteristics, as described by Runeson and Höst (2009)

<i>Methodology</i>	<i>Primary objective</i>	<i>Primary data</i>	<i>Design</i>
Case Study	Exploratory	Qualitative	Flexible
Survey	Descriptive	Quantitative	Fixed
Experiment	Explanatory	Quantitative	Fixed
Action research	Improving	Qualitative	Flexible

The purpose of this study builds upon the case company’s anticipated problem of successfully scaling up their business in the case of an exponential increase of order volumes. The aim is to investigate how a startup can approach this issue in a structured manner and increase the startup’s preparedness for such an event. A suitable approach could be considered to be that of an improving

study, as the research study aims to solve a problem for the case company. However, as the authors conducted a literature review on the subject of managing an exponential increase in order volumes, there was a perceived lack of theory applicable to startups. In order to gain further insights into the matter through empirical studies and develop new ideas for future research, an exploratory study approach was chosen.

### **2.1.2 Qualitative vs. Quantitative Research Strategy**

A research strategy may be either quantitative or qualitative in its nature. Qualitative studies put great emphasis on the context and provide a detailed description of the studied phenomenon. Thus, qualitative data emphasizes words, whereas quantitative data focuses on numbers. Data collection and analysis coincides in a qualitative study, while quantitative data is used to test already existing theories by applying statistics to analyze outcomes. This makes qualitative data collection more flexible as it is not strictly limited to a specific structure, which is the case of quantitative data collection as it is more sensitive to a change in direction of the study. (Bryman and Bell 2015; Runeson and Höst 2009). However, according to Seaman (1999), the use of both qualitative and quantitative data in a research study allows for a better understanding of the studied phenomenon. This approach is sometimes referred to as "mixed methods" (Runeson and Höst 2009).

As the aim of the research study is to understand a specific phenomenon and develop new theory rather than to test already existing theory and concepts, the main focus has been on collecting qualitative data. This is supported by Runeson and Höst (ibid.), who argue that an exploratory study should use qualitative primary data. Due to the fact that new insights are anticipated to be gained along with the collection of empirical data, a flexible approach to the research study is also preferred. A qualitative research method will allow for adjustments to be done in the research strategy during the course of the investigation in order to narrow down the scope of the study, as the initial research focus can be considered rather general. Complementary quantitative data will be collected in the form of a survey to get clear and easily comparable answers. Thus, the research study will use the approach of "mixed methods" to collect data.

## **2.2 Research Design**

In line with the defined characteristics of research methodologies by Runeson and Höst (ibid.), a case study design has been adopted to conduct the research study due to its mainly exploratory nature. As a complement, a survey in the form of a self-completion questionnaire has been sent out to the interviewees at each case company in order to collect data regarding performance measurements in the supply chain for a startup. In this subchapter, a further description of case study design and methods used for collecting data will follow.

### 2.2.1 Case Study Design

According to Yin (2003), a case study design is preferred when research questions such as "why" and "how" are being asked. This type of research method allows the researcher to gain a deeper understanding of a complex phenomena in social settings through an intensive examination of the selected case (Bryman and Bell 2015). Runeson and Höst (2009) further argue that case studies are of a highly reliable nature as they are based in real-world settings. However, as the characteristics of the studied phenomena are difficult to predict in advance, researchers must be flexible in their approach in order to be able to adjust their study according to the context. Hence, case study researchers lose a certain level of control over the study. Thus, a case study research will never be able to provide a conclusion based on statistics (ibid.). A distinctive advantage with using a case study design, however, is that it provides the researcher with strong, connected evidence collected from multiple sources that provide a solid foundation for building a relevant conclusion.

A case study can focus on one single case or use multiple cases to understand the complex phenomenon that is being investigated. A single case study is commonly used in situations such as in the critical test of existing theory, the phenomena being studied occurs under rare circumstances, the case is considered to be representable, or the single case serves a revelatory or longitudinal purpose (Yin 2003). This study will be based on multiple cases as to distinguish between what is common and what is unique among the selected case companies, in order to generate a generalizable framework applicable to startups that are on the verge of scaling up their business. An additional advantage of conducting a multiple case study is that the investigation of several cases increases the reliability of the analytical conclusion, according to Yin (ibid.).

#### Selection of Case Companies

Case selection is a form of sampling and the process is highly relevant to address since one or a few cases cannot be based on theories of the statistical probability of selection (Curtis et al. 2000). Purposive sampling, in contrast to probability sampling, is a common method of sampling cases where the objective is to sample in a strategic way so that those sampled are relevant to the research questions. Since it is a non-probability sampling method, it does not let the research be generalized to a population (Bryman and Bell 2015). In purposive sampling, cases are chosen because of their relevance to the research as well as for convenience, access, and geographic proximity (Yin 2003).

Bryman and Bell (2015) proposes a series of purposive sampling-strategies where *critical case sampling* will be used by the researchers. This strategy allows choosing cases that meet a certain criterion and might be of interest to the research. The criteria for the case study to be eligible objects are:

- Case company that started small and been through an exponential growth



- Case company that produces a hardware product
- Case company that has a global presence and/or sources globally
- Accessible interview object that knows the company’s growth phase

Based on these criterion, the companies presented in table 2.3 were chosen for the case study. A more elaborate description of each case company will follow in section 4.1

Table 2.3: Case Company Overview

<i>Company</i>	<i>Industry</i>	<i>Net Sales (TSEK)</i>	<i>Number of Employees</i>	<i>Active Since</i>
<i>Modcam</i> (Modcam 2018)	Video Analysis (IoT)	900	10	2014
<i>Orbital Systems</i> (Orbital 2018)	Water Recycling (IoT)	1 000	50	2013
<i>Anima</i> (Anima 2018)	Smart-watches (IoT)	37 100	62	2015
<i>Hövding</i> (Hövding 2018)	Airbag	67 000	33	2006
<i>Axis</i> (Axis 2018)	Cameras (IoT)	8 602 600	2780	1984

## 2.2.2 Research Methods

The research methods used to collect data for this study have been through *literature reviews*, reviewing *archival records*, by conducting *interviews* with the selected case companies, as well as collecting data through a *survey*. A more detailed explanation of each method used is provided below.

### Literature Review

To create a rigorous foundation, the research has to be conducted in relation to pre-existing knowledge. (Seuring et al. 2005) The objective of a literature review is to distill and summarize the state of science in the research field. (Rowley and Slack 2004) According to Seuring et al. (2005), there are two main reasons to conduct a literature review. First, it summarizes existing research by identifying patterns, themes, and issues to help generate ideas. This provides a starting point for the research. Second, since all new knowledge has to be assessed and handled in accordance with existing theories, the literature review provides a means to do this.

When conducting the literature review, gathering relevant data is key for a substantiated result (Runeson and Höst 2009). Rowley and Slack (2004) proposes four main strategies for gathering data, see table 2.4.

Table 2.4: Strategies for gathering data

<i>Strategies</i>	<i>Description</i>
<i>Citation pearl growing</i>	Uses phrases and terms from one or a few documents to find new documents.
<i>Breifsearch</i>	A quick-search that retrieves documents crudely and quickly. It may be suitable to begin with this strategy of search.
<i>Building blocks</i>	Terms and synonyms derived from relevant concepts are used for retrieving a comprehensive set of documents.
<i>Successive fractions</i>	Aim to reduce an already retrieved large set of documents by searching within this set of documents to eliminate less relevant data.

Based on the scope and research questions set forward in chapter 1, the theory was gathered and organized to form the literature review. Strategies used to find relevant data were citation pearl growing, briefsearch and building blocks. Search-strings that were initially used alone and later in combination with each other were *SMEs*, *Scaleup*, *Startup*, *Operations Strategy*, *Supply Chain Management*, *Born Global*, *Scaling Supply Chain*, *Scaling Startup*.

### Archival Research

Archival records consist of data produced by the investigated case company, such as meeting minutes, strategic planning and financial information (Runeson and Höst 2009). By taking part of archival data, mainly at the primary case company, the researchers gained a better understanding of the different stages of development that the primary case company has undergone and where the company is headed in the near future. However, what can be a challenge when collecting data from archival records is to properly assess the quality of this data according to Runeson and Höst (ibid.). Therefore, the quality of archival records has always been verified with the management at the primary case company.

### Interviews

When carrying out a qualitative study, interviews are an effective way of gathering rich data. It is the flexibility of the method that makes it well suited to a qualitative study, where the interviewee's perspective is of greater importance (Bryman and Bell 2015). Wohlin et al. (2012) present three types of interviews: *unstructured*, *semi-structured* and *structured interviews*. The characteristics of these strategies are presented in table 2.5. Unstructured interviews may consist of just a single question, and the interviewee is allowed to respond and elaborate freely (Bryman and Bell 2015). In a fully structured interview, pre-determined questions are asked, and the interview is more like a questionnaire Wohlin et al. (2012). Semi-structured interviews are something in between where

the researcher is free to ask questions in any order and to follow up with questions on other topics of interest (Bryman and Bell 2015).

Table 2.5: Interview methods

	<i>Unstructured</i>	<i>Semi-structured</i>	<i>Structured</i>
<i>Focus</i>	How individuals qualitatively experience a phenomenon	How individuals qualitatively & quantitatively experience a phenomenon	Researcher aims to find relations between concepts
<i>Interview questions</i>	Interview guide with themes to cover	Mix of open and closed questions	Closed questions
<i>Objective</i>	Exploratory	Descriptive & Explanatory	Descriptive & Explanatory

As the focus of the study is mainly exploratory, unstructured and semi-structured interviews are chosen as the preferred methods. When conducting interviews at the main case company Minut, unstructured interviews are used to capture the broad nature of the problem and to help identify areas of concern or improvement unknown to the researchers. When later conducting interviews with sub-case companies, the study takes on a more descriptive and explanatory approach, semi-structured interviews will be used. The semi-structured method is used to pinpoint similarities and differences between Minut and the sub-case companies as well as identifying key strategies.

## Survey

As a complement to the literature review and the insights gained from the case studies, a survey in the form of a self-completion questionnaire was sent out to the interviewees at each case company to collect data regarding performance measurements in the supply chain for a startup. In a self-completion questionnaire, respondents are responsible for completing the questionnaires themselves. There are several advantages and disadvantages of using self-completion questionnaires. Bryman and Bell (ibid.) mentions a few, see table 2.6.

Table 2.6: Advantages and Disadvantages with Self-Completion Questionnaires

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> <li>- Cheap and quick to administer</li> <li>- No interviewer effects</li> <li>- No interviewer variability</li> <li>- Convenience for respondents</li> </ul>	<ul style="list-style-type: none"> <li>- No opportunity to probe</li> <li>- No ability to ask other questions</li> <li>- No ability to collect additional data</li> <li>- Difficult to know who completes the survey</li> <li>- Risk of missing data</li> <li>- Not suitable for illiterate respondents</li> <li>- Low response rates</li> </ul>

The tool used for designing the questionnaire and collecting data from respondents was Google Forms, as it enables for a quick and convenient way for sending out the questionnaire as well as monitoring and comparing the collected data between respondents. The questionnaire consisted of

thirteen questions with the majority being questions where the respondent was required to rank the importance of certain supply chain performance metrics. As to know which answer belonged to a specific case company, the representatives were asked to disclose the name of the company in the survey. In order to mitigate the disadvantages associated with using a self-completion questionnaire, it was designed with a focus on having a clear presentation together with clear instructions on how each question was to be answered. The use of open-ended questions was strictly limited to only one, which was to be answered only if the respondent had additional thoughts or comments that he or she wanted to share with the researchers. This way, the survey enabled for additional data to be collected. However, the additional data given was only based on the initiative of the respondent and not the researcher. Thus, there might still be a risk of missing relevant information compared to conducting an interview where the interviewers are given the opportunity to ask supplementing questions. In order to increase the response rates of the questionnaire, a follow-up email was sent to the respondents where the researchers provided more elaborate instructions on how to answer the questionnaire. The importance of completing the questionnaire for the sake of the research was also emphasized in the follow-up email.

### 2.2.3 Data Analysis

As a qualitative study is a flexible method, data analysis have to support this. Seaman (1999) proposes a set of qualitative data analysis methods first to generate a hypothesis and later build up a "weight of evidence" necessary to confirm the hypothesis. Runeson and Höst (2009) emphasizes the importance of keeping a clear chain of evidence to ensure a certain quality of the study. The first set of methods is used to generate hypotheses and is commonly called grounded theory methods (Seaman 1999). Grounded theory is defined as "*theory that was derived from data, systematically gathered and analyzed through the research process. In this method, data collection, analysis, and eventual theory stand in close relationship to one another*" (Strauss and Corbin 1994). Thus, Bryman and Bell (2015) derives that the process is iterative and is concerned with the development of theory out of data. After generating a hypothesis, the new theory has to be strengthened by building up the "weight of evidence." Seaman (1999) also proposes methods for this purpose.

Seaman (ibid.) proposes two separate methods for *grounded theory*. The first one, constant comparison method, is concerned with generating new theory by attaching codes to relevant pieces of text in the data which are relevant to a specific theme or idea. The groups are analyzed to build propositions. The feasibility of the new proposition is checked against new data in the next data collection iteration. The second method, cross-case analysis, is concerned with generating new theory by cross-analyzing different cases to find similarities and differences. According to Eisenhardt (1989) the analysis of multiple cases should be based on looking at data in different ways. This is done by grouping or pairing cases and then examine for similarities and differences between and within each group or pair. Attributes for grouping or pairing could be for example the type of

product, the number of people involved or the source of data.

Any new hypothesis or theory cannot be confirmed, only supported or denied (Bryman and Bell 2015). The *Weight of evidence* is a means of strengthening a studies quality, thus making it harder to deny the proposed new theories. This can be build up either by qualitative or quantitative methods but is best done with a combination of both (Seaman 1999). Examples of these methods are *negative case analysis and member checking*. Other qualitative ways of strengthening the new theory are concerned with the quality of the study, which is further discussed in section 2.3. Quantitative ways of strengthening the data are usually related to statistical methods, such as surveys (ibid.).

As for this study, methods from both hypotheses generating and hypothesis confirming categories were incorporated. Firstly, the grounded theory methodology was used to generate theory from the collected data. Both the constant comparison method and cross-case analysis were applied to find hypotheses. Secondly, qualitative methods were used to confirm the found hypothesizes. Regarding qualitative methods, beyond what is covered in section 2.3, member checking was used. Regarding quantitative methods, a survey collecting comparable answers was conducted to answer research question three.

## 2.3 Research Quality

When evaluating the quality of business research, the level of reliability, generalizability, and validity are commonly used as criteria (Bryman and Bell 2015). However, these criteria are based on the assessment of quality for quantitative studies and should not be used in the evaluation of qualitative studies according to Guba, Lincoln, et al. (1994). Instead, they propose an evaluation of the quality based on the research's *trustworthiness* and *authenticity*.

### 2.3.1 Trustworthiness

Trustworthiness consist of four criteria; *credibility, transferability, dependability, and confirmability* (ibid.). In table 2.7 a short explanation to each criterion is provided as described by Guba, Lincoln, et al. (ibid.), followed by actions taken by the researchers in order to satisfy the specific criterion.

Table 2.7: Trustworthiness criteria

<i>Criterion</i>	<i>Explanation</i>	<i>Actions taken</i>
<i>Credibility</i>	Ensures that the research is carried out according to good practice, and that the researcher confirms with the subjects that the interpretations in the study are accurate (i.e. <i>respondent validation</i> ). Triangulation of data is also a technique used to ensure credibility.	The researchers have provided each participant of the study with an account of what he or she contributed with during the interview to establish an accurate interpretation. To triangulate data, multiple sources have been utilized, such as interviews from several companies and different theoretical perspectives.
<i>Transferability</i>	As qualitative studies focus on depth rather than breadth, it is important that the researchers demonstrate how the results of the study can be transferred to a different milieu. This can be achieved by providing detailed descriptions throughout the study.	A careful consideration between the amount of details provided and its relevance of the study has been made by the researchers, as not to overwhelm the readers with redundant information nor take away the focus from the intention of the study.
<i>Dependability</i>	Refers to the systematic recording of data during the research process that should be accessible in a convenient manner.	Interviews have been recorded and transcribed to increase the reliability of the qualitative data. The researchers have aimed at being transparent in the way of conducting the study by providing a detailed description of the methodology used.
<i>Confirmability</i>	Concerns the level of objectivity by the researcher in the study. The researcher should not incorporate own personal values in the study.	To achieve complete objectivity in a qualitative study is considered difficult. However, to fulfill this criterion the researchers have not interfered with the collected data prior to the analysis.

### 2.3.2 Authenticity

The purpose of evaluating a research based on its authenticity is to raise awareness regarding the possible wider political impact of the study (Guba, Lincoln, et al. 1994). To determine whether or not the criterion of authenticity is met, the study should be reviewed based on the following aspects according to Guba, Lincoln, et al. (ibid.), see table 2.8.

Table 2.8: Authenticity criteria

<i>Criterion</i>	<i>Explanation</i>	<i>Actions taken</i>
<i>Fairness</i>	Concerns the representation of different viewpoints that participating subjects have expressed in the study.	Employees from different functions have been interviewed at the primary case company in order to understand each function's viewpoint.
<i>Ontological &amp; educative authenticity</i>	Refers to whether or not the research helps the participating subjects to better understand the complex phenomena, as well as the level of understanding of other members' perspective the participating subjects receive through the study	Have been achieved through a regular discussion with key players at the primary case company to verify whether or not the research helps the subjects to understand the complex phenomena and the different viewpoints of each function. If not, changes have been made accordingly.
<i>Catalytic &amp; tactical authenticity</i>	Concerns whether or not the research has acted as a catalyst for the studied subjects to actively change their circumstances, as well as the level of motivation provided by the research in order for the studied subjects to take the necessary steps required to engage in action	The theoretical framework that is the result of the research has been developed in unison with the primary company in order to ensure that it enables the company to take the necessary actions when they reach the critical point of having to rapidly scale up their business.

## 2.4 Summary of Methodology

A visual representation summarizing the methodology chosen for this study is shown in figure 2.1. Our belief is that this chosen methodology is the best possible research design in order to answer the research questions.

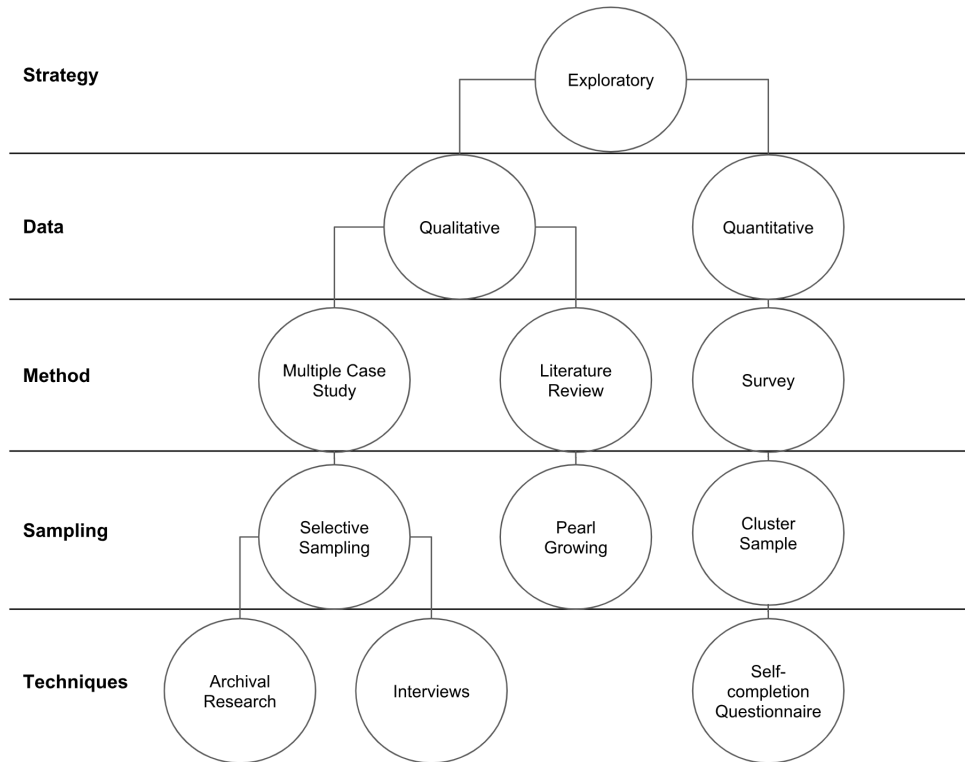


Figure 2.1: Summary of the method chosen for this study

A visual representation of the methodology of this entire project is shown in figure 2.2. The project starts with the purpose as well as the research questions. After that, the design of the study is set. From that, multiple iterations are conducted between literature review, theoretical framework, the empirics, analysis, and strategic framework. The reasons behind the iterations are to capture all insights as well as anchoring the empirics in the theoretical framework well.

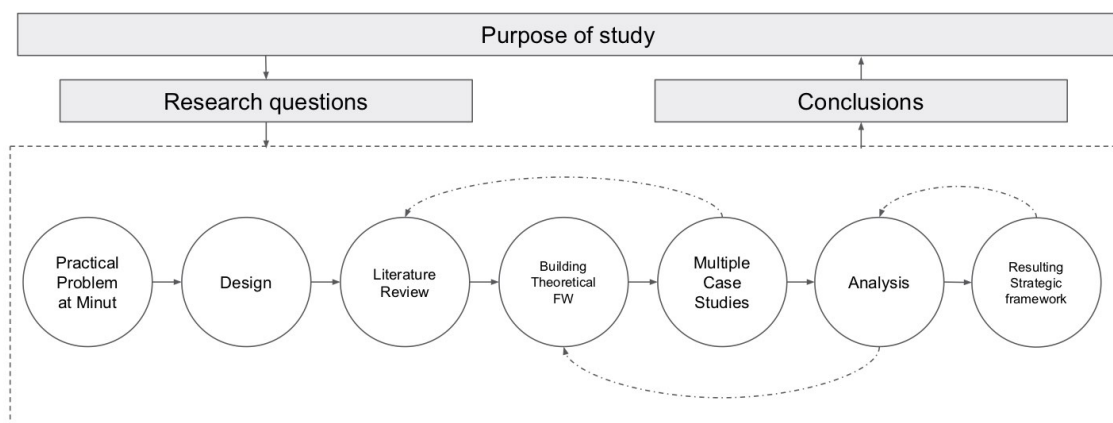


Figure 2.2: Process summary of the methodology for this entire project



## Chapter 3

# Theory

*Literature relating to our research focus arises in three contexts. First, introduction to the global supply chain and supply chain management. Secondly, literature linking the industry characteristics, product type, the product life cycle, and the life cycle of an entrepreneurial venture with supply chain strategy. Lastly, literature on supply chain capabilities that will support the supply chain strategy and its accompanying objectives is presented.*

### 3.1 Introduction

There is limited research on how a startup should go about defining its supply chain objective and how to measure its performance. Startups are constantly struggling with optimizing its use of resources, which are usually scarce. Lack of funds to hire employees makes time a constant issue for the startup, as it is the responsibility of only a few people to drive an entire business. This makes strategic, long-term planning less prioritized within the organization as the organization needs to allocate resources towards issues that need immediate attention. We argue that in order for a startup to identify the right strategy for its supply chain, management must first assess the characteristics of the industry that they are in order to determine the level of uncertainty both on the demand side as well as on the supply side. Secondly, management must identify and take into consideration the following factors: (1) *the type of product* the startup is producing, (2) *the stage in the product life cycle* where the product is currently at, and (3) *the stage in the entrepreneurial life cycle* where the organization is currently at. Together with the level of uncertainty in the market, these factors are the determinants of the startup’s supply chain strategy. Further, we argue that the management of the startup must assess how the *capabilities of the startup’s supply chain network* can help the startup to achieve its supply chain strategy and accompanying objectives. This theoretical framework is visually presented in figure 3.1.

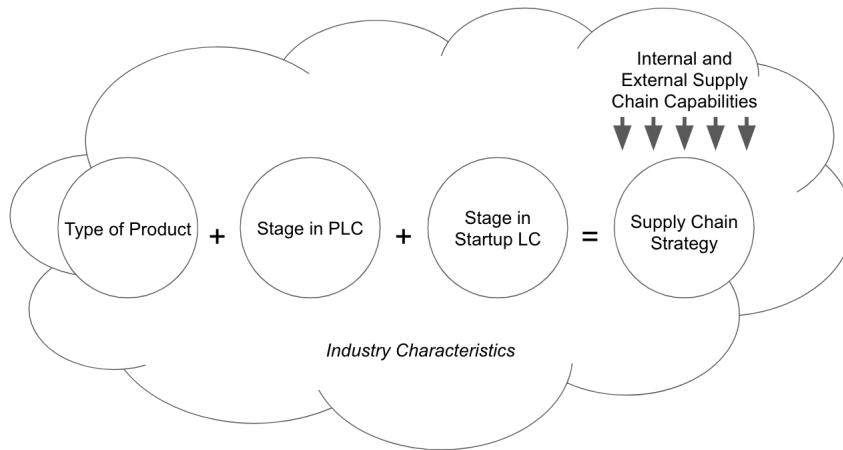


Figure 3.1: Theoretical Framework developed for this study

### 3.2 Managing the Supply Chain

#### 3.2.1 The Global Supply Chain

Mentzer et al. (2001) define the supply chain as "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer". Figure 3.2 depicts the layout of a typical supply

chain process. Modern supply chains have become more dynamic and complex due to progressive liberalization and deregulation of international trade and investments, rapid changes in customer demand, and the emergence of the Internet (Hausman 2004). As an effect, many organizations now operate in multiple nations as they now have access to a global market that can drive higher volumes, and companies have also been given the opportunity to outsource activities to low-cost countries which is believed to result in reduced costs in the supply chain (Rose and Reeves 2017).

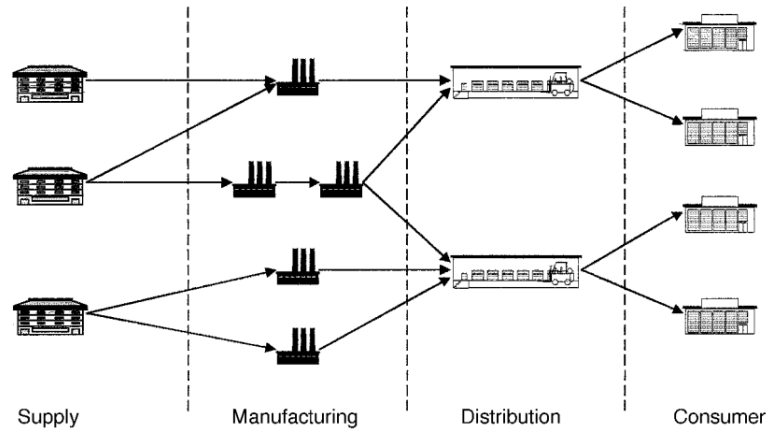


Figure 3.2: The Supply Chain Process (Beamon 1999)

However, operating a global supply chain is no easy task. Skjott-Larsen et al. (2007) recognize the following challenges that all are the result of a globalized world:

- The firm must offer customers across foreign markets a unique value proposition
- The firm is facing competition from around the world
- The firm must adapt to the national environment of several countries. This includes adapting to different cultures, political-, economic-, legal-, and tax systems, as well as to differences in business practices
- The firm needs to tend to global politics of economic and trade relationships
- The firm must assess the country's level of quality and availability of infrastructure in transport and telecommunications
- Time, distance, and location of markets will all have an impact on the supply chain's performance
- Changes in monetary exchange rates need to be considered as it may impact the costs of supply chain activities taking place in foreign countries

Furthermore, the once single-site and vertically integrated firm now consists of several geographically dispersed entities that partner up in order to capture market opportunities. All these entities that are spread across the world must be managed to work in unison in order to be flexible and fast enough to compete in a global market (Stock, Greis, and Kasarda 2000). Christopher (2016) states that even though it is a global market, there are still local preferences and requirements that must be taken into account when designing a product. Country-specific product certifications and

language in manuals are only a few examples. Additionally, companies must recognize the trade-off between using low-cost supply sources and the total cost of managing these at a distance as seen in figure 3.3. There has been an increase in fuel and transportation costs during recent years, which argues against vast geographical distances in the supply chain (Ellram, Tate, and Petersen 2013). Companies operating a global supply chain will also most likely have more tied up capital in inventory to hedge for delays in shipment, consolidation and customs clearance (Christopher 2016). What further should be recognized when evaluating these trade-offs is the fact that countries that once were considered to have low operations costs drastically have increased their cost of labor. One example is China, who has had an annual increase in labor cost of 15 percent to 20 percent (Rose and Reeves 2017).

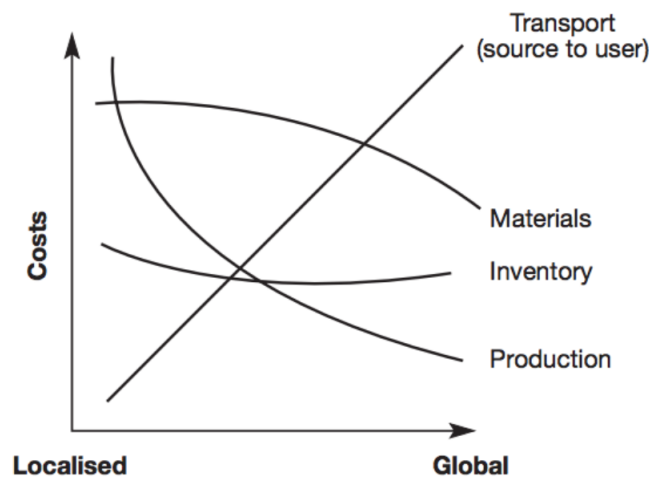


Figure 3.3: Potential Cost Trade-Offs for Global Strategy (Christopher 2016)

Apart from the cost trade-offs mentioned, other issues need to be managed in a global supply chain. This includes an increased focus on companies to lower their carbon footprint, higher risk of having obsolete products due to short product life cycles, and difficulties with managing the level of quality throughout the supply chain. It is also essential to coordinate actors in the supply chain more intensively, such as managing the flow of cash and information, so that lead times and costs do not increase. This, in turn, leads to higher transaction costs according to Gereffi, Humphrey, and Sturgeon (2005).

However, there are several benefits of operating a global supply chain, such as improving overall quality, meeting the planned schedule, reducing cost, benefiting from new technologies, as well as extending the supply base (Handfield 1994). Tanev (2012) identifies several reasons as to why a small firm chooses to go global at an early stage. One reason is that it gives access to a bigger market to support the scale needed for the firm to be profitable. Another reason is that customer preferences for the product or service that the firm is offering are not linked to a geographical market. Thus, the offering does not require any modification when launching in a new country. This lowers the barriers for the firm to take their business global. For the business to be profitable,

the value of the product or service must also exceed the costs of the added complexity to the supply chain. To realize the benefits of a global supply chain, Handfield (1994) argue that a firm must align supply chain decisions with the business' overall mission, objectives, and strategy.

### 3.2.2 Supply Chain Management

Due to the now global competition that organizations are facing today, time to market has become critical. This has resulted in the supply chain becoming a source of competitive advantage to achieve time to market in the most efficient and effective way, while at the same time ensuring that customer expectations are being met (Anand and Grover 2015). Thus, the practice of supply chain management has become an essential part of the success of a firm. Supply chain management is defined by Mentzer et al. (2001) as *"the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole"*. It is a complex matter of managing all the processes within the supply chain, spanning from sourcing of raw materials to providing post-purchase services for the customer. In figure 3.4, a framework for supply chain management is shown.

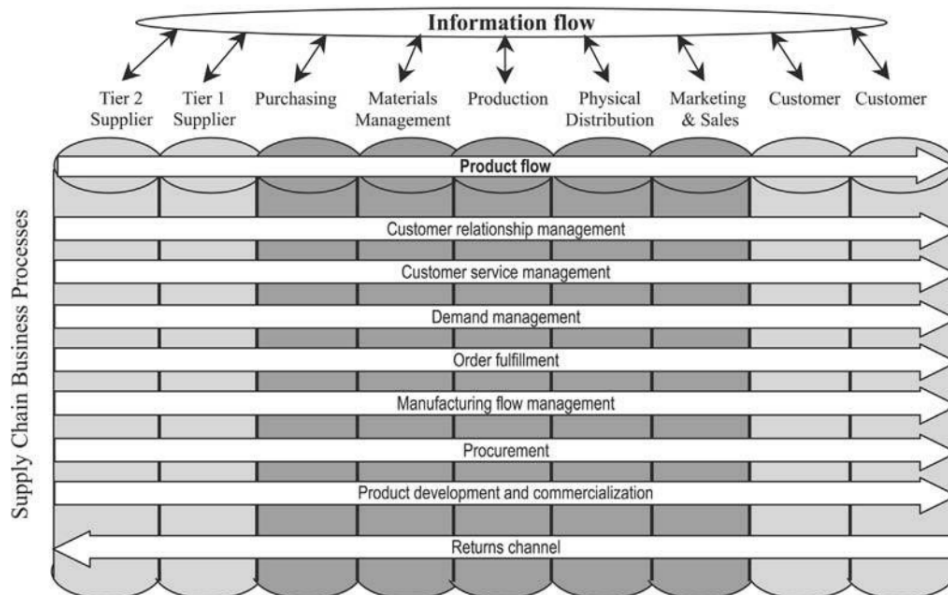


Figure 3.4: A Framework for Supply Chain Management (Chan and Qi 2003)

Supply chain management includes the following components according to Mentzer et al. (ibid.): information sharing, shared risks, cooperation among entities in the supply chain, aligning customer service goals and focus, integration of key processes, long-term relationships, and interfunctional coordination. Mentzer et al. (ibid.) argue that managing all this properly will result in lower costs, improved customer value, improved customer satisfaction, and a strengthened competitive

advantage. These are considered to be the key objectives of a supply chain. However, it is important to know what the value proposition of the company is in order to make the right trade-offs between efficiency and effectiveness so that the supply chain will be able to support the company accordingly. Being efficient means reducing costs in the supply chain, such as lowering inventory levels and leveraging on economies of scale, whereas being effective means providing availability by always having items in stock and ensuring high product quality. Nevertheless, what makes the supply chain profitable comes down to achieving the right balance between efficiency and effectiveness (Mentzer et al. 2001).

### **Supply Chain Strategies**

Lee (2002) identifies four different supply chain strategies that a firm could pursue; *efficient*, *responsive*, *risk-hedging*, and *agile*. *Efficient supply chains* should pursue scale of economies, optimization in capacity and distribution and cost-efficient, accurate distribution of information across the supply chain. *Responsive supply chains* should pursue strategies to be responsive and flexible to the changing demand and needs of the customer. Ways to become responsive are mass customization, excess inventory and capacity, and postponement. *Risk-hedging supply chains* should implement an efficient supply chain downstream and hedge for uncertainties upstream. As there might be some supply issues with certain components, the risk of disruption should be mitigated by multiple supply sources or by pooling safety stocks with other companies. *Agile supply chains* should pursue strategies to be responsive to demand uncertainty, like responsive supply chains are, while hedging for supply uncertainty upstream. The agility comes from mitigating the risks of supply shortages while still being responsive and flexible to customer needs. Morgan (2004) claims that agility is the strategic driver in the development of the supply chain of the 21st century. An agile supply chain responds quickly to customer demands, is equipped with customized manufacturing systems, it is flexible, the scheduling is synchronized with the final demand, the supply chain processes are controlled, capabilities with trading partners are integrated into the chain, e-trading can take place, it can handle concurrent product development and "pipeline" cost improvements (Hughes, Ralf, and Michels 1998).

In order to determine which strategy that is most suitable to pursue, Lee (2002) argue that different combinations of uncertainty benefit from different supply chain strategies. His model is presented in table 3.1. By reducing both demand and supply uncertainty, fewer resources are needed concerning excess inventory and capacity according to Lee (ibid.). Ways to minimize uncertainty are for example information sharing through the supply chain, early design collaboration, and collaborative replenishments.

Table 3.1: Lee's Uncertainty Framework with Matching Supply Chain Strategies

	<i>Demand uncertainty low</i>	<i>Demand uncertainty high</i>
<i>Supply uncertainty low</i>	Efficient supply chains	Responsive supply chains
<i>Supply uncertainty high</i>	Risk-hedging supply chains	Agile supply chains

Chopra and Meindl (2006) present a three-step method for achieving strategic fit for a company and its supply chain strategy. The three steps are:

1. Understanding the customer and supply chain uncertainty
2. Understanding the supply chain capabilities
3. Achieving strategic fit

There are many parameters to consider when deciding upon a strategy for a company's supply chain and the strategies suggested should not be viewed as either-or, but should rather be specially tailored according to the specific situation. Chopra and Meindl (ibid.) emphasize that to be able to achieve a strategic fit, all functions within the company such as product development, supply chain, and marketing must be aligned with the overall competitive strategy.

### 3.2.3 Performance Measurements in the Supply Chain

Performance measurement has been defined by Neely, Gregory, and Platts (1995) as *"the process of quantifying the efficiency and effectiveness of action"*. Today, performance measurement has come to be viewed as an important tool for reviewing business management and identifying areas for improvement across industries. Measuring performance has also led to enhanced motivation at the workplace as well as improvements in communications between different functions (Chan and Qi 2003). Gunasekaran, C. Patel, and Tirtiroglu (2001) state that measuring activities in the supply chain is necessary in order to *"streamline the flow of material, information, and cash, simplify the decision-making procedures, and eliminate non-value adding activities"*. However, there are several challenges associated with measuring the performance of a supply chain. Sink and Tuttle (1989) argue that you cannot manage what you cannot measure, yet it is of high importance to not only have the right metrics but also to have *the right amount* of metrics. Otherwise, the number of metrics will be difficult to manage and take action on (Chae 2009). This is especially true for startups, as they have limited resources that they need to manage effectively and efficiently (Rompho 2018). Thus, it is of high importance for a startup to chose the right metrics to focus its resources on. It is also important for the metrics chosen to have a holistic perspective as the goal is to integrate the different functions within the supply chain so it will operate as a single entity (Chan and Qi 2003).

## The SCOR Model

Due to the difficulty of defining the right performance measurements, Chae (2009) proposes that companies use the Supply Chain Reference (SCOR) Model to identify proper metrics for measuring supply chain performance. SCOR is a model of the most critical business activities to satisfy customer demand, developed by the Supply Chain Council, and it is used by companies to understand, structure, and evaluate the performance of their supply chain (Council 2008). The SCOR model is divided into five core management processes as seen in figure 3.5 that together make up the supply chain of a company; (1) *plan*, (2) *source*, (3) *make*, (4) *deliver*, and (5) *return*.

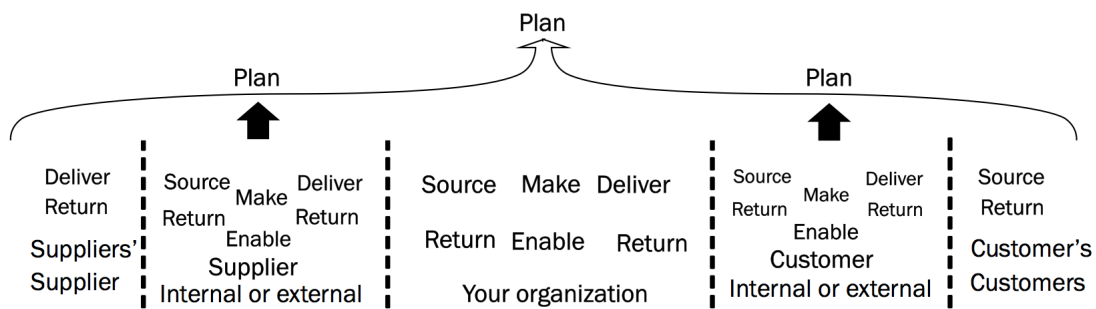


Figure 3.5: SCOR Processes and the Supply Chain (Council 2008)

*Plan* refers to the process of aligning and organizing the other categories in the SCOR model, with the goal being to balance aggregate supply and demand to best meet supply chain requirements, including sourcing, production, and delivery (ibid.). *Source* concerns processes associated with the procurement of goods and services necessary to create the actual output of the supply chain activities. This includes how a company should select suitable suppliers and evaluate their performance, as well as how to manage supplier payments (Li, Su, and X. Chen 2011). The *make* process encompasses activities that are part of the production process, where procured goods and services are transformed to a final state that is to be delivered to the customer. When the product has gone through the production step, the next supply chain process will be to *deliver* the product. This means transporting it either to its final destination or to a temporary location for storing before being sent off to the customer. *Return* concerns the return flow process of the product and is linked to the level of customer satisfaction. Having appropriate performance measurements within each function will increase the visibility of supply chain operations and help the company to assess their performance to make improvements where necessary (Anand and Grover 2015). The SCOR model has recognized five performance attributes that should be used to set the strategic direction of the supply chain, each being provided with diagnostic metrics for three process levels in the supply chain. The levels are (Council 2008):

- *Level-1 metrics*, also known as *key performance indicators*, measures the overall health of the supply chain



- *Level-2 metrics* further break down level-1 metrics to identify the root cause of the performance
- *Level-3 metrics* are diagnostic metrics for the level-2 metrics, helping firms to identify the root cause for a problem

The SCOR performance attributes and their level-1 metrics are described in table 5.4.

Table 3.2: SCOR Performance Attributes (Council 2008)

	<i>Attribute</i>	<i>Strategy</i>	<i>Key Performance Indicators</i>
Customer	Reliability	Consistently getting the orders right, product meets quality requirements	- Perfect order fulfillment
	Responsiveness	The consistent speed of providing products/services to customers	- Order fulfillment cycle time
	Agility	The ability to respond to changes in the market (external influences)	- Upside supply chain adaptability - Downside supply chain adaptability - Overall value at risk
Internal	Cost	The cost associated with managing and operating the supply chain	- Total SCM costs - Cost of goods sold
	Assets	The effectiveness in managing the supply chain's assets in support of fulfillment	- Cash-to-cash cycle time - Return on SC fixed assets - Return on working capital

SCOR has become a preferred tool to use when evaluating the performance of a supply chain. This is due to its broad applicability and inclusiveness of the entire chain, its focus on creating value for the customer, and its standardized metrics which facilitates in benchmarking activities (Council 2008). However, there are several hundred metrics to choose from in the SCOR model, see appendix C for the SCOR metrics used in this research. To be successful, the company must ensure that the chosen metrics are aligned with its business, product strategy, and value proposition (Hausman 2004).

### Choosing the Right Metrics

As the objective of the supply chain varies with the overall business strategy, it is important to recognize that one supply chain is not the other one alike. Hausman (ibid.) claims that the metrics need to be tailored to the company's value proposition. If the strategy is low cost, management should monitor metrics such as costs, capacity utilization, and labor productivity. If the chosen strategy is responsiveness, proper metrics would be order response time, order change flexibility, and expediting capabilities (ibid.). Rompho (2018) also emphasizes that metrics must be tailored to the specific organizational and contextual factors of the firm. Rompho (ibid.) points out that this is especially the case regarding large corporations and a startup firm. Rompho (ibid.) argues

that the current research done on performance metrics are focused mainly on already big and established firms, and the proposed performance metrics in research is thus not applicable in the case of a startup. Even though there is not much research done regarding performance metrics for startups, measuring performance is still highly relevant in order for the startup to know where and how to improve to be successful (Davila and Foster 2005). The most significant difference between the metrics used for large firms and metrics that startup should use is their differences regarding the time perspective (Rompho 2018). Large firms tend to focus more on long-term planning, whereas startups have a more short-term focus. Many high-tech startup companies are funded by various kinds of investors, looking to make a profit in the future through an initial public offering (IPO) or through selling the company. For the startup, a primary goal is to generate enough revenue to continue operations and enable further search for a sustainable business model and market return (Lester, Parnell, and Carraher 2003). It is crucial to show the investors that the company is on the right track and not spending their money at a too fast rate. Important financial metrics to do this might be burn rate, cash-to-cash time and gross profit margin (Blank and Dorf 2012).

Blank and Dorf (ibid.) argue that a startup should base its decisions on facts and implement decisions according to the plan. While sticking to these constraints, a firm should not search for the perfect solution but instead focus on speed. Keeping the momentum is more important, as well as having a tight feedback loop to identify and reverse bad decisions. The first step in choosing the right metrics is identifying the stage of the startup life cycle that the firm is currently in. This is due to the fact that stages differ in their nature, thus they require different focuses of their metrics (Rompho 2018). It has been concluded that when choosing the performance metrics, a startup must take into account the characteristics of the industry in order to assess the level of supply and demand uncertainty, the type of product that the startup is offering, the stage it is at both in regards to the product life cycle as well as the startup life cycle, the capabilities of its supply chain, and its overall value proposition.

### **3.3 Industry Characteristics**

Lee (2002) argues that a firm can choose a proper supply chain strategy by mapping uncertainty both at the supply as well as the demand side. In order to determine the level of uncertainty in the market, it is important first to understand the market the company is operating in. To analyze and assess a specific industry, Michael E. Porter (1979) presented a comprehensive tool consisting of five forces that influence the competitiveness in an industry, see figure 3.6.

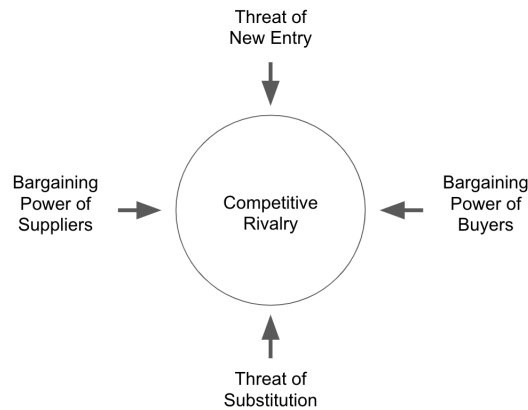


Figure 3.6: Porter's Five Forces (Michael E. Porter 1979)

Although the model is almost 40 years old, to this date the model is still being used and taught. The five forces; *threat of new entry*, *supplier and buyer power*, *threat of substitution* and *competitive rivalry*, are summarized in table 8 in the appendix and further elaborated upon in the following sections.

### Threat of New Entry

A new competitor poses a threat to existing firms in an industry as the newcomer brings new capacity and a desire to gain market share. The threat of new entry in an industry is dependent on the barriers to the industry. If barriers are high, then the threat is low. Capital requirements, economies of scale and cost disadvantages based on the learning curve (further developed upon in section 3.6.2) all make it especially hard for a startup to enter. Loyalty to an already existing brand as well as technology IP also limit the chances of new entry. A new firm to an industry faces a barrier when setting up its supply chain if they have to fight for shares in the distribution channel. This happens for example in a grocery store where each company competes for shelf space.

### Supplier Power

A supplier might behave differently depending on their bargaining power and might raise prices or lower the quality of their products or services if they have much power. The power of a supplier group is dependent on if; it is dominated by just a few companies or is highly concentrated; there are high switching-costs or if the product is unique or highly differentiated; the supplier has the ability to integrate forward or; if the industry is not an important buyer of the supplier group.

## **Buyer Power**

Similarly, as supplier power, buyers (customers) might behave differently depending on their power compared to the industry. The buyer power is dependent on various aspects such as the nature of the product and the customers. If the product is standardized or has low switching costs, then buyers can leverage this to lower the prices. If the product is unimportant to the quality of the customer's product or if the product does not save the customer any money, then they also have the leverage to lower the prices. If the customer group is concentrated or purchases in large quantities or if the customers have the ability to integrate backward, they also have the leverage to lower prices. The buying power for retailers is also affected by the above points, but with one addition. Retailers have the ability to influence customers' purchasing decisions as they are ambassadors for the products they stock.

## **Threat of Substitution**

Substitute products limit the prices an industry can charge for their products and thus the potential of an industry. The only way for an industry to escape this limit is to differentiate or upgrade the quality of the product. Substitutes that should receive the largest attention strategically are; substitutes that are improving their price-performance trade-off compared to the industry or substitutes that are produced by an industry earning high profits. For example, soft drink producers faced a substantial threat from other substitutes. However, they overcame this threat by innovating in the distribution channels to supply soft-drinks through fountains and convenience stores.

## **Competitive Rivalry**

The internal competition in an industry makes up the last force and will determine how difficult the competitive environment is. Industry competitive rivalry is, contrary to the previous forces, an internal force for each industry. This force is dependent on the maturity of the industry. As an industry matures and the growth slows down, profits declines and this usually results in a shake-out of inefficient companies. The number and size of competitors also affect this force, as fewer and larger companies make the climate rougher. High exit barriers, customer loyalty, quality differences, and high fixed costs also play a big part. A company will have to live with many of these internal forces, however, they might be able to affect some of them, for example raising the quality or switching costs. (Michael E. Porter 1979)

For every industry, a combination of these five forces makes up the industry landscape based on economic and technical characteristics. To be able to position a firm in its surrounding environment strategically, or to change that environment into a firms advantage, the company must first

understand the effect of these five forces.

### Formulation of Strategy

By assessing all of the five forces, a macro-level analysis of the industry and the startup’s position in it can be established. This is accomplished by doing the following; (1) position the company so its capabilities provide the best defense against the competitors, (2) influence the balance of the forces and (3) exploit industry change. Number one is merely coping with the forces and trying to position the firm in a competitive spot. Two is trying to influence the forces to alter the competitive landscape through for example innovations. The last strategic point is to actively alter the business as time passes and the industry matures. New trends, like the Internet and globalization, has changed the landscape and staying up to date with these trends might boost the business in the long run (Michael E. Porter 1979).

## 3.4 Product Characteristics

### 3.4.1 Type of Product

Fisher (1997) has set up a framework for choosing a supply chain strategy based on the nature of the demand for the products a company provides. Fisher (ibid.) argues that a supply chain is either *efficient* or *responsive* and that a product can either be *functional* or *innovative*. A functional product benefits from an efficient supply chain and an innovative product benefit from a responsive supply chain as visualized by the framework developed by Fisher (ibid.), see table 3.3.

Table 3.3: Matching Supply Chains With Products by Fisher (1997)

	<i>Functional Product</i>	<i>Innovative Product</i>
<i>Efficient</i>	Match	Mismatch
<i>Responsive</i>	Mismatch	Match

Functional products typically have long life cycles, and innovative products typically have short life cycles with high fashion and innovation contents. In table 3.4, differences in demand for the two types of products are presented.

Table 3.4: Product Demand as presented by Fisher (1997)

<i>Aspects of demand</i>	<i>Functional product</i>	<i>Innovative product</i>
<i>Product life cycle</i>	More than 2 years	3 months to 1 year
<i>Contribution margin</i>	5% to 20%	20% to 60%
<i>Product variety</i>	Low (10-20 variants per category)	High (often millions of variants per category)
<i>Average margin error in the forecast at the time production is committed</i>	10%	40% to 100%
<i>Average stockout rate</i>	1% to 2%	10% to 40%
<i>Average forced end-of-season markdown as percentage of full price</i>	0%	10% to 25%
<i>Lead time required for made-to-order products</i>	6 months to 1 year	1 day to 2 weeks

Depending on the type of product or service a company is selling, the primary purpose will be to either supply a *predictable demand* efficiently at the lowest possible cost (efficient) or responding quickly to *unpredictable demand* in order to minimize stock outs, forced markdowns and obsolete inventory (responsive). The responsive strategy is operated with a higher cost while the efficient strategy is operated with lower flexibility. Chopra and Meindl (2006) provide a framework that also connects the characteristics of the demand to what type of supply chain that is appropriate to have, see figure 3.7.

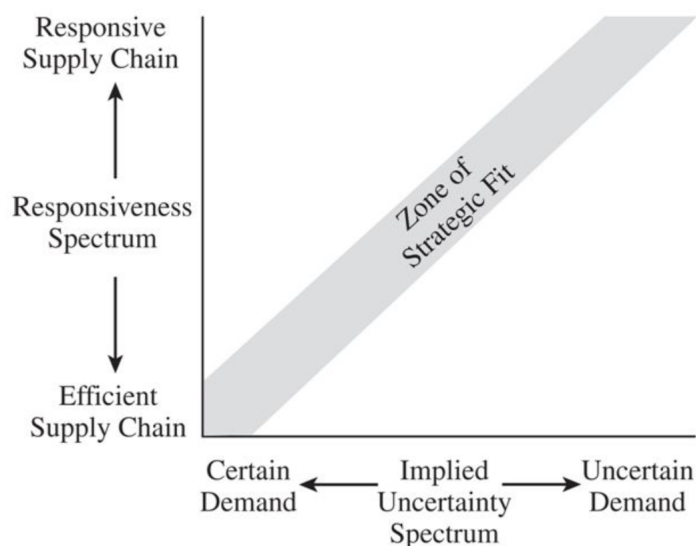


Figure 3.7: Zone of Strategic fit (Chopra and Meindl 2006)

Both frameworks conclude that an efficient supply chain is the best fit for a product with a certain demand and a responsive supply chain is the best fit for a product with an uncertain demand.

### 3.4.2 Product Life Cycle

The product life cycle (PLC) theory posits that a product will follow an S-shaped curve through its life cycle, where the curve represents the volume of sales for this product over time (Yoo 2010). The curve is further divided into four stages as shown in figure 3.8; *introduction*, *growth*, *maturity* and *decline*. In the introduction stage, the annual sales volume of the product is expected to increase only slightly. During the growth stage, sales volumes will increase exponentially, followed by a more certain demand in the maturity stage. Lastly, sales volumes will start to decrease as the product enters the decline stage.

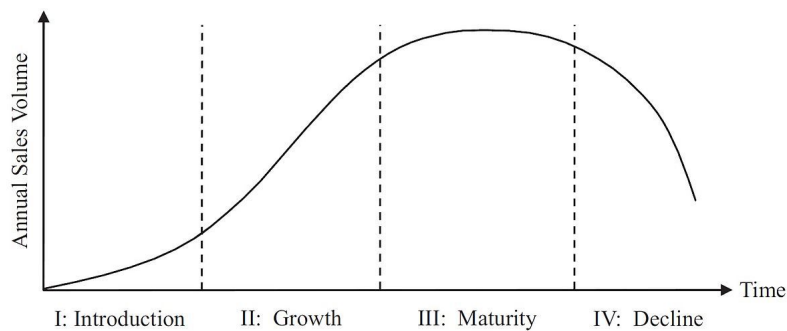


Figure 3.8: The Product Life Cycle (Yoo 2010)

Aitken, Childerhouse, and Towill (2003) argue that a firm must take the product life cycle into consideration when defining the supply chain strategy for a particular product. The reason is that the requirements of the supply chain drastically change as a product moves through the different stages of the life cycle. In order to sustain a competitive supply chain strategy, a company must recognize the characteristics of each stage in the product life cycle and reconfigure the supply chain accordingly.

#### Introduction Stage

During the *introduction stage*, information about the product has just reached the market. The people buying the product at this stage are the "early adopters", who according to Yoo (2010) are considered to be price-insensitive and risk-taking customers. The focus in the introduction stage should therefore not be on price or product quality as these are not considered to be order winners by the current customer, nor currently achievable by the firm's supply chain (ibid.). The key order winners in this stage are, according to Aitken, Childerhouse, and Towill (2003), the lead time from concept through to availability and capability of design. To mitigate possible risks and enable a supply chain that will successfully manage a rapid increase in demand, Xia and B. Chen (2011) suggest that the product development team should design products with a focus on customer orientation, sustainability, and standardization concepts during the introduction stage of the product life cycle. Having a product that is standardized reduces the number of components

and suppliers involved in the production process and increases flexibility as there is no need to adjust the manufacturing process for new products. Anderson and Zeithaml (1984) suggest that the business strategy in the introduction stage should focus on the buyer, the marketing of the product and on increasing the purchasing frequency. What is important in the introduction stage is to keep an eye on the demand rate. When the demand rate suddenly increases, a different strategy is needed to manage the product (Hsueh 2011).

### **Growth Stage**

As the product enters the *growth stage*, sales volumes have gone up significantly and continue to grow exponentially for a period of time as the product is penetrating the market at an accelerating pace (Yoo 2010). With this, the firm experiences an increase in production competence and establishes logistical support through supply chain networks (Xia and B. Chen 2011). More focus is put on strategic segmentation and on achieving efficiencies in production and marketing. The firm should shift its focus from the early adopters towards targeting the mass market instead (Yoo 2010).

In order for the supply chain not to be a bottleneck for the growth of a company in the retail industry, Anand and Grover (2015) argue that the supply chain must be designed with a focus on adaptivity and responsiveness. This is supported by Aitken, Childerhouse, and Towill (2003), who claim that the order winners in the growth stage are product availability and the product's ability to respond to uncertain demand. This means that the supply chain and its network must be flexible enough to respond to the rapidly changing demand of consumers, as well as having an increased collaboration and visibility between the entities in the supply chain. Anderson and Zeithaml (1984) argue that a long-term perspective is necessary at this stage as decisions made with a focus on short-term profitability and market share may have severe implications on the business in the future as the product progresses in the life cycle.

### **Maturity Stage**

At the *maturity stage*, the firm experiences a more steady demand with higher sales volumes. This allows for the company to reduce costs in marketing, production, and distribution of the product. Cost per unit will also drop significantly due to the now realizable economies of scale. As a result, the profit for the company is likely to improve at this stage. However, the firm will experience more intense competition in the market. Other significant differences compared to the previous stages in the product's life cycle is that product quality is further improved and the company puts a more significant emphasis on product differentiation strategies as well as on market segmentation (ibid.). In order to be successful at the maturity stage, Hall (1980) identifies two competitive strategies adopted by high performers, where the top performers use a combination of the two. These are:



1. Take a cost-leadership position in the market, where the quality and pricing policy is accepted by the customers in order to achieve a sustainable market share with profitable sales volumes; and
2. Take a leadership position in the market regarding product/service/quality differentiation. The delivered cost structure needs to be acceptable, and the pricing policy should be constructed in a way that allows for margins to be sufficient enough so that some of the profit can be reinvested in differentiating the product further.

Yoo (2010) also points out that price competition will intensify at this stage due to the less aggressive growth in sales volumes together with standardization of products, thus forcing companies to reduce its costs and differentiate the product in order to stay competitive. Mahapatra, Das, and Narasimhan (2012) argue that the differentiation strategy requires a significant amount of resources in order to redesign the product or its processes. Thus, companies are seeking to expand its capabilities by tapping into the resources of its suppliers. According to (ibid.), a company having prior experience of investing in supplier development would have a significant advantage compare to others; they would reduce uncertainties in operations, benefit from prior learnings, minimize the risk of leakage, retain resources and optimize the structure of exchange between the two parties.

### **Decline Stage**

While at the *decline stage*, sales volumes have begun to drop and demand is once again unpredictable (Aitken, Childerhouse, and Towill 2003). The underlying factor is the emergence of new and technologically superior substitutes in the market (Yoo 2010). The decline stage is estimated to last between 5-15 years according to Aitken, Childerhouse, and Towill (2003), depending on the need to service existing customers with spare parts and repairs. Several strategies can be considered to adopt in this stage, both a quick exit from the market as well as milking the remaining profits of the product for as long as possible according to Anderson and Zeithaml (1984). In order to dominate the market during the decline stage and be profitable, the company should reduce its investments and focus on efficiency through standardization according to the authors. This will allow for mass production to take place and it will simplify the production lines. Thietart and Vivas (1984) further suggest that expenses should be reduced for marketing as well as for R&D from initial levels.

## **3.5 The Life Cycle of a Startup**

Depending on the position of a firm in the organizational life cycle, the strategy, structure and managerial priorities of a firm will vary according to Elsayed and Wahba (2016). This is due to the fact that each stage in the organizational life cycle poses its own specific threats and opportunities.

Knowing the characteristics of the stage where the firm is currently at helps managers to successfully form strategies that suit the current situation and enables better benchmarking against competitors (Elsayed and Wahba 2016). Strategic issues that vary with the different stages in the organizational life cycle include the goals of the firm, asset stocks, resource needs, and resource acquisition challenges according to Hite and Hesterly (2001). Picken (2017) divides the life cycle of an entrepreneurial venture into four stages as shown in figure 3.9; (1) *startup*, (2) *transition*, (3) *scaling*, and (4) *exit*.

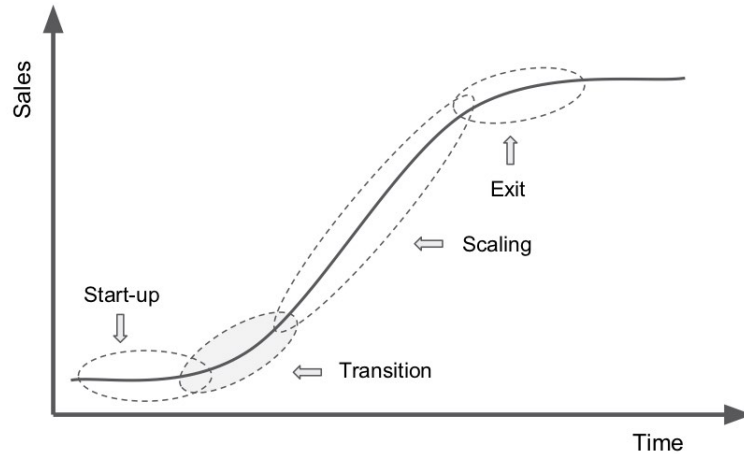


Figure 3.9: The Life Cycle of an Entrepreneurial Venture according to Picken (2017)

As seen in figure 3.9, sales volumes stay relatively constant at a low level in the initial stage of the startup life cycle. During the transition stage, the startup will experience a slight increase in sales volumes, followed by a more rapid increase as the startup enters the scaling stage. Finally, the startup will enter the exit stage where they will experience a more steady demand with higher sales volumes compared to the previous stages. Below follows a more detailed description of each stage.

### Startup Stage

The *startup* stage marks the birth of the firm. The overall objective at this stage is survival according to Hite and Hesterly (2001), and the organization is characterized by a loosely structured informality (Picken 2017). Picken (ibid.) identifies several critical factors to ensure survival of an organization in this stage, including identifying and validating the business concept, assessing the market opportunity, deciding on the product or service and its value proposition, defining the business model (such as knowing what resources are needed, processes that will be used and deciding on revenue streams), as well as knowing which go-to-market strategy is best suited for the organization and its offering (ibid.). However, what sets a firm in the startup stage back from being successful is the lack of resources, time, and skills. The environment is uncertain, and the firm has not yet been able to build a reputation to gain legitimacy and trust in the marketplace. Because

of this, the firm is highly dependent on the resources and capabilities of its external network (Hite and Hesterly 2001). What marks the end of the startup stage is when the organization begins to receive attention in the marketplace, and the business is subject to new challenges associated with the next stage (Picken 2017).

### **Transition Stage**

As the organization enters the *transition stage*, the new objective will be to lay a foundation to support a rapid growth of the business (ibid.). When a company ships its first product, a range of new tasks emerge that the organization needs to tend to. This includes marketing the product, hiring a sales team, manage the supply chain as well as sorting out finances with the incoming revenues and outgoing payments (Wasserman 2003). The new activities performed by the firm demands a different type of competence and experience from the management team, leading to further acquisition of resources and developing internal capabilities to cope with the new situation (ibid.). Picken (2017) argues that the transition stage is the most crucial period for an organization, meaning that a proper foundation for scaling allows the firm to take maximum advantage of an expanding market. However, several challenges lie ahead. Picken (ibid.) summarizes a few of the challenges into eight bundles that the firm needs to overcome in the transition stage. These are:

1. *Setting a direction and maintaining focus* - The goals need to be communicated in a way that gives the organization a clear direction. This includes setting the target customer, offering, value proposition, business model and key milestones.
2. *Positioning products/services in an expanded market* - The offering needs to be expanded and redesigned to meet the needs and expectations of the market. Appropriate distribution channels must be decided upon, and the organization must focus on fostering customer relationships.
3. *Maintaining customer/market responsiveness* - Growth slows down the decision processes as additional layers of complexity is added to the organization. New procedures must be developed to maintain flexibility and responsiveness.
4. *Building an organization and management team* - The management team needs to structure the organization more formally than before and ensure that activities and employees are aligned with the company strategy.
5. *Developing effective processes and infrastructures* - Having a proper infrastructure together with an effective decision-making process is necessary to manage growth as it helps the organization to adapt to external and internal changes in the environment quickly.
6. *Building financial capability* - As financial resources are scarce, the organization needs to manage resources and working capital efficiently as well as having clear communication with

investors and other stakeholders.

7. *Developing an appropriate culture* - Failing to develop a culture that supports the strategy of the organization increases the risk of organizational failure. The management team should foster a culture that reflects values, beliefs, and norms that are aligned with the business' overall objective.
8. *Managing risks and vulnerabilities* - Risks faced by the organization include uncontrolled and rapid growth, narrow revenue base, lacking skills of employees, as well as lacking infrastructures, information, and management systems, and a preference toward entrepreneurial risk-taking.

If these hurdles can be overcome, the organization has laid a successful foundation for the business to grow on.

### **Scaling Stage**

When reaching the *scaling stage*, the firm's overall objective is to rapidly grow the business so that the organization can secure market leadership as well as gain a competitive scale. Nielsen and Lund (2018) refer to scalability as "*a system's ability to expand output on demand when resources are added*", and argue that a firm during this stage needs to be flexible and take into account external pressure as it grows its business, such as regulations, new competitors, and changes in the macroeconomic environment. The rate at which the business is able to scale depends mainly on three things according to Ries (2011); (1) profitability per customer, (2) cost per new customer acquisition, and (3) rate of repeated purchase by existing customers. Nielsen and Lund (2018) have identified five ways of achieving scalability. These are:

1. Adding new distribution channels
2. Freeing the organization from capacity constraints
3. Outsourcing capital investments to partners and engaging them in the business model
4. Giving customers and partners multiple roles in the business model
5. Establishing platforms in which competitors can become customers

To succeed, the company must add a significant amount of resources to its organization, as well as utilizing the resources of its partners (Picken 2017). The investors expect the business to become profitable at this stage. Thus, the firm should spend its money on creating end-consumer demand and drive these into its sales channel (Blank and Dorf 2012), as well as focusing on making other changes in the business where additional input will create greater output (Nielsen and Lund 2018).

## Exit Stage

DeTienne (2010) defines the *exit stage* of a startup as "*the process by which the founders of privately held firms leave the firm they helped to create; thereby removing themselves, in varying degree, from the primary ownership and decision-making structure of the firm*". DeTienne (ibid.) argues that the exit of a startup is an important event that may have either positive or negative effect on the business, and it may happen at any time in the startup life cycle. One reason for exit may be bankruptcy, but other successful exit strategies include an initial public offering (IPO), private sale, merger, or acquisition (Picken 2017). A successful exit allows for the investors and the entrepreneurs to harvest the value of the business, and extra money, new resources, and a boost of energy will be added to the firm (DeTienne 2010). Exiting through a merger or acquisition will allow the firm to further grow its business through international expansion, access to new technology, or expanding into other product areas (Pisoni and Onetti 2018). A challenge for a successful M&A is to value a young firm with lacking historical data and performance records, as well as integrating the two businesses that may have different cultures and values (ibid.).

## 3.6 Supply Chain Capabilities

### 3.6.1 Internal Capabilities

Analyzing and understanding internal capabilities is vital to analyze and understand a firm in the larger concept of a network. Michael E Porter (1985) presented a framework now called Porter's Value Chain. This model is widely used to examine a company's value-adding functions as well as its sources of competitive advantage. The model is shown in figure 3.10 and consists of primary and supporting activities that a firm uses to design, produce, market, deliver and support its products. Each of the activities can contribute to a firm's competitiveness and can lay a foundation for differentiation. Porter's model is intended to be used for business units and not for industries, as an industry-wide analysis may hide important sources of competitiveness. For example, a company may position itself as either a premium or low-cost provider of a certain product, but it is still in the same industry regardless of positioning.

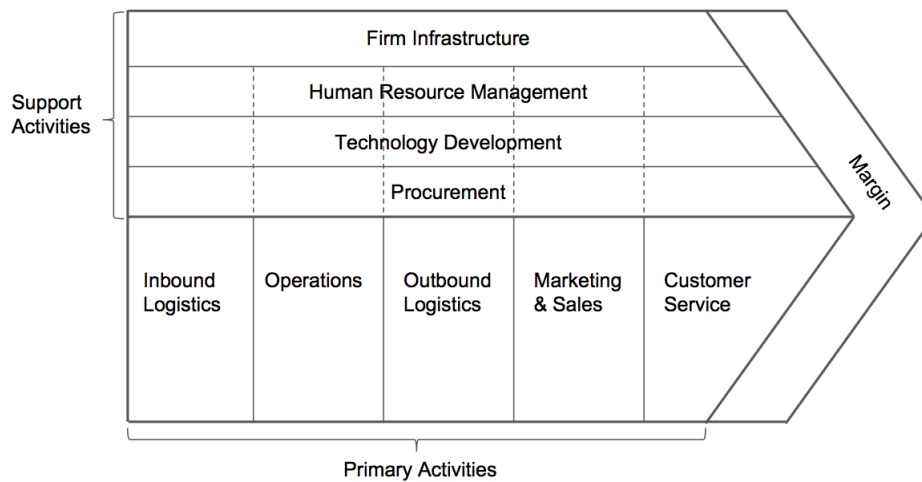


Figure 3.10: Porter's Value Chain (Michael E Porter 1985)

As seen in figure 3.10, the firm infrastructure is company-wide, containing for example company strategy, structure, and management. The other supporting activities are usually conducted through all primary activities, even though a company has a dedicated function, for example, human resources or procurement. The dotted lines highlight that the support activities can be associated with each primary activity as well as support the entire value chain. The primary activities are the activities involved in producing the product, sales and transfer to the buyer, as well as after-sale and support. The total performance of all activities constitutes the company's margin. How each activity is performed combined with its economy will determine if a company is high- or low cost oriented. The performance will also determine the contribution to buyer needs, thus allowing differentiation to take place. Analyzing the value chain of a focal company and comparing to other companies can help to identify strengths and weaknesses, and further determine competitive advantages. Although *value activities* are the building blocks of the model, the *value chain* is related by linkages inside the value activities and they interconnect these activities. An internally efficient company has efficiently working linkages regarding communication and optimization (Michael E Porter 1985).

### Born Global Characteristics & Size Effects

Firms that is referred to as "born global" are those who engage in international activities and targets a global customer base from the start according to Rennie (1993). Tanev (2012) identifies the following characteristics that born global firms possess:

- High activity in international markets from the start, initiated by the founders
- Scarce financial and tangible resources
- Focus on differentiation strategy

- Focus on product quality
- Connecting with independent intermediaries to distribute product in foreign markets
- Use of advanced information and communications technology

A born global firm's sources of competitive advantage will lie in their ability to manage the following factors according to Cavusgil and Knight (2015):

1. Having a continued focus on entrepreneurial orientation and innovation
2. Having the ability to refine the offering and retain a technological edge
3. Having a dynamic engagement of networks of customers, suppliers, partners, and external stakeholders
4. Being able to manage a transition to a more complex organization without losing entrepreneurial prowess
5. Being able to sharpen the ability to balance opportunity and risk
6. Being able to retain an agile, and experimenting organization

The challenges with going global from the start are many, especially for a small firm with limited resources. Managing a global supply chain means dealing with environmental and structural complexities that do not exist in domestic supply chains. However, Hong and Jeong (2006) argue that the supply chain still needs to be managed effectively to be able to compete with large enterprises.

Startups also face the challenge of securing fundings for its business, as a small firm is usually operating with low capital investments and high working capital requirements (Thakkar, Kanda, and Deshmukh 2009). Without capital, a firm cannot invest in product development, hire the people necessary to expand the business or create the infrastructure to be an efficient company, which is crucial to do if the startup wants to stay in business. However, startups are struggling with obtaining long-term finance in the form of debt and equity due to their perceived high risk according to Thakkar, Kanda, and Deshmukh (ibid.). They also have difficulties with achieving favorable terms that could boost their cash flow when making deals with both upstream- and downstream suppliers due to their low bargaining power (Hong and Jeong 2006). For a startup to be successful on an international market under these constraints, they must find a way to leverage on other internal and external capabilities Weerawardena et al. (2007).

### **3.6.2 Supply Chain Network Capabilities**

#### **The role of networks**

Networks play an increasingly larger role in modern businesses as vertical integration decreases. Prahalad and Hamel (2006) first introduced the concept of core competencies in their article in 1990. Before then, most companies valued vertical integration highly but with the Internet came

the ease of cooperating across firms, thus the advantage of specializing in core competencies and outsourcing other functions to gain increased competitiveness. From that, the term "orchestrated networks" was developed highlighting the importance of organizing the value-creating process, rather than owning and controlling all resources. Orchestrated networks build upon that a firm should focus on their core capabilities and outsource other functions to firms that can benefit from the scale of economics or are better at managing the resources. While doing that, they become the core company orchestrating the network. A visual representation of this can be found in 3.11 The orchestrated network includes entities from the suppliers' supplier to the customers' customer. Usually, the core company has the responsibility to align all entities and to be the face of the network outward against the customer. Managing all entities in a network can be a challenging task and should be the main concern in supply chain management. In addition to said benefits of outsourcing a non-core activity, there are some immediate risks of outsourcing. Firstly, it can be hard to specify deliverables and quantify a price; secondly, it can be hard to know a contractor actually can deliver; and thirdly, it can be hard to get the knowledge back if once outsourced. (Edgren and Skärvad 2014) Collaboration and methods to manage collaborations is further covered in section 3.6.2.

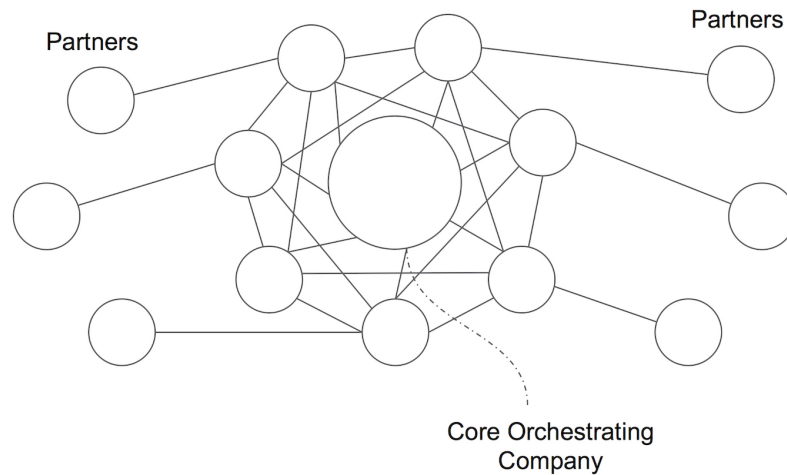


Figure 3.11: Representation of Core Orchestrating Company (Edgren and Skärvad 2014)

Jin and Edmunds (2015) discusses *supply chain networks* in his article, and proposes that geographically dispersed businesses benefit from well-maintained networks. The recent technological developments have changed most companies and industries to be less vertically integrated and focus more on core capabilities, thus have to be more concerned with their network and collaborations (Peppard and Rylander 2006). As the resources needed for manufacturing firms today are usually dispersed, companies need to cooperate with other businesses, which requires a well functioning network. This is especially true for a startup with limited financial resources as well as low bargaining power in the network, both upstream and downstream. Supply chain networks include physical resources, skilled workers, technologies, managerial skills, implicit knowledge, and relation



specific resources. A network not only benefits from its resources and the partner's resources but also from the synergy of the partnership. A relationship is time-consuming and costly, however, it is hard for competitors to imitate because of the information hurdle embedded in the network. Above aspects of a supply chain network can be divided into three, the configuration, the intangible resources, and the relational resources. Configuration is related to the tangible resources in the network and can be protected through governance mechanisms, such as contracts or modular design. The intangible resources are related to knowledge and skills in the network and can be improved through sharing knowledge through openness and trust. The relational resources refer to the relationship between the firm and members of the network, and it is here the synergy effects happen when the relationship is coordinated well, which are hard to imitate (Jin and Edmunds 2015).

A born global, high-tech, startup company is dependent on its network for several reasons, such as being able to secure capital, scale production and ship units all across the world. Cavusgil and Knight (2015) as well as Hite and Hesterly (2001) argue that a vital part of born global companies competitive advantage should include networks of customers, suppliers, partners, and external stakeholders. Born globals success is thought to benefit from network relationships and other forms of social capital. To secure financing, as well as other resources, a startups network of investors, mentors and is critical for survival and growth. A startup has a lower degree of legitimacy than in later growth stages. Founders usually have a good understanding of the product, however, they might face uncertainty regarding markets, customers and scaling the business as the firm is trying to do something it has never done before. Thus, startups benefit from external resources with the know-how that cannot be produced internally (ibid.).

## **Collaborating**

As previously covered, competition no longer takes place between individual businesses, but rather between entire value chains. Intelligent collaboration through networks will provide a competitive edge, and may be one of the most important core capabilities for a core orchestrating company (Horvath 2001). To align a supply chain Narayanan and Raman (2004) proposes that a value chain needs to have aligned incentives and ways to align may be through revised contracts, sharing hidden information or through establishing trust through intermediaries. Min et al. (2005) takes it one step further and presents a framework for deeper collaboration with a number of antecedents and methods. The five collaboration methods are presented below:

1. *Information sharing* - Information covering various aspects depending on business area and partner, may be shared Min et al. (ibid.). Shared information will reveal actions that enhance forecasting and planning but also trust between partners (Narayanan and Raman 2004).
2. *Joint planning* - Joint planning is closely connected to information sharing and is required

to co-align operations as well as capacities.

3. *Joint problem solving* - Partners benefit from working together to solve joint problems, problems that not necessary concern one partner but will make the supply chain more efficient as a whole. Joint problem solving could cover product development, logistics, and quality for example. (Min et al. 2005)
4. *Joint performance measurement* - Narayanan and Raman (2004) proposes a contract based reward system for aligning partners in the supply chain. Min et al. (2005) argues for that the performance measurements and rewards should be continuously jointly updated. Collaboration is based on trust, and the reward and performance systems should, therefore, be developed jointly.
5. *Leveraging resources and skills* - To make the supply chain as efficient as possible, each partner's resources should be leveraged. This can be done by for example pooling resources or specializing and letting others do what they do best, which is further covered in section 3.4.

These five methods lead to higher efficiency, effectiveness, profitability as well as reinforcement and expansion of the relationship between partners. The goal of collaborations should be to achieve a win-win situation where both parties - and the whole supply chain - benefit. (ibid.)

## **SCN Learning and Knowledge Transfer**

When firms today are outsourcing more and more, understanding and exploiting this outside information is crucial to stay competitive. Cohen and Levinthal (2000) states in their article that the ability to exploit and utilize this outside knowledge is a function of the level of prior knowledge. This prior knowledge is cumulative, thus gaining knowledge over time builds up a stock. The knowledge confers an ability to absorb new information and apply it to the business. In a small firm, the knowledge flow more freely between functions, as functions work closer together and usually only consist of one or a few persons. However, when growing, information between functions diffuse more difficult. (ibid.) Then, processes for diffusing knowledge within the company might be needed such as a common internal wiki or a personnel rotation program where each employee can gain insights from different functions.

When communicating with the partners that are handling outsourced functions, high knowledge transfer are crucial to staying competitive. To absorb this knowledge transfer, there has to be an existing internal knowledge in the firm as well as knowledge at the partner. In addition, they have to make sure there is a flow of information through knowledge transfer from each part of the partnership. For example, the core firm must have enough knowledge to understand if the quality of a product drops, and the contractor must have enough knowledge to alter its processes to make

sure it does not happen again. The best way to improve the knowledge transfer between two parts, as well as to improve its absorptive capacity, is to have a long-term partnership with great trust and openness. Keeping gained knowledge is done by documentation, internal knowledge transfer as well as keeping key personnel employed in the firm (Gaimon, Özkan, and Napoleon 2011).

When assessing the capabilities and the capacity of the supply chain, it is important to consider the learning effects that the ingoing actors might experience. *The learning curve theory* states that levels of productivity can be improved at a predictable rate as systems and the people in the systems learn and become more efficient in executing its tasks over time, see figure 3.12 (Bozarth and Handfield 2008). The general equation used in learning curve analysis is as follows:

$$Y = aX^b$$

where

- $Y$  = the average time per unit of output
- $a$  = the time required for the first unit of output
- $X$  = the cumulative output
- $b$  = the learning index

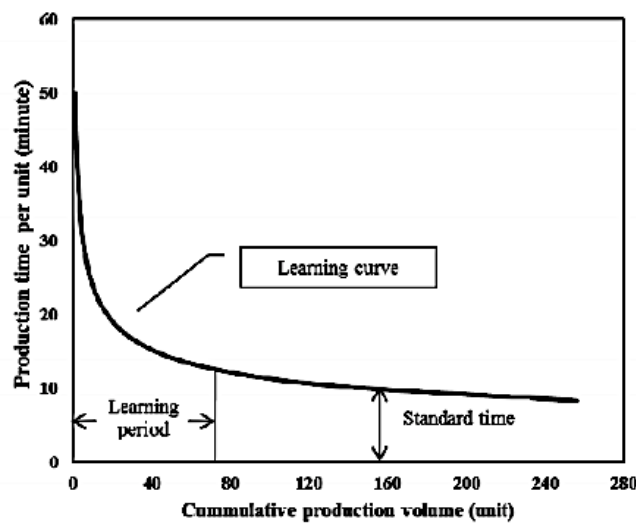


Figure 3.12: The Learning Curve (Bozarth and Handfield 2008)

According to Yelle (1979), the learning curve should be viewed as "an aggregate model in the sense that it includes learning from all sources within the firm". The slope of the curve represents how the number of labor hours needed to produce one unit declines as the total number of manufactured units goes up. This is due to the fact that as people learn, they become more skilled at their job, which leads to the output being produced at a faster pace, with increased quality, and at a lower cost (Kortge et al. 1994). If the company anticipates to experience learning effects, they should not invest in excess capacity. Instead, they can expect their system to become more productive

over time, where the amount of output will increase while resources remain constant (Bozarth and Handfield 2008).

## Clusters

Clusters are defined as multiple firms within the same sector or industry geographically located near each other. The fundamental driver of clusters is external economies of scale such as specially developed know-how, specially tailored supplier- and service firms, as well as specialized education, information, and research. (Gilbert, McDougall, and Audretsch 2008) The short geographical distances makes it easy for firms to communicate, although the Internet has made this force weaker, as well as finding skilled labor. Firms in a cluster tend to perform better and have a higher competitive advantage due to the superior access to knowledge spillover (Edgren and Skärvad 2014). Gilbert, McDougall, and Audretsch (2008)'s research shows that this is also true for new ventures, especially with technology knowledge spillover which contributes to product innovation. Porter's diamond model differs from other network models, where he determines that the firms included in a cluster compete and collaborates in the same market. It is the combination of collaboration and competition that creates dynamic and innovation in a cluster (Edgren and Skärvad 2014). Michael E Porter (1998)'s diamond model consists of four drivers all influenced by each other, making up a diamond. A visual representation of porters five forces is shown in figure 3.13. The four drivers are:

- *Factor conditions* - Access and quality of input-factors for production, such as specialized knowledge and service, specialized venture capital firms and so on.
- *Demand conditions* - The size and quality of the demand. Having customers geographically nearby that are demanding high quality is important to make the company create superior products.
- *Related supporting industries* - The quality and number of the cluster's suppliers, service-firms and other related industry, such as schools and research. Quality of the relationships between the firms also plays a role here.
- *Firm strategy, structure, and rivalry* - The basic fact that competition leads to higher production and better company efficiency. A firm then needs to choose an offensive strategy and structure its organization efficiently. Laws and regulations in the market need to promote free competition for this factor to work.

The four drivers of Michael E Porter (ibid.) model influences and strengthen each other. All of these forces need to be in place for a cluster to develop and generate maximal market dynamic. With a dynamic cluster, firms tend to generate higher productivity as well as better innovation capability. The downside of a cluster might be higher costs for, for example, labor and office space

as well as higher competitiveness. However, the positive sides of knowledge spillover are in many aspects greater than the downsides.

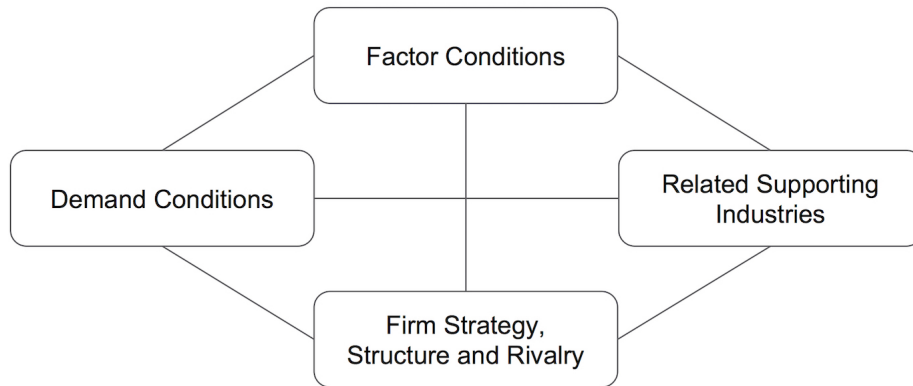


Figure 3.13: Representation of Porter's Diamond Model



## Chapter 4

# Empirics - Case Studies

*In this chapter, findings from the conducted semi-structured interviews will be presented. First, a summary of the case companies is given. This is then followed by a brief introduction to each case company and a description of the case company's supply chain. Lastly, identified CSFs from each interview is presented.*

## 4.1 Case Company Data

The examined companies are presented in table 4.1 and are all hardware manufacturing companies that started as startup companies in the Lund-Malmö region in Sweden. As seen in the table, the companies differ somewhat in turn-over and number of employees. Axis is by far the largest company. Hövding, Anima and Orbital Systems are on their way of scaling, and Modcam is more similar to Minut, preparing for scaling. All five case companies are producers of hardware as well as software. However, only orbital have in-house manufacturing. (Hult Johansson 2018; Lindroth 2018; Kalogeropoulos 2018; Arnesson 2018; Johansson and Tudosoiu 2018)

Table 4.1: Case Company Overview

<i>Company</i>	<i>Industry</i>	<i>Net Sales (TSEK)</i>	<i>Number of Employees</i>	<i>Active Since</i>
<i>Modcam</i> (Modcam 2018)	Video Analysis (IoT)	900	10	2014
<i>Orbital Systems</i> (Orbital 2018)	Water Recycling (IoT)	1 000	50	2013
<i>Anima</i> (Anima 2018)	Smart-watches (IoT)	37 100	62	2015
<i>Hövding</i> (Hövding 2018)	Airbag	67 000	33	2006
<i>Axis</i> (Axis 2018)	Cameras (IoT)	8 602 600	2780	1984

## 4.2 Case Company A, Modcam

### 4.2.1 Introduction to Modcam

Modcam was founded in 2014 with the vision to analyze visual data from a camera. Modcam designs the camera themselves and is produced by a Swedish manufacturer. They sell their camera to larger corporations (B2B) who are wishing to analyze for example movement on a retail floor, movement in warehouses or shoppers age and gender. Modcam’s main product is the program that analyses the data gathered by their camera, and not the camera itself. They are profiling themselves as an internet of things company. After their first years on the market, they are now designing a new better camera, called MOD.02, based on their market learnings. The new camera will better capture the targeted market needs. Right now Modcam does not have a product solving a consumers problem, thus the choice of only selling B2B. Out of 10 employees, Karl-Anders Johansson and Bogdan Tudosoiu were interviewed as they are working with the physical product and its supply chain. (Johansson and Tudosoiu 2018) For the last four years, their economic growth has been steady with an exceptionally good 2017 (Modcam 2018). However, they are still



highly dependent on investors and other venture capital to continue their growth (Johansson and Tudosoiu 2018).

Displayed in figure 4.1 is Modcam’s positions in the Startup Life Cycle and Product Life Cycle, based on the interview with Johansson and Tudosoiu (ibid.) as well as theory presented in the previous chapter. Modcam is a fairly new company still developing its core product, hence it is placed in the first phase in the startup life cycle. The market of which Modcam is operating in existed previously, but are in a growth phase with promising potential. Therefore Modcam’s product is placed in the growth phase in the product lifecycle.

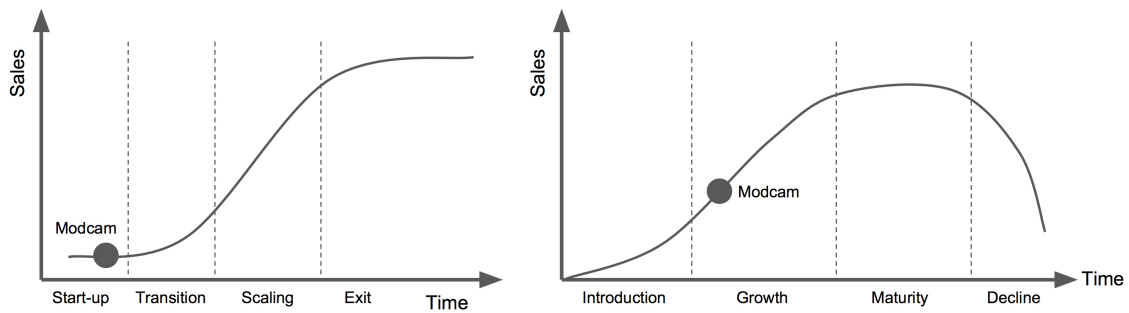


Figure 4.1: Modcam’s Startup Life Cycle and Product Life Cycle

### 4.2.2 Modcam’s Supply Chain

Modcam produces their cameras in Sweden, while sourcing components from all over the world. Most components are sourced by the producer and come from Taiwan or Europe. Modcam chose to produce their hardware in Sweden because of the small batch-sizes associated with a startup company and might consider moving the operation to Asia when their sales get considerably higher. Their downstream warehouse is at their HQ, and from there they ship products to the end customer. They also flash the products with the latest firmware in-house before shipping. Right now, all customers need help with setting up their hardware as well as their software, which is service they provide in-house. Their supply chain focus is on flexibility and not costs since the software produces great value for the customer, and the camera is simply a prerequisite for the software to work. (ibid.)

### 4.2.3 Critical Success Factors

Modcam’s relationships with many of its partners have proven to be important when it comes to raising funds and maintaining a functioning economy, especially since Modcam is a startup. For example, they got a contract for the development and production of a number of units, without having to pay any large sums upfront. When continuing to produce, they also got some credit. Now, they are looking to raise more money with a series-A round to be able to produce more

products, and here they can also benefit from relationships. Cash-to-cash cycle time, as well as liquidity, are important measurements to Modcam to know how its supply chain performs.

Modcam has been listening to customer feedback to make adjustments to its business model as well as its supply chain. For example, since the launch of their first product, MOD.01, they have gathered data on how customers use their product. Now, when they are designing the next generation of their product, they use these insights to make the product better. They also changed their business model to target larger customers, when they found out that these are more likely to buy their product.

As Modcam is planning for future growth, they are identifying bottleneck functions to assess. Their distribution process, as well as their support function, need more personnel or to be outsourced. To be able to sell more units, sales-staff is also essential. The downside of using a Swedish contractor to build the product is the large costs associated with the assembly. However, the geographical closeness, especially in a startup-phase, weighs up the negatives for Modcam. They concluded that if they do not have to produce around 100 000 units from day one, it is cheaper to have the production locally. First when Modcam would have orders on 100 000 units, moving the production to Eastern Europe would be more profitable. If the production volume were to go up to 1 million units, it would make sense to move the production to Asia. Flexibility is more important than costs in this stage for Modcam. As a small company, Modcam values its extensive network of contacts highly. Tudosoiu previously worked for Ericsson and HTC and there got in contact with a lot of different people as well as companies. Many internal problems get solved by reaching out to the large network Modcam has acquired (Johansson and Tudosoiu 2018).

#### 4.2.4 KPI:s during Growth Phase

From the self-completion questionnaire, Modcam gave the highest score (5 points) to the supply chain attributes of *responsiveness* and *agility*, followed by the attributes of *asset management efficiency* and *reliability* whom each was given 4 points. Hence, Modcam considers agility and responsiveness to be the most important attributes for the supply chain as sales volumes rapidly increase for a startup. 3 points was given to *cost* on a scale from 1-5. Thus, Modcam does not consider cost to be a priority for the supply chain during the growth phase of a startup.

Regarding KPI:s to monitor during the growth phase of a startup, Modcam recommends to track *order fulfillment cycle time*, *cash-to-cash cycle time*, and *cost of goods sold*. For order fulfillment cycle time, the *delivery cycle time* is the level-2 metric considered to be most important to monitor by Modcam. After that, *make cycle time*, *source cycle time*, and *return cycle time* are all considered to be the second most critical level-2 metrics to monitor. Least important to watch for this KPI according to Modcam is *delivery retail cycle time*. For cash-to-cash cycle time, *days sales outstanding*, *inventory days of supply*, and *days payable outstanding* are all considered to be equally

important to monitor according to Modcam. For inventory days of supply, the level-3 metrics that are considered to be most important to track are *inventory days of supply for raw material* and *inventory days of supply for work-in-process*. Regarding the KPI of the cost of goods sold, *direct labor costs* and *direct material costs* are the level-2 metrics that are considered to have the most significant impact on the KPI. *Indirect cost related to production* is considered to have less impact according to Modcam.

## 4.3 Case Company B, Orbital Systems

### 4.3.1 Introduction to Orbital Systems

Orbital Systems was founded in 2013 by Mehrdad Mahdjoubi, who was involved in a Mars-mission project at NASA before founding Orbital Systems. From that project, Mahdjoubi got inspiration to build a water purifier for ordinary showers to minimize water waste. The product consists of a shower, purifier, water tank, heater, and a control system, and can recycle about 80-90% of the water used. Other companies make similar products, however, Orbital Systems product is the only one intelligently choosing whenever the water should be recycled and when to not. Orbital Systems sell their product to other companies (B2B) and not directly to end customers since their product is large, need professional installation and that Orbital Systems want to have fewer but larger customers. Their future market is most likely in countries with poor access to clean water. However, their main markets right now are the US and several countries in Europe. At Orbital Systems, we interviewed David Arnesson, who works with logistics and purchasing. (Arnesson 2018) Since 2013, Orbital Systems have had some ups and downs in their net sales, ending 2016 with 6 million in sales and 2017 only with 1 million in sales. (Orbital 2018) However, their labor force has steadily risen and is now about 50 in strength. Orbital Systems is still dependent on venture capital or other forms of investments.

Displayed in figure 4.2 is Orbital Systems' positions in the Startup Life Cycle and Product Life Cycle, based on the interview with Arnesson (2018) as well as theory presented in the previous chapter. Orbital Systems started a while ago but are still developing a sustainable and stable product to go to market with. The company have some traction and interest from customers but are holding off to get the product right. Orbital Systems are therefore placed in the transition stage, soon to be ready to scale. The market of which Orbital Systems operates in is relatively new, with few substitutes and low competition, especially in Orbital Systems' niche. Therefore Orbital Systems' product is placed in the introduction phase in the product life cycle curve.

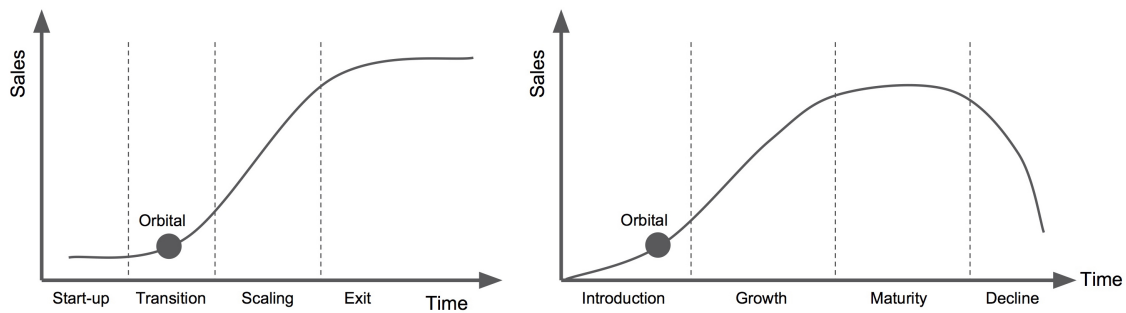


Figure 4.2: Orbital Systems’ Startup Life Cycle and Product Life Cycle

### 4.3.2 Orbital Systems’ Supply Chain

Orbital Systems manufactures and stores their product in Sweden, and are planning to do so for the coming few years since they want to keep the production close to their R&D department and HQ. However, to scale in the future, they need to manufacture close to the customer since the product is expensive to ship. Most components of Orbital Systems’ product are non-specialized which can be sourced fairly easily, however, it is the system as a whole that brings value to the customers. Since the product is complex, Orbital Systems has a large service organization assisting with installation and support. Most of Orbital Systems’ customers are construction firms having long lead times from design to finished project, thus not demanding fast delivery. This means that orbital Systems has chosen a make-to-order strategy for its product. (Arnesson 2018)

### 4.3.3 Critical Success Factors

A challenge for Orbital has been to develop and produce a high-tech product that consists of multiple areas of expertise, while still having a startups financial constraint. To develop the product, knowledge of hardware, software, control engineering, biology as well as other areas are needed, and knowledge is expensive to acquire. A critical success factor has been to raise enough money to be able to acquire all the necessary knowledge. Arnesson (ibid.) describes that for Orbital Systems, it has been important to produce developments in R&D fast, rather than doing things cost-effectively. A dilemma Orbital Systems has faced is to determine at what point to expect higher sales volume. For example, should Orbital Systems buy tooling that pays off after 10 000 units or should they hand-make components, which is the best option when selling 1000 units? This trade-off is hard for a startup since it is hard to make accurate forecasts. This is true for the service organization too. The trade-off here is if Orbital Systems should keep developing a more stable product or if they should sell more units and need a large service organization. The quality is an important factor for Orbital Systems, as the product they sell is expected to last long and the inconvenience of having a broken shower is considerable. Therefore they quality-check components and often, especially from new suppliers.

An important goal for Orbital Systems has been to forecast better and to achieve a more even production schedule since it is difficult for a contractor to get 100 orders one week and five the next week. So the connection between sales, forecasting, and manufacturing has to run smoothly. The network around Orbital Systems is essential in many aspects. The investor-side is, of course, a prerequisite for Orbital to continue its journey. As Orbital Systems plan to sell their product through multiple distributors in various markets, their relationships with these distributors will also have an important role. Also, installation and service will be provided by partners downstream with their own inventories of both products and spare parts (Arnesson 2018).

#### 4.3.4 KPI:s during Growth Phase

From the self-completion questionnaire, Orbital Systems gave the highest score (5 points) to the supply chain attribute of *agility*, followed by *asset management efficiency* (4 points) and *cost* (3 points). Hence, Orbital Systems considers responsiveness to be the most important attribute for the supply chain during the growth phase of a startup. 2 points was given to *reliability*, and 1 point was given to *responsiveness* on a scale from 1-5. Thus, Orbital Systems does not consider responsiveness to be a priority for the supply chain during the growth phase of a startup.

Regarding KPI:s to track during the growth phase of a startup, Orbital Systems recommends to monitor *order fulfillment cycle time*, *overall value at risk*, *cash-to-cash cycle time*, *return on working capital*, and *cost of goods sold*. For order fulfillment cycle time, the level-2 metric that Orbital Systems considers to be the most important to monitor as sales volumes rapidly increase for a startup is the *cycle time of the make process*, followed by *source cycle time* and *deliver cycle time*. Least significant are *return cycle time* and *delivery retail cycle time*. For overall value at risk, Orbital Systems considers the *value at risk for the source process* to be most critical to manage during the growth phase of a startup concerning the level-2 metrics for this KPI. This is followed by *value at risk in the deliver process*, and then the *value at risk in the planning process* of the supply chain. The level-2 metrics that have the least impact on the KPI is *value at risk during the make process* and *time to recovery*. For cash-to-cash cycle time, Orbital Systems considers *inventory days of supply* to be the most critical level-2 metric to monitor. Less important is *days sales outstanding*, followed by *days payable outstanding* which is considered to have the least impact on this KPI for a startup during the growth phase. The level-3 metric that is considered to have the most significant impact on inventory days of supply is *inventory days of supply for raw material*, followed by *inventory days of supply for work-in-process material*, and lastly *inventory days of supply for finished goods*. Regarding the KPI return on working capital, *inventory* is the level-2 metric that has the most significant impact on the KPI according to Orbital Systems, followed by *accounts receivable*. The level-2 metric considered to have the least impact is *accounts payable*. Lastly, the level-2 metric with the most significant impact on the cost of goods sold is *direct material cost*, followed by *direct labor cost* according to Orbital Systems. *Indirect cost related*

to production is the level-2 metric that is considered to have the least impact on this KPI.

## 4.4 Case Company C, Anima

### 4.4.1 Introduction to Anima

Anima started 2015 with the idea to create an IoT company producing stylish smartwatches. The core value of the product is "Connected but not distracted." We interviewed Sarandis Kalogeropoulos, one out of four founders of the company. All of the founders previously worked for Ericsson in Lund and used their experience from there to realize their idea of a startup. They got funding from Goertek, a Chinese manufacturer and investor of technology hardware, who now produces Anima's products. Anima, the parent company, owns Kronaby, their company as well as brand name outwards. With technology influencing traditional businesses, such as cars, home equipment, and watches, traditional sales channels gets interrupted. Anima chose to keep the watch stylish with a design reminding of traditional watches. Therefore, they chose to sell their watch through physical watch-stores and not through technology-stores like Elgiganten or Mediamarkt. (Kalogeropoulos 2018) Since 2015, their growth has been steadily rising. Both net sales and number of employees have risen exponentially. (Anima 2018)

Displayed in figure 4.3 is Anima's positions in the Startup Life Cycle and Product Life Cycle, based on the interview with Kalogeropoulos (2018) as well as theory presented in the previous chapter. Anima produces and sells smart-watches, which is a quite developed market with some competition. However, there is still potential, thus Anima's product is placed in the growth stage in the product lifecycle. The company started only three years ago, but with their funding from Goertek they managed to rapidly go through the transition stage in the startup life cycle and is therefore placed in the scaling phase.

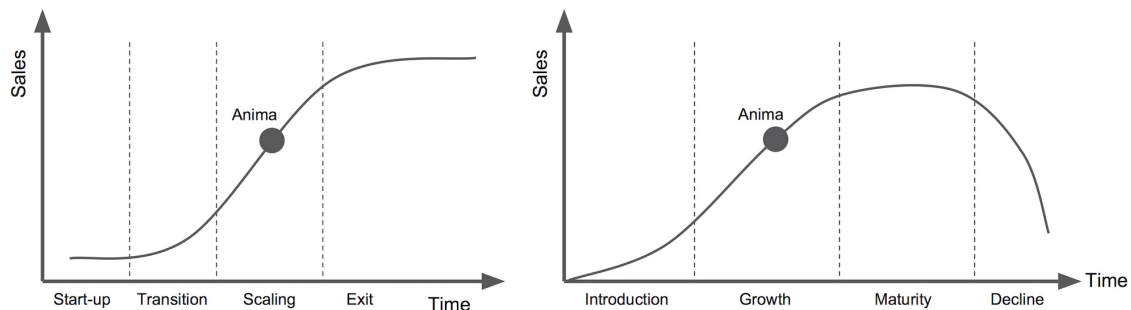


Figure 4.3: Anima's Startup Life Cycle and Product Life Cycle

#### 4.4.2 Anima's Supply Chain

Today, Anima produces their products in China, via Goertek, and has its central warehouse in the Netherlands. They support sales of the watch to 40 different countries, so their supply chain is global and has been from the start. Anima's product is a consumer good, and they sell their products directly to customers (B2C) through multiple channels, such as physical and online stores, as well as to distributors (B2B). Most of the components in the watch is sourced by Goertek. As the watch is an IoT product, Anima focuses both on hardware and software and both components of the watch are essential factors to achieve excellent customer value, hence the supply chain need to be well designed. (Kalogeropoulos 2018)

#### 4.4.3 Critical Success Factors

Kalogeropoulos (ibid.) emphasizes the importance to align sales channels before trying to attack them all. For Anima, it was not a large issue since they had the capital to assess all sales-channels, but for most startups, this is an issue. The different channels might then start competing with each other and prices might not be aligned, thus it is better to focus on fewer but better-managed sales channels. Kalogeropoulos (ibid.) also emphasizes that there is a trade-off between product development and sales. The sales organization is at the end responsible for paying all salaries in the company. A startup is usually firstly designed around the product as R&D is the first function in the company. To pivot from focusing of product to focusing on sales and marketing is a challenge most startups need to address, according to Kalogeropoulos (ibid.). However, the R&D function still needs to work as before and not be a function controlled by the sales function. That might lead to a short-term focus on product features not aligned with customer needs. When scaling the sales-force, another issue arose for Anima. The issue of determining when to enter a new geographical market and when to not. There is a fixed cost for making sure a product is compatible with other countries laws and regulations, as well as establishing a supply chain in the new market. The decisions also have to be in line with the corporate strategy and how the company defines itself. However, from a salesperson's perspective, larger markets makes it easier to sell the product.

An essential thing for Anima is their culture and their employee's values. They have three core values that should match what their employees values. Firstly, honesty and transparency. For example, in their common areas, they have information about purchases and unit-activations to show how the company is performing to all employees. Secondly, curiosity is an important value to be able to innovate and create new, better solutions. Thirdly, Anima should be agile and flexible for example to accommodate a ramp up in production, design products after a new market trend or to meet demand in a particular market. When a startup is hiring new employees, they should not hire for a specific role but instead a versatile person who can contribute in the areas the person

values the most. Hence, the business structure should not be defined by roles in the beginning, but rather by loose work descriptions. Working at a startup means taking on several tasks and roles at the company. This will enable a person to find its best fit for the company, as well as giving employees the chance to identify flaws outside their actual work and not hinder them from fixing it themselves.

Kalogeropoulos (2018) points out that an important strategy for Anima regarding marketing has been that all marketing needs to be connected to generated sales, more specifically return on investment. Since a startup usually has little funds, all marketing efforts need to generate sales, otherwise, the risk is that the company throws money in the lake. He also points out the importance of forecasting and the risks of building too much inventory. The forecasting needs to be anchored in actual sales numbers and not what management think of the products, because often those forecasts are too positive. Another way to prevent building stock and get a more accurate forecast is to shorten the lead-times. Also, the business should be driven by batch orders which means that sales should learn to only sell what inventory the company have on hand. Doing this, the company will not oversell or sell the "wrong" products.

A valuable insight gained by Kalogeropoulos (ibid.) is that a company should only build its supply chain for a slightly larger demand than what is seen presently. A bad thing is that the supply chain can not produce and ship enough units, but worse is if a supply chain is scaled prematurely and the utilization of the supply chain is too low. Then the costs per unit rockets and the management wonder what is happening. This is also true for the company internally, where premature scaling might be a problem. Kalogeropoulos (ibid.) also identifies the opportunity to hire consultants to help to scale, because if the demand is not growing faster than the company, then it is easier to lay off a consultant than an employee. This helps the company to be agile.

#### 4.4.4 KPI:s during Growth Phase

From the self-completion questionnaire, Anima gave the highest score (5 points) to the supply chain attribute of *cost*, followed by the attributes of *agility* and *reliability* whom each were given 4 points. Hence, Anima considers the cost to be the most important attribute for the supply chain during the growth phase of a startup. 3 points were given to *asset management efficiency* and *responsiveness* respectively on a scale from 1-5. Thus, Anima does not consider asset management efficiency nor responsiveness to be a priority for the supply chain during the growth phase of a startup.

Regarding KPI:s, Anima recommends for a startup to monitor *order fulfillment cycle time*, *overall value at risk*, *cash-to-cash cycle time*, *total supply chain management costs*, and *cost of goods sold* when the startup is experiencing an exponential growth in sales volumes. For order fulfillment cycle time, the level-2 metric that Anima considers to be the most important to monitor during



the growth phase is *delivery retail cycle time*, followed by *make cycle time* and *deliver cycle time*. Least significant are *source cycle time* and *return cycle time*. For overall value at risk, *value at risk in the make* and *deliver process* of the supply chain are considered to be the level-2 metrics that are the most important to monitor according to Anima, followed by *value at risk in the sourcing process* of the supply chain. For cash-to-cash cycle time, the most important metric to track is *inventory days of supply*, followed by *days sales outstanding* and *days payable outstanding*. Regarding inventory days of supply, the most critical level-3 metrics to watch here are *inventory days of supply for work-in-process material*, *raw material*, and for *finished goods*. Regarding the KPI of total supply chain management costs, the *cost to make* is considered to be the most critical level-2 metric to monitor. *Cost to source* and *cost to deliver* are considered less significant, followed by *cost to return*. *Risk mitigation costs* are not regarded as relevant to observe at this stage according to Anima. For the last KPI, cost of goods sold, the level-2 metrics that Anima considers to have the most substantial impact are *direct material cost* and *direct labor cost*. The level-2 metric with the least impact on the KPI of the cost of goods sold is *indirect cost related to production*.

## 4.5 Case Company D, Hövding

### 4.5.1 Introduction to Hövding

Hövding started 2005 with the idea of making a bicycle-helmet that customers want to use. This idea came from a Master Thesis conducted at Lund University, where the two authors invented and conceptualized the airbag-bicycle-helmet. This led to the start of Hövding and their international expansion. Today the company sell their product in about 16 countries mostly around Europe, both to distributors (B2B) and to final customers (B2C). At their headquarters in Malmö, the authors got the opportunity to interview Marie Hult Johansson, Strategic Sourcing Manager. Her role has been to lead the project of moving the production from Portugal to a new manufacturer in China. After the completion of that project, she continued with strategic purchasing projects. (Hult Johansson 2018) From 2012, Hövding has grown and 2017 their net sales was 67 M SEK. Today more than 130 000 Hövdings have been sold and the company has around 35 employees. 2015 the company was introduced on NASDAQ. (Hövding 2018) According to Hult Johansson (2018), being publicly traded means that spotlights are on the company each quarter, and short-term goals have become more prominent. However, being publicly traded has also reinvigorated the company with an increase in cash flow.

Displayed in figure 4.4 is Hövding's positions in the Startup Life Cycle and Product Life Cycle, based on the interview with Hult Johansson (ibid.) as well as theory presented in the previous chapter. Since Hövding did an IPO 2015, they are per definition placed in the exit-phase in the startup life cycle, even though they are still searching for new market and ways to grow. Their

product is a novel solution to a traditional problem, hence the market they compete in is quite mature with a lot of substitutes.

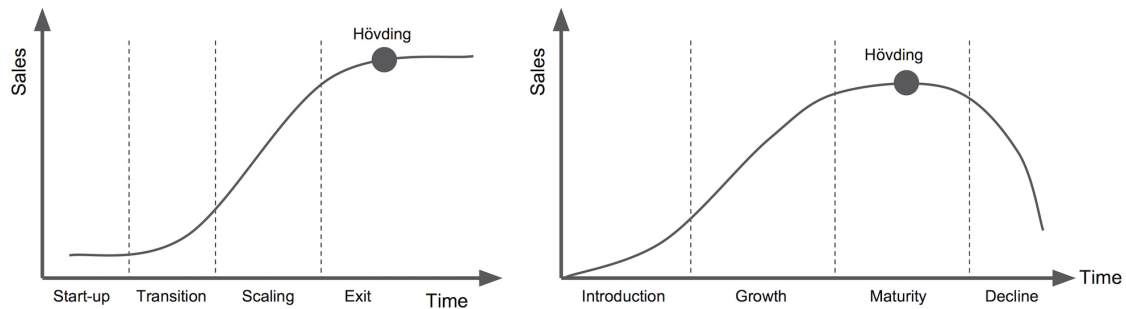


Figure 4.4: Hövding's Startup Life Cycle and Product Life Cycle

### 4.5.2 Hövding's Supply Chain

Today, Hövding produces their product and makes the final assembly in China, where they have partnered up with a producer of airbags and plastics to manufacture their product. There, the manufacturer is responsible for stocking parts and producing according to the forecast Hövding sends to them. Then, the products get shipped to Sweden to a company in Göteborg, who is responsible for keeping stock and shipping to distributors and final customers. Since the product is quite large and heavy, compared to many consumer electronics, they ship by boat from Asia to Sweden rather than flying its goods. The manufacturer in China is responsible for sourcing most standard components, while Hövding is responsible for some specially produced components. (Hult Johansson 2018)

### 4.5.3 Critical Success Factors

For Hövding, finding routines and efficiencies in the work is an important factor to be able to move from an entrepreneurial stage through the process of scaling. Hult Johansson (ibid.) highlights that a startup is used to having to invent the wheel for everything it does, however, when the company is maturing, repeatable processes have to be in place to gain efficiency. When more employees join the company, their process of finding their place is also easier when processes and routines are in place. Now that Hövding is growing, they are also looking to integrate their management systems to streamline their internal work better. This integration will also help to forecast production schedules as well as integrating production and distribution partners. Hult Johansson (ibid.) mentions three key factors to scaling, firstly to choose the right partners, secondly, watch the cash flow to be sure that the company is doing the right things and thirdly, optimize the geographical localization of both contractors and subcontractors.

When establishing a product in a new country, new rules and regulations apply. Hövding empha-

sizes the importance of making the product as generic as possible and then make alterations as late as possible if needed. For example, the manual can be made in many languages if that makes the distribution cheaper. As for being global, Hult Johansson (2018) points out that each establishment in a new geographical market comes with a cost and that the opportunity always should be weighed against the costs. Having the production in Asia is also a choice where the opportunities should be weighed against the costs. For example, each unit may be cheaper considering direct costs, but with the costs of managing the suppliers from this far away might not be cheaper. However, from a scaling perspective the large manufacturing firms, as well as suppliers, might be situated there. Right now Hövding uses an agency to solve easier production issues, and they might look into the economies of having an employee in Asia.

When choosing suppliers, Hult Johansson (ibid.) points out that suppliers close to the assembly site are to be preferred as well as good quality on the parts. Preferably, suppliers with ISO 9001 and 14000 certification as well as they should follow FN's ten compliance rules. These factors combined with the right cost and the right delivery time are the most important when choosing a supplier. As they are producing safety-products for them, quality is something that cannot be neglected, hence they sometimes have to choose a less efficient supply chain to acquire better quality. There are multiple ways to make sure the quality of the products is perfect. Audits, as well as quality sampling and manufacturing tests, should be made. Hövding works with all of these, however due to the long geographical distance, the opportunity of using partners to do the audits can sometimes be the solution.

For Hövding, their product is highly attractive for manufacturers to produce, since they have a novel, high-tech solution to a common problem. Their contractor feels proud to be part of Hövding's supply chain and itself learn from Hövding, especially since this particular contractor usually produces parts for larger products and never sees a finalized product. Hövding, in turn, can learn from the contractor, who is a large producer of products from a nearby industry. The win-win situation of relationships is essential to seek out and exploit. These kind of relationships are important to find, especially as a smaller company with smaller volumes, as the bargaining power is smaller than for a large volume company. As the volume goes up, the contractor can make the products cheaper which also produces a win-win. Hult Johansson (ibid.) points out that their international recognition has risen, and the implications of this are better agreements with suppliers and distributors financially. The larger volumes also help to negotiate better terms as well as lower prices.

#### 4.5.4 KPI:s during Growth Phase

From the self-completion questionnaire, Hövding gave the highest score (5 points) to the supply chain attribute of *asset management efficiency*, followed by the attributes of *responsiveness* (4 points) and *reliability* (3 points). Hence, Hövding considers asset management efficiency to be the

most important attribute for the supply chain during the growth phase of a startup. 2 points was given to *agility*, and 1 point was given to *cost* on a scale from 1-5. Thus, Hövding does not consider cost to be a priority for the supply chain during the growth phase of a startup.

Regarding KPI:s to monitor during the growth phase of a startup, Hövding recommends to track *upside supply chain adaptability*, *downside supply chain adaptability*, *cash-to-cash cycle time*, and *total supply chain management costs*. For upside supply chain adaptability, *upside adaptability for the sourcing process* is considered to be the most critical level-2 metric to monitor according to Hövding. Second most important is *upside adaptability for the make process* of the supply chain, followed by *upside supply adaptability for the delivery process*. The level-2 metrics considered to have the least impact on this KPI during the growth phase of a startup concern *upside return adaptability*, both for the source and delivery process of the supply chain according to Hövding. For downside supply chain adaptability, *downside adaptability in the sourcing process* of the supply chain is the most critical level-2 metric to monitor, followed by *downside adaptability in the make process*. *Downside adaptability for the delivery process* in the supply chain is considered to have the least impact on this KPI during the growth phase of a startup according to Hövding. For cash-to-cash cycle time, Hövding considers *inventory days of supply* to be the most important level-2 metric to monitor. Less significant is *days sales outstanding*, followed by *days payable outstanding* which is considered to be the least important metric to track. The level-3 metric that is thought to have the most significant impact on inventory days of supply is *inventory days of supply for finished goods*, followed by *inventory days of supply for work-in-process material*, and lastly *inventory days of supply for raw material*. Regarding the KPI of total supply chain management costs, Hövding considers the *cost to make* to have the most significant impact on this KPI for a startup during the growth phase, followed by *cost to source*, and then *cost to deliver*. The *cost to return* and *risk mitigation costs* are not considered to have a significant impact on the KPI during this stage.

## 4.6 Case Company E, Axis

### 4.6.1 Introduction to Axis

Axis was founded 1984 by two graduates from Lund University, with the idea to produce a module making it possible to connect a printer to an IBM mainframe. Since then, the company has grown to be a billion-dollar firm. Their main product today is security-cameras and tools for viewing and analyzing the captured video data. Their headquarters are situated in Lund, Sweden, but they have offices all around the world. They have a unique business model as they only sell their cameras to their distributors and never sell anything directly to customers or other firms. This creates trust between them and their distributors as well as incentive for the distributors to sell Axis' products. (Lindroth 2018) Since their early days, Axis' growth has been fairly steady with a

growth rate of approximately 10-40% per year. Today they have net sales of approximately eight billion SEK and are 2800 employees. (Axis 2018) At Axis, we had the opportunity to interview Robert Lindroth who has been working as Operations development manager at Axis for the last five years. (Lindroth 2018)

Displayed in figure 4.5 is Axis' positions in the Startup Life Cycle and Product Life Cycle, based on the interview with Lindroth (ibid.) as well as theory presented in the previous chapter. Axis left the startup life cycle a long time ago, since they did an IPO and are now a large corporation. Their main product, the cameras, competes in a well-matured market. However, there can still be some potential identified in the market, and thus the products are placed in the maturity phase of the product life cycle.

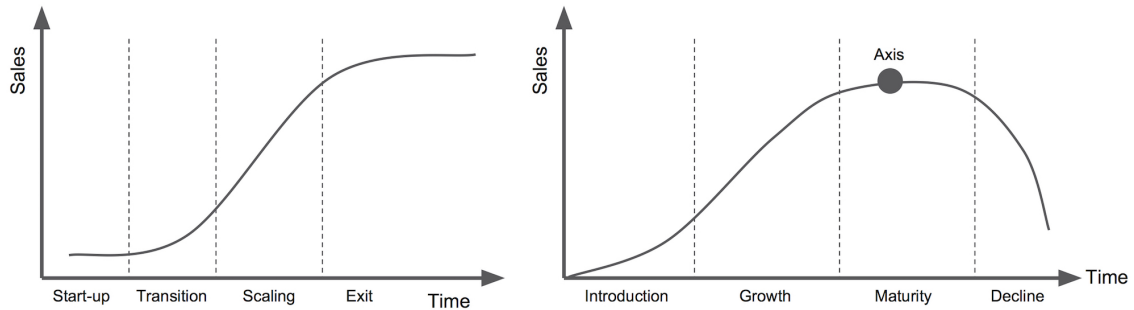


Figure 4.5: Axis' Startup Life Cycle and Product Life Cycle

#### 4.6.2 Axis' Supply Chain

Since Axis is a large global corporation, they have a complex supply chain. Axis does not have any production internally, but all production is done by contractors, most of them situated in Asia. The most critical components are sourced by Axis, and the rest is sourced by the contractors. After assembly, they ship the products to a configurations logistics center where they make the final assembly and software-updates before shipping the final product to the distributors. These configurations logistics centers are placed around the globe, hence generic products are produced in Asia and then country-specific modifications are done at the configurations centers. Axis cooperates with the largest manufacturing companies in camera production in the world. These companies are happy to produce Axis' products even though Axis does not have any huge volumes, but rather to learn from their leading research and developments. Such complex supply chain takes much work to run smoothly, and Axis has a large supply chain division in Lund dedicated to optimizing it. They also use much software to control and forecast their SKUs. (ibid.)

### 4.6.3 Critical Success Factors

Axis' production is mainly done in Asia, and then the products are shipped out to different configuration logistic centers to be modified for the specific customer or market. Since Axis is still a growing company with higher net sales each year, Lindroth (2018) points out that scalability is an important factor when designing a supply chain. For the company, each function has to grow to be able to handle the increasing demand, as well as the suppliers and distributors, have to be able to handle it. Axis contractors and configuration centers are mostly run by larger corporations, which means they all could supply Axis with larger volumes if needed. However, the market of electronic components is quite overheated which has made it harder to acquire the components and has boosted the lead times. This has made Axis consider securing components through stock or to design future cameras with less critical components. Axis use their contractors to source components since the contractors often have better bargaining power and can benefit from economies of scale. For a startup, finding a contractor that is willing to spend time and effort on manufacturing the product and sourcing components is harder. Then, going through middle hands may be the only way.

Axis where fast to become international with fast expansion into Germany and the US and are now present in most areas of the world. Lindroth (ibid.) emphasizes the importance and difficulty of maintaining an excellent homogeneous culture inside the company when growing. The positive effect of a good culture is threefold; first it makes Axis act as the same company all over the world, secondly it maintains a positive work culture and a sense of community all over Axis, and thirdly Axis' cultural values are applied to all new employees, hence only employing persons that fit the culture and has the same fundamental values. One of Axis most essential values is openness and transparency, which is vital to creating an including the atmosphere.

Axis decided early on that they should not produce anything in-house and only focus on their core competencies which include being innovative and developing efficient sales channels. By taking this decision, Axis managed to maintain high liquidity by avoiding building expensive factories. Since Axis did not tie a lot of capital, they had the capital for fast growth instead. This setup also enables fast growth since it is easier to adjust and keep the supply chain flexible if the production is outsourced. However, while there are benefits of outsourcing, there are also downsides of outsourcing. For example, while outsourcing the activity of production, the knowledge of production had to be kept in-house and maintained to be able to design, order and quality check the products. The communication and feedback of production are also less frictionless when not kept in-house since the company has to deal with another entity as well as other cultures and standards.

When Axis started as a startup, they chose local manufacturers, mostly because it was not easy or common for a startup to start as a born global company at that time. When growing, Axis had to find new contractors and distributors with higher capacity, and finally ended up where they are

today. Lindroth (2018) discusses the advantages and disadvantages of postponement, that is, the delay of adding value to a product, such as labeling and packaging. The cheapest thing is to finish assembling a product at the manufacturer in Asia and then ship to the configurations center for further distribution. However, the most flexible solution, which builds the least stock, is to ship a half-finish product to the configurations center, which product can turn into several different finished products. The math behind calculating the optimal solution is complex and often depends on variables hard to capture.

Lindroth (ibid.) points out the importance of network and relationships since all business is conducted between people. In the beginning, Mikael Karlsson, one of the founders, had an extensive network of business relations and from that built the network that accelerated Axis' growth. When utilizing a network, Lindroth (ibid.) emphasizes that a relationship should be long term, and not focus on capitalizing as soon as it is possible. This means that it is better to have a long-term partner than to take advantage of and make a one-time deal. During growth, this becomes even more important, however, the growth may also be seen as a bargaining power to "sell on a possible future volume." For example, a contractor might not want to partner up based on the volume of today, but if growth can be shown, they might want to build a relationship on the possibility of that future volume.

#### 4.6.4 KPI:s during Growth Phase

From the self-completion questionnaire, Axis gave the highest score (5 points) to the supply chain attribute of *responsiveness*, followed by the attributes of *reliability* (4 points) and *agility* (3 points). Hence, Axis considers responsiveness to be the most critical attribute for the supply chain during the growth phase of a startup. 2 points were given to *asset management efficiency*, and 1 point was given to *cost* on a scale from 1-5. Thus, Axis does not consider cost to be a priority for the supply chain during the growth phase of a startup.

Regarding KPI:s to track during the growth phase of a startup, Axis recommends to monitor *perfect order fulfillment*, *order fulfillment cycle time*, *upside supply chain adaptability*, and *downside supply chain adaptability*. For perfect order fulfillment, the level-2 metric that Axis considers to be the most important to monitor during the growth phase is *delivery performance to customer commitment date*, second most important is *% orders delivered in full*. Less critical is *perfect condition*, followed by *documentation accuracy*. For order fulfillment cycle time, the level-2 metric that Axis consider to be the most important to monitor during the growth phase is *deliver cycle time*, second most important is *make cycle time*. Less critical is *delivery retail cycle time* followed by *return cycle time*. For upside supply chain adaptability, *upside adaptability for the make process* is considered to be the most critical level-2 metric to monitor according to Axis. Second most important is *upside adaptability for the sourcing process* of the supply chain, followed by *upside supply adaptability for the delivery process*. The level-2 metrics considered to have the least impact on this KPI

during the growth phase of a startup concern *upside return adaptability*, both for the source and delivery process of the supply chain according to Axis. For downside supply chain adaptability, *downside adaptability in the delivery process* of the supply chain is the most critical level-2 metric to monitor, followed by *downside adaptability in the make process*. *Downside adaptability for the sourcing process* in the supply chain is considered to have the least impact on this KPI during the growth phase of a startup according to Axis.

## 4.7 Cross Case Findings

To summarize the empirics, some cross-case findings will be presented. Notably, all companies do research and development in-house as well as some of the companies does software production. However, none of the interviewed companies do any hardware production in-house. The core competencies are thus research and development, sales and marketing, support, as well as some functions that differ from company to company. The cross case findings are divided below between Supply Chain findings, Critical Success Factors and KPIs during growth phase.

### 4.7.1 Supply Chain Findings

Many of the interviewees discussed the issue of globalization and of outsourcing the production locally or to Asia. The tradeoffs are quite clear from all the interviews; either the production contractor is close and easy to manage and communicate with but incurs higher costs, or the production contractor is cheap and close to most sub-parts but harder to manage and communicate with. Hövding, Anima, and Axis prioritize the costs and thus have their manufacturing in Asia. (Hult Johansson 2018; Lindroth 2018; Kalogeropoulos 2018). Orbital and Modcam, however, put their manufacturing closer to their headquarters to be able to more easily adjust and manage their contractor, as well as having larger flexibility. (Arnesson 2018; Johansson and Tudosoiu 2018) Johansson and Tudosoiu (2018) also emphasized that it is important to find long-term partners that a business can grow together with, thus exploiting the learning curve.

Kalogeropoulos (2018) and Hult Johansson (2018) both addresses the issue of determining when to enter a new geographical market. The sales team often want to be in as many markets as possible since the larger population of possible customers the better. However, there is an entry cost to each new market, including a supply chain entry cost. Therefore, the opportunity for a new market should be weighed against the costs.

All of the interviewees valued quality highly, but two companies were emphasizing it more. Hövding explained that their product is a safety product and could hurt a person if it malfunctions. Their supplier selection and quality control are therefore well thought through to secure good quality standard on their product. Orbital's product is installed in people's homes and is hard to repair



if broken. Thus, both these companies valued quality higher than the other companies. (Hult Johansson 2018; Arnesson 2018)

Both Axis and Hövding discuss the possibility of postponing differentiation of their product, hence keeping the product generic for as long as possible as this makes the company more flexible and can have lower stock-levels. However, postponement can be costly as value adding activities have to be performed in countries with more expensive labor. As in many things, this situation is also made up of a complex trade-off which has to be assessed. (Lindroth 2018; Hult Johansson 2018)

#### **4.7.2 Critical Success Factors found**

All companies highlighted the importance of planning for higher turnover and the complexity of doing so. Scaling prematurely might turn out wrong and hurt the liquidity of the business since it is hard to forecast the true growth in the future. However, not preparing enough might cost sales or produce unsatisfied customers. Johansson and Tudosoiu (2018) and Hult Johansson (2018) emphasize the importance of watching the cash flow to make sure the company makes the right things and do not risk bankruptcy. Each interviewee discusses their businesses individual problems, however, they all emphasized that it is hard to forecast when it is the right time to grow and what functions of the company to focus on then. Kalogeropoulos (2018) identifies the possibility to use buffers when scaling, in this case, consultants. Hult Johansson (2018) instead presented three important factors to consider when scaling; choose the right partners; watch the cash flow and; optimize the geographical location of contractors and subcontractors.

Both Arnesson (2018) and Kalogeropoulos (2018) commented that for a startup with limited funds and investors that want to see results, there is usually no time to research the most cost-effective solution. Then, it might be better to take decisions, and later hope that they are the right decisions. Both comments that that is not very optimal, but it is how the startup landscape looks like. Arnesson (2018) underlined the challenge to produce a complex product which requires expertise in many areas. The financial constraints of a startup hinder this multitude of internal knowledge, something that is true for more of the high-tech companies interviewed.

All the interviewed companies seem to value their network highly, both their manufacturing network as well as their closer stakeholder-network. Modcam, as well as Axis and Orbital Systems, said they valued their investor-network highly, not only because they helped out with funds but also because of their expertise and further contacts. (Johansson and Tudosoiu 2018; Lindroth 2018; Arnesson 2018) Many of the interviewed companies had previously worked for other companies, where they had gained many contacts which were still relevant. All businesses are conducted between people, which is another reason to value and maintain the network. Hövding and Axis both commented on the importance of selling your business and business idea to contractors. For example, Hövdings contractors value Hövding, even though their volumes are fairly low. Hövding

sold their high expertise instead and offered the possibility of future growth to get them onboard. (Lindroth 2018; Hult Johansson 2018)

The three largest companies interviewed, Hövding, Anima, and Axis all pointed out the difficulties with transforming from focusing on research and development to focusing on sales and marketing to generate growth in sales. Often the founders are R&D oriented but do not have any previous experience in sales, thus having a hard time pivoting to focus on this. The three largest companies interviewed have all made this step and knows how difficult it can be. (Hult Johansson 2018; Lindroth 2018; Kalogeropoulos 2018)

Anima and Axis emphasize the importance of having a strong culture when hiring new personnel and growing. To keep a healthy work environment as well as keeping a homogenous culture between offices is important to communicate strong values internally as well as only hiring candidates with the right values from the beginning. Openness, transparency, and curiosity are common values the companies have communicated. (Kalogeropoulos 2018; Lindroth 2018)

On a concluding note for the critical success factors, many of the companies said the same thing about the difficulties about going from a startup company to a significant global competitor. Many factors seem to play a role, and the landscape of scaling is hard to assess. What markets should be targeted and with what sales channels? Where should the production be situated and what supply chain should be applied? The interviewed companies seemed to identify the complex landscape and have their idea of what solutions are the best.

### 4.7.3 KPI:s during Growth Phase

The findings from the self-completion questionnaire regarding important attributes of the supply chain during the growth phase of a startup are summarized in table 4.2. The companies were asked to score each attribute between 1-5 points, where 1 point was given to an attribute that was not considered to be important for the supply chain during the growth phase of a startup, and 5 points were given to an attribute that was considered to be very important during this stage.

Table 4.2: Most important attribute of supply chain during growth

<i>Attribute</i>	<i>Modcam</i>	<i>Orbital Systems</i>	<i>Anima</i>	<i>Hövding</i>	<i>Axis</i>	<i>Aggregated score</i>
<i>Reliability</i>	4	2	4	3	4	17
<i>Responsiveness</i>	5	1	3	4	5	18
<i>Agility</i>	5	5	4	2	3	19
<i>Asset Management</i> <i>Efficiency</i>	4	4	3	5	2	18
<i>Cost</i>	3	3	5	1	1	13

From table 4.2, it can be seen that agility is the attribute that receives the highest score of 19

points out of a maximum score of 25. This is closely followed by the attributes responsiveness and asset management efficiency who each received an aggregated score of 18 points, then by reliability who received 17 points. The small difference in points between the attributes with the highest score is considerably low. However, there seems to be a consensus among the interviewed companies that the attribute of cost is moderately desirable to strive for in the supply chain at this stage, apart from Anima who considers cost to be an essential attribute for the supply chain as sales volumes grow. Both Modcam and Orbital Systems gave responsiveness the highest score of 5 points, whereas Hövding and Axis gave agility a lower rating. Modcam and Axis both consider responsiveness to be one of the most important attributes of a supply chain during the growth phase of sales volumes. However, Orbital Systems only gives this attribute 1 point in the survey. Asset management efficiency received the highest score (5 points) by Hövding, whereas Axis only scored the attribute with 2 points.

The findings from the self-completion questionnaire regarding KPI:s to track in order to monitor and evaluate the performance of the supply chain during the growth of sales volumes for a startup can be seen in table 4.3.

Table 4.3: Most important KPI:s to monitor during growth

<i>KPI</i>	<i>Modcam</i>	<i>Orbital Systems</i>	<i>Anima</i>	<i>Hövding</i>	<i>Axis</i>
Perfect order fulfillment					x
Order fulfillment cycle time	x	x	x		x
Upside supply chain adaptability				x	x
Downside supply chain adaptability				x	x
Overall value at risk		x	x		
Cash-to-cash cycle time	x	x	x	x	
Return on supply chain fixed assets					
Return on working capital		x			
Total supply chain management costs			x	x	
Cost of goods sold	x	x	x		

From table 4.3, it can be seen that none of the interviewed companies considered the KPI return on working capital to be essential to monitor during the growth of sales for a startup. Return on working capital is not either considered to be of high relevance at this stage, and only Orbital Systems marked the KPI as essential to track. The same goes for perfect order fulfillment, which only Axis considers as an important KPI. Both Hövding and Axis believe that KPI:s regarding upside and downside supply chain adaptability should be monitored at this stage of a startup. However, this opinion is not shared amongst the other correspondents. Hövding and Anima also share the view of total supply chain management cost being a critical KPI to track. Regarding overall value at risk, only Anima and Orbital Systems think that a startup should monitor this KPI in as sales volumes start to increase for the startup. Cost of goods sold was considered an important metric to measure in order to evaluate the performance of the supply chain by three

correspondents; Modcam, Orbital Systems, and Anima. The KPI:s with the highest relevance according to the result of the survey are order fulfillment cycle time and cash-to-cash cycle time, whom each was considered to be relevant by 80 percent of the correspondents. The level-2 metric of inventory days of supply was found to have the most significant impact on the company's cash-to-cash cycle time. Hövding was the company who did not consider order fulfillment cycle time to be a relevant KPI to track at this stage, and Axis was the company who did not consider cash-to-cash cycle time to be a relevant KPI at this stage.

## Chapter 5

# Analysis

*This chapter includes the analysis of reviewed theory together with the gathered empirical data. First, a summary of the supply chain strategies and their respective objectives as defined by Lee (2002) are presented. Then, a supply chain strategy will be matched to each stage depending on the characteristics of the ingoing factors in the analysis. Afterward, identified critical success factors for the particular stage will be presented.*

## 5.1 Summary of Supply Chain Strategies

Before going into the analysis, let us review the different supply chain strategies presented by Lee (2002) one more time. The supply chain strategies are summarized in table 5.1.

Table 5.1: Summary of Supply Chain Strategies

<i>Supply Chain Strategy</i>	<i>Description</i>
<i>Efficient Supply Chain</i>	Should pursue scale of economies, optimization in capacity and distribution and cost-efficient, accurate distribution of information across the supply chain
<i>Responsive Supply Chain</i>	Should pursue strategies to be responsive and flexible to the changing demand and needs of the customer
<i>Risk-hedging Supply Chain</i>	Should implement an efficient supply chain downstream and hedge for uncertainties upstream
<i>Agile Supply Chain</i>	Should pursue strategies to be responsive to demand uncertainty, like responsive supply chains are, while hedging for supply uncertainty upstream

Industry characteristics, product type, stage in the product life cycle, and stage in the startup life cycle will each receive a recommended supply chain strategy that is matched to strategies mentioned in table 5.1. This will be accompanied by critical success factors as identified in the literature review as well as in the collected empirical data for the particular factor or stage.

## 5.2 Industry Characteristics

### 5.2.1 Supply Chain Strategy

According to Lee (ibid.), the matching supply chain strategy depends on the combination of demand- and supply uncertainty in the market. To determine the right supply chain strategy for a company based on the industry characteristics, Lee's supply chain uncertainty model can be applied. The framework with matching supply chain strategies can be found in table 5.2

Table 5.2: Lee's Uncertainty Framework with Matching Supply Chain Strategies

	<i>Demand uncertainty low</i>	<i>Demand uncertainty high</i>
<i>Supply uncertainty low</i>	Efficient supply chains	Responsive supply chains
<i>Supply uncertainty high</i>	Risk-hedging supply chains	Agile supply chains

Thus, all of the suggested supply chain strategies can be relevant for the startup to apply if only industry characteristics are taken into account. It is the nature of demand and supply uncertainty in the market that will determine the most suitable strategy for the supply chain. As mentioned by Lindroth (2018), the market for electronic components is currently overheated, which means

that the aggregate demand is higher than the productive capacity of the industry. This results in high supply uncertainty and, as a result, either an agile or risk-hedging supply chain strategy may be suitable for a company that is sourcing complex electronic components.

### **5.2.2 Identified Critical Success Factors**

As Lee (2002) describes with his uncertainty model, it is essential for a company to identify the level of uncertainty both on the demand side as well as on the supply side in order to determine on the right supply chain strategy. We argue that Porter's Five Forces is a good strategic tool to use to assess the level of uncertainty on the market. For the company to use Porter's Five Forces successfully, it is critical that the company knows who its customers are and how they are using the product. This can be difficult for a startup as their customer segment may yet be undefined, and not enough data has been collected to assess the level of demand uncertainty. On the supply side, it is essential for the startup to know the market trends and how to secure critical components.

What is a common denominator for the interviewed case companies is that they are competing on a global market, which has resulted in several challenges for all. One issue is that of country-specific requirements forcing the startup to create multiple SKU:s of virtually the exact same product to comply with the rules and regulations for a particular country. A critical success factor as mentioned by Hult Johansson (2018) is that the customization should take place late in the supply chain to have a standardized process for as long as possible. Another issue with competing on a global market is that of having to pay tariffs for import and export of components and finished products. As protectionism is an increasing concern affecting companies that are operating on a global level, it is essential to have this in mind when deciding upon which markets to serve and where the manufacturing is to take place. The company experiencing the least effect from increased tariffs is Modcam, who manufactures in Sweden and ships their product from their HQ to the world. They consider tariffs to be an unrelated problem. As finances usually are scarce for a startup, as stated in the literature review, the impact of tariffs need to be taken into consideration when deciding upon a manufacturing and distribution strategy for the supply chain for the startup to identify and minimize costs associated with import and export of goods and components. Thus, the startup must consider its supply chain strategy when assessing trade-offs between local or off-shore manufacturing and distribution.

## 5.3 Product Type

### 5.3.1 Supply Chain Strategy

To determine whether it is a functional or innovative product the supply chain is to be designed for, the product characteristics could be matched with Fisher's demand aspects. However, not all aspects of demand might be applicable in the case of a startup, or in the early stages of a product's life cycle. The product of a startup will most likely not have a large variety as of yet. The average margin error in the forecast is also likely to be high as the startup might not have an identified market segment, and it is always a gamble predicting sales volumes when there is no historical data to base forecasts on. The product might also have a longer lead time in the early stages of the product life cycle or the startup life cycle as processes have not yet been established. Hence, the strategic tool for determining product type and the matching supply chain factors, other factors needs to be taken into account. However, as Fisher (1997) argues, a functional product benefits from an efficient supply chain strategy, and an innovative product benefits from a responsive supply chain. This recommendation is based on the level of uncertainty regarding downstream demand. Thus, linking this to Lee's Uncertainty Framework, it would mean that a functional product would benefit from having either an efficient or risk-hedging supply chain strategy, whereas an innovative product would benefit from having either an agile or responsive supply chain strategy.

### 5.3.2 Identified Critical Success Factors

As mentioned by Arnesson (2018), the level of product complexity affects the choice of an appropriate supply chain strategy. As Orbital System's product is both highly customized, complex, and bulky it is not profitable for them to have a lot of finished goods in inventory. This increases the lead time of the product significantly. However, Orbital System's customers do not value speed as they are placing an order on the product far in advance due to the customers' need to plan early. This allows for Orbital Systems to focus less on speed in the supply chain. However, as mentioned by Hult Johansson (2018), full availability of their product is critical since their customers are expecting to be able to buy a bicycle helmet off-the-shelf. Thus, a critical success factor is to identify customer delivery preferences for the product as well to choose the most suitable supply chain strategy.



## 5.4 Product Life Cycle

### 5.4.1 Introduction Stage

#### Supply Chain Strategy

As identified from the literature review, the characteristic of the introduction stage in the product life cycle is that sales volume will be low. As the product is anticipated to reach relatively low sales volumes, it is difficult to standardize processes, achieve economies of scale and draw any experiences from the learning curve in order to lower costs or improve product quality. Thus, the right supply chain strategy at this stage will not be to strive for an efficient supply chain. It does not appear that the customer that will purchase the product at this stage is sensitive to price, which makes it able for the startup to charge a higher price to cover for the inefficiencies in the supply chain. According to Johansson and Tudosoiu (2018), it is beneficial to have the production close to the headquarter even though that incurs higher production costs. A risk-hedging supply chain is not desirable either as it is difficult to achieve efficiencies with the low sales volumes both upstream and downstream in the supply chain. However, the customer seems to value availability and speed to market based on the conducted literature review. This argues for the startup to go with either an agile or responsive supply chain strategy at this stage. This is further supported by Arnesson (2018), who claims that agility at this stage is important as many changes to the product are made.

#### Identified Critical Success Factors

One identified critical success factor at the introduction stage is that the design of the product should be standardized. However, it is difficult for a startup to choose a design since a standardized design has to be anchored in what the customer wants, and usually, a startup does not know that from the beginning. Even though a standardized design is not needed to be successful at the introduction stage, it is important to prepare for a rapid increase in demand nonetheless. A standardized design will allow for greater flexibility in the supply chain, which is necessary in the event of a sudden surge in demand. What is critical at this stage is to monitor the rate of the demand as a change in demand might require a different supply chain strategy.

Based on the collected empirical data, it has been concluded that Orbital Systems has a product that is in the introduction stage in the product life cycle. As the product is very immature at this stage, Arnesson (ibid.) argues for a need to keep production close to the R&D function of the company. The proximity of the two functions allows for changes in product design to be made quickly, which is desirable as changes in product design are common in the introduction stage of a product. It is due to this specific reason that Orbital Systems has chosen to execute

the manufacturing activity in-house, since R&D constantly developed and improved their product even when it was already in production. Having an external partner to manufacture the product would lead to less agility in the supply chain, and as the focal company is the one with most product knowledge at this point it is considered to be more beneficial to produce in-house. For the company to move their product to the next stage in the product life cycle, Arnesson (2018) argue that it is the responsibility of every function within the startup to sell the product. If the supply chain function is able to sell in the product to both upstream- and downstream suppliers, they might gain more beneficial deals with better partners. Thus, the possibility of being successful whilst at the same time have cash on hand increases.

## **5.4.2 Growth Stage**

### **Supply Chain Strategy**

In the growth stage, it is likely to experience some learning effects as the sales volumes will have gone up at this point. This allows for the supply chain to gain efficiencies in their processes, and achieving efficiencies in production is desirable at this stage. Some flexibility in the supply chain is needed to make adjustments in the product based on the customer feedback that is now being received. Adaptivity and responsiveness are two essential factors during the growth stage of the product as availability is key and demand is uncertain. Flexibility in the supply chain at this stage has also been identified as crucial by Johansson and Tudosoiu (2018). Thus, the appropriate supply chain strategy for this stage is to be either responsive or agile.

### **Identified Critical Success Factors**

A critical success factor during the growth stage is utilizing the company's network to respond quickly to changes in demand. Thus collaboration among partners is key. Continuous improvements in product design and optimizing distribution channels are also necessary to implement at this stage as the customer is starting to value quality more. As these investments might be costly and do not give immediate pay-off, startups may not consider it to be a priority as they often have a short-term focus. Thus, another critical success factor at this stage is to start to have a long-term focus to be successful at later stages in the product life cycle.

As presented in figure 4.1 and 4.3, the case companies that are considered to have their products in the growth stage of the product life cycle are Anima and Modcam. Kalogeropoulos (2018), co-founder of Anima, stresses the importance of having identified the right sales channels for the product and make sure that the sales channels are treated equally. This is critical to maintain a good relationship with all distribution partners in the startup's sales channels. Kalogeropoulos (ibid.) further argues that it is essential to monitor inventory levels at this stage. Inventory means

tied-up capital for the startup as well as an increased risk of products becoming obsolete. To cope with this matter, Kalogeropoulos (2018) suggests either that production forecasts are based on actual sales numbers and not anticipated demand by the management team, or that lead times in the supply chain are reduced. Kalogeropoulos (ibid.) states that if forecasts are based too much on the expectations of sales from the management team, the startup poses the risk of having scaled prematurely. This might lead to rapidly increased costs in the supply chain as it will contain too much over-capacity in to be profitable. However, flexibility at this stage is a critical success factor to secure availability as stated by Johansson and Tudosoiu (2018).

### **5.4.3 Maturity Stage**

#### **Supply Chain Strategy**

A significant difference from the previous stages in the product's life cycle is that the company now will experience a more steady demand. This will have a positive impact on the firm's ability to plan production and distribution, thus allowing the firm to reduce costs and experience some economies of scale due to the now larger sales volumes. Because of an intensified competition on the market, a larger focus will be put on the price of the product as well as its level of differentiation compared to the other competing products on the market. Due to these circumstances, a firm will benefit from having an efficient supply chain strategy at this stage to be profitable.

#### **Identified Critical Success Factors**

As Hall (1980) suggests, the company must choose between taking either a cost-leadership position in the market or a leadership in product/service/quality differentiation. To be able to compete at this stage, it is critical to have developed a close relationship with the actors in the company's supply chain network in order to expand the company's existing capabilities. A close relationship with the actors in the company's supply chain network also results in reduce uncertainties and greater learning effects. It is also important to focus on the delivered customer value at this stage to satisfy current customers and to have the ability to steal customers from competitors.

A critical success factor at this stage as identified from the interview with Hövding, who is considered to have a product in the maturity stage of the product life cycle, is that even though sales volumes have increased at this point, a startup should still think twice before moving their production to Asia. The company might experience a reduction in production costs, but the transaction costs for managing the partners in the supply chain will increase significantly. To reduce transaction costs and enhance communication between the focal company and its suppliers, the manufacturing plant, and distribution partners, Hult Johansson (2018) argue that the focal company will benefit from having an employee managing these partners on-site. Another important

point that Hult Johansson (2018) makes is that the increased production volumes will allow for a startup to negotiate better prices and payment terms when in the maturity stage of the product life cycle.

Axis is the other interviewed case company that is considered to have products in the maturity stage of the product life cycle and they have been able to maintain products at this stage for quite some time. As Axis have multiple SKU:s they do consider a critical success factor, as mentioned by Lindroth (2018), to be a postponement of final assembly to keep products as generic as possible throughout the supply chain. This will result in less stock in the supply chain, thus making it leaner. Lindroth (ibid.) further argues that as sales volumes now are at its peak, economies of scale are realizable. As Axis has grown its business continuously over the last decades, Axis has chosen to partner with larger corporations that have the capacity to increase production volumes over time. Thus, as Axis continuous to grow there is no need for them to change production partners. The success factor here lies in the ability to pick the right partners to continue to grow with.

#### **5.4.4 Decline Stage**

##### **Supply Chain Strategy**

As sales volumes will start to decrease at the decline stage, realizing benefits from economies of scale becomes more challenging to achieve. However, as many authors suggest that the strategy at this stage should be to milk profits for as long as possible, an efficient supply chain strategy is suggested to be pursued in to be profitable at this stage.

##### **Identified Critical Success Factors**

A critical success factor at this stage is to keep current customers satisfied with the now old product, whilst at the same time supporting a new product or service at the market. This new product is what will make the company successful when the demand for the old product cease to exist. Axis is the interviewed case company with the most experience of products that have entered the decline stage, as their initial product was a module making it possible to connect a printer to an IBM mainframe and today their main products are security-cameras and tools for viewing and analyzing the captured video data. As Axis has both introduced and withdrawn products from the market, it has been essential for them that their current manufacturers are able and willing to continue to partner up with Axis and learn from producing Axis' new products. This way, there is no need to change production partners even though a new product is being introduced whilst at the same time laying off production for the old product.

## 5.5 Startup Life Cycle

### 5.5.1 Startup Stage

#### Supply Chain Strategy

From the conducted literature review the conclusion can be drawn that a high level of uncertainty characterizes this stage. Due to this, either a responsive or agile supply chain strategy is recommended to use at this stage. Modcam is the interviewed case company that is considered to be in the startup stage of the startup life cycle, and they stress the importance of being flexible at this stage and not focus on cost at all. This is due to the fact that they need to show progress to their investors, and the ability to prove that their product actually works is currently more valuable than reducing costs in the supply chain. (Johansson and Tudosoiu 2018) Thus, this also supports the suggestion of having either an agile or responsive supply chain strategy at this stage.

#### Critical Success Factors

Due to the lack of market knowledge about the company, it is critical to develop a close relationship with partners in the supply chain and use their channels to make beneficial deals both upstream and downstream in the supply chain. However, it is important that the company does not "sell out" because of its high dependency on the external network. Commitments made at this stage must still be somewhat flexible so that the company avoids a lock-in situation with an actor in the supply chain. Otherwise, the firm might be stuck with a partner in the supply chain that is not able to deliver as required during the different stages that the startup will go through. Another thing that is crucial at this stage is for the company to focus on defining their product, its market niche and what their competitive advantages should be as to be able to design the supply chain accordingly. Due to the limited resources of the startup at this stage in the life cycle, Johansson and Tudosoiu (ibid.) from Modcam stress the importance of optimizing the utilization of the existing resources. Modcam is doing this by only serving B2B and not B2C, as they consider the return of investment for serving B2C to be low or even negative. Having a B2B sales model allows for Modcam to serve fewer customers but with larger sales volumes. By doing this, Modcam is able to use fewer resources internally, whilst at the same time have equal, or even higher, sales volumes compared with having a B2C sales model.

## 5.5.2 Transition Stage

### Supply Chain Strategy

As described in the literature review, the transition stage is a critical phase in the life cycle of a startup. Picken (2017) mentions several features concerning the design of the supply chain at this stage, such as being efficient enough to build financial capabilities, maintain customer responsiveness and flexibility, as well as to hedge for a rapid increase in demand. As Orbital Systems is the case company that has been identified to be in the transition stage of the startup life cycle, one learning drawn from the interview with Arnesson (2018) is that it is important to add extra capacity to the supply chain at this stage to hedge for an increase in demand. Thus, a level of flexibility is still considered to be crucial to serve a high uncertainty in demand. Due to this, either an agile or responsive supply chain strategy is recommended to apply at this stage.

### Critical Success Factors

The key to success at the transition stage lies in the planning of future events to come. As discussed by Picken (2017), many of the challenges associated with this stage concern the management of the internal organization. It is important to establish processes and routines whilst at the same time keeping a high level of responsiveness in the organization to be successful at this stage, as well as developing an appropriate organizational culture. Having established an corporate culture together with setting the company values was crucial during this stage according to Kalogeropoulos (2018), co-founder of Anima. This allows for the firm to recruit people that are aligned with the company's identity and have the required skills for the role, which helps the firm to be successful as its employees will share the same values and strive for the same goal. Another critical success factor during the transition stage according to Arnesson (2018) is that the supply chain must have extra capacity to manage a rapid increase in demand. It is due to this factor that Orbital Systems is currently looking to move their production from performing it in-house to outsource it to an external partner. To still have a level of flexibility in the manufacturing process, the external production partner will be located in Sweden to allow decisions and alterations to be made on relatively short notice. However, moving the production to an external partner forces Orbital to focus on achieving higher accuracy in their sales forecast as the external partner needs this information to be able to plan their own operations.

### 5.5.3 Scaling Stage

#### Supply Chain Strategy

The scaling stage is the stage where the startup is expected to become profitable, which means that the startup must now focus more on achieving efficiencies in the supply chain than before. The company will most likely experience an increased level of efficiency in its operations due to learning effects, but economies of scale are not anticipated to be achieved just yet. However, a level of flexibility is still desirable to be able to adapt to external factors according to Nielsen and Lund (2018). The organization should also be freed from capacity constraints at this stage. The interviewed case company considered to be in the scaling stage is Anima, where Kalogeropoulos (2018) argue that having excess inventory in the supply chain at this stage will increase costs, which is not desirable. Hence, the startup should focus on having a lean supply chain, thus a more efficient supply chain strategy at this stage.

#### Critical Success Factors

What is essential during the scaling stage is that every added input must result in a higher degree of output. One way of increasing output is to add extra sales channels to allow for an increased product volume to reach the market at the same time. Another way is to involve supply chain partners and customers more in the business model to leverage on their resources.

Kalogeropoulos (ibid.) emphasizes the importance of the sales function within the startup at this stage, as they are responsible for paying all the salaries and the bills of the company. As added inputs to the firm are to generate a higher degree of output, Kalogeropoulos (ibid.) argues that the profitability of each new country-market must be assessed prior to launch. This is due to the country-specific rules and regulations that must be complied with, which results in a fixed cost for the company. If the sales volumes are low for that market, the payback time of the investment might be too long to be considered profitable. Another key to success at this stage as mentioned by Kalogeropoulos (ibid.) is to add temporary resources to the organization, such as consultants. These types of resources are easy to lay off and increases the startup's flexibility if the outcome is not as anticipated for the firm.

Hövdning is also one of the interviewed case companies that have been through the scaling stage in the startup life cycle, and Hult Johansson (2018) argues that it is important to have processes and routines in place to support the firm through the stage of scaling. One way to do so is by implementing management systems to enhance communication both internally as well as with external actors. Furthermore, Hult Johansson (ibid.) claims that key to success in the scaling stage lies within the firm's ability to choose the right partners to grow with, monitor the cash flow, and optimize the geographical location of actors in the supply chain network.

## 5.5.4 Exit Stage

### Supply Chain Strategy

The exit stage can either be positive for the startup, such as going through an IPO, or negative, such as the need to declare bankruptcy due to the business being unprofitable. Hövding is the interviewed case company that has recently gone through the exit stage of the startup life cycle in the form of an IPO. Hult Johansson (2018) claims that an IPO may have either a positive or a negative effect on a startup. Flexibility decreases significantly, and there is a larger focus on short-term goals for each quarter. This means that investments that have a longer payback time but will lead to efficiencies and other advantages in the long-term become less prioritized. The positive effect is that the company will increase its cash flow, thus allowing them to make critical investments to support the growth of the company. However, no strong argument has been laid forward regarding a specific supply chain strategy at this stage in either the collected empirical data or when conducting the literature review.

### Critical Success Factors

As mentioned by Pisoni and Onetti (2018), a challenge when for example exiting through an M&A is the fact that startups lack proper historical data to determine both its current and future value. Thus, the better the quality of the historical data is, the easier it will be to make a correct evaluation. However, as experienced from both the literature review as well as the gathered empirical data, administrative work is not prioritized by startups. A critical success factor may, therefore, lie in a greater focus on logging data at an early stage.

## 5.6 Summary of Matching Supply Chain Strategies

Based on the analysis the following framework named *The Startup Supply Chain Strategy Framework*, has been developed to guide a startup in determining the most suitable strategy for its supply chain, see table 5.6

Table 5.3: The Startup Supply Chain Strategy Framework

	Industry Characteristics				Product Type		Product Life Cycle				Startup Life Cycle			
	Demand Uncertainty		Supply Uncertainty		Functional	Innovative	Introduction	Growth	Maturity	Decline	Startup	Transition	Scaling	Exit
	High	Low	High	Low										
Responsive	x			x		x	x	x			x	x		n/a
Agile	x		x			x	x	x			x	x		n/a
Efficient		x		x	x				x	x			x	n/a
Risk-hedging		x	x		x									n/a

The framework should be seen as a strategic tool for startups to use throughout the life cycle



of both the startup as well as their offered product. As the startup and the product go through different stages in their respective life cycles, different supply chain strategies may apply. Thus, the ingoing factors in the framework should be reviewed on a regular basis to ensure that the startup is using the proper strategy at the time.

Trade-offs have to be made and alternatives assessed as factors may recommend contradicting strategies. For example, if a company is in an industry with low supply and demand uncertainty, this would indicate that an efficient supply chain strategy is desirable. However, the startup might be in the transition stage, where either an agile or responsive supply chain strategy is applicable. Alternatively, an efficient supply chain may be difficult to achieve due to the limited resources of a startup even though it is the best-suited strategy in regards to market conditions. This is where it is essential for the startup to have a long-term perspective of its business and understand that different strategies are desirable during different stages of both the product and the startup life cycle. If the startup knows that an efficient supply chain strategy is what the market requires to be profitable in the long-term, they can make informed decisions that give room for changes in the design of the supply chain as the firm or the product matures. As an example, Modcam's manufacturing partner has production plants in Sweden, Eastern Europe, and Asia. Due to the current relatively low sales volumes of the company, no efficiencies would be achieved if Modcam was to move the manufacturing process to the production plant in either Eastern Europe or Asia. However, as sales volumes go up for Modcam, their manufacturing partner has the ability to move Modcam's production to its other production plants where they have a larger capacity. Thus, a startup's supply chain partners can provide the flexibility needed for a startup to move between different supply chain strategies quickly.

## 5.7 KPI:s during Growth Phase

First, let us review the SCOR performance attributes and their level-1 metrics once again, see table 5.4.

Table 5.4: SCOR Performance Attributes

	<i>Attribute</i>	<i>Strategy</i>	<i>Key Performance Indicators</i>
Customer	Reliability	Consistently getting the orders right, product meets quality requirements	- Perfect order fulfillment
	Responsiveness	The consistent speed of providing products/services to customers	- Order fulfillment cycle time
	Agility	The ability to respond to changes in the market (external influences)	- Upside supply chain adaptability - Downside supply chain adaptability - Overall value at risk
Internal	Cost	The cost associated with managing and operating the supply chain	- Total SCM costs - Cost of goods sold
	Assets	The effectiveness in managing the supply chain's assets in support of fulfillment	- Cash-to-cash cycle time - Return on SC fixed assets - Return on working capital

As the growth phase represents the point in time where the startup will experience exponential growth in sales volumes, this is related to both the scaling stage in the startup life cycle as well as the growth stage in the product life cycle. As stated in 5.4.2, the growth phase of the product life cycle favors either an agile or responsive supply chain strategy, whereas the scaling stage in the startup life cycle promotes a more efficient supply chain to become profitable, see 5.5.3. This may seem contradictory, however, due to the learning effects that the startup and its partners in the supply chain are expected to experience at this stage will allow for the supply chain utilize its assets more efficiently while at the same time being agile or responsive. As order volumes rise, unit fixed costs will fall as the fixed costs will be spread out over more units. Thus, efficiencies can be achieved without any significant reconstructions of the supply chain. From the cross-case findings, the conclusion can be drawn that there is a lack of consensus between the companies regarding the attribute of the supply chain of a startup that is experiencing rapid growth in demand, as well as which KPI:s to track at this stage. The attribute that was considered to be most relevant for the supply chain was agility. However, it is difficult to draw any absolute conclusions on this matter as there was a considerably low difference in the score between four of the five attributes.

The theory advocates a responsive, agile, or efficient supply chain strategy when sales volumes rapidly increase for the startup, whereas there is a more significant emphasis put on the attribute of agility based on the collected empirical data. The most relevant attribute according to the survey, agility, does not, however, correlate with the KPI:s that are considered to be most important to monitor at this stage. Upside and downside supply chain adaptability, as well as overall value at risk, was considered important to monitor by only two companies respectively. Based on the collected answers regarding relevant KPI:s to measure in the supply chain, a responsive supply

chain would be preferred as order fulfillment cycle time was considered to be one of the most relevant metrics to monitor at this stage for the startup. Cash-to-cash cycle time was also one of the most relevant KPI:s to monitor according to the survey, where the level-2 metric of inventory days of supply was considered to have the most significant impact on the KPI. Even though the attribute of cost received the lowest score in the conducted survey, four of the five case companies agree that KPI:s related to cost should be monitored at this stage. As seen in table 5.4, these KPI:s are total supply chain management costs and cost of goods sold, where cost of goods sold was considered to have a more significant impact on the attribute of cost compared to total supply chain management costs. Return on working capital was not considered to be essential to monitor by any of the case companies.

As the answers from the conducted survey differ significantly from one another, it indicates that there are other factors that need to be taken into account than just an increase in sales volumes when choosing the right KPI:s to monitor during the growth phase of a startup. As an example, Orbital Systems does not value responsiveness as an attribute for the supply chain. This may be due to the fact that their product has long lead times and their customer usually puts in their order on the product years in advance. Agility in the supply chain may be considered as the most important attribute by Orbital Systems as they are still developing their product, thus they are in the need of a supply chain that quickly can adapt to a new design. These factors differ from the case of Hövding, who value asset management efficiency the highest and cost the lowest. Unlike Orbital Systems, Hövding has already a finished and established product on the market that does not require large alterations in design, thus Hövding does not consider agility to be the main priority of the supply chain at this stage. However, the answers from the survey indicate that flexibility is preferred over efficiency in the supply chain as sales volumes rapidly increase for a startup. As stated in the literature review, a company should not have too many metrics to monitor. Only 3-5 KPI:s are considered to be enough in order for the company to focus on the right issues. Thus, to conclude, relevant KPI:s to measure during this stage for a startup based on the collected empirical data would be order fulfillment cycle time, cash-to-cash cycle time, and cost of goods sold. The trade-offs between the KPI:s should be in favor of order fulfillment cycle time as flexibility is preferred over efficiency in the supply chain as demand increases for the startup.



## Chapter 6

# Conclusion

*In this chapter, the answers to the research questions of the study are presented. This is then followed by suggestions for future research regarding supply chain strategy for startups, as well as the theoretical contribution of this research.*

## 6.1 Research Questions

### 6.1.1 Research Question 1: What should a startup's supply chain strategy be during growth?

In order for a startup to determine an appropriate strategy for their supply chain, we argue that the organization must take into consideration the following factors: (1) the characteristics of the industry they are operating in, (2) the type of product they are selling, (3) the stage in the product life cycle that the product is currently in, and lastly (4) the stage in the startup life cycle the organization is currently in. In order to determine an appropriate supply chain strategy based on these four factors, the following procedure is recommended:

- Use Porter's Five Forces to assess industry characteristics. This will help to identify the level of supply- and demand uncertainty that the startup will experience on the market.
- Use Fisher's identified characteristics for product demand to determine whether the product is functional or innovative.
- Use the Product Life Cycle to determine the level of maturity of the product.
- Use Picken's Life Cycle of an Entrepreneurial Venture to determine the stage that the startup is currently in.

When this is done, the Startup Supply Chain Strategy Framework should be used to identify an appropriate supply chain strategy for the particular context of the startup depending on the mentioned factors. To realize the best matching supply chain strategy as derived from the framework, the internal and external capabilities of the startup's supply chain should be analyzed. The recommended tools to evaluate the supply chain capabilities are:

- Porter's Value Chain, which can help the startup to identify strengths and weaknesses, and further determine its competitive advantages and how these can be utilized in the supply chain.
- Porter's Diamond Model, to assess how clusters can be used to achieve the objectives of the chosen supply chain strategy.
- The Learning Curve, to investigate how efficiencies and effectiveness can be achieved over time in the supply chain as both the startup and its external supply chain partners will learn.

A summary of the tools used as the foundation to determine the best matching supply chain strategy for a startup and how to support the objectives of this strategy through internal and external supply chain capabilities can be seen in figure 6.1.

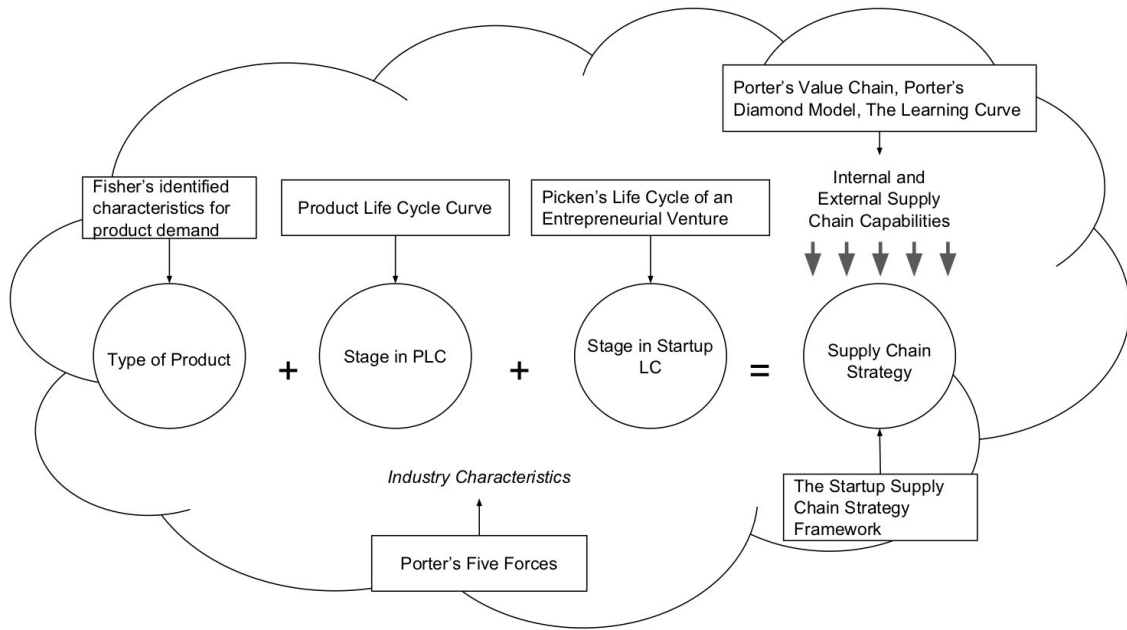


Figure 6.1: Theoretical framework with corresponding tools used

### 6.1.2 Research Question 2: What critical success factors (CSFs) can be identified for the supply chain of a startup?

In general, conclusions can be drawn that there are several critical success factors for succeeding with scaling a startups supply chain. Since the research question states that critical success factors should be identified for startup firms, only CSFs that comply with this will be stated below; even that numerous other has been found. Thus, only CSFs for firms in the startup or transition stage in the startup life cycle. Presented in table 6.1 are the CSFs identified from the empirics and analysis, which the interviewees valued the highest. Notably, they can be divided into two categories, internal and external supply chain capabilities. The external CSFs aims to maintain, control and exploit the network a startup surrounds itself with. The internal CSFs aims to prepare for scaling as well as build and maintain a supply chain that can adapt depending on the current and future sales volumes.

Table 6.1: Critical Success Factors for a Startup

<i>CSFs of Internal Supply Chain Capabilities</i>	<i>CSFs of External Supply Chain Capabilities</i>
<ul style="list-style-type: none"> <li>- Manage and overlook the transition from entrepreneurial to a more complex organization.</li> <li>- Produce close to the HQ when possible during the initial stages of the startup life cycle.</li> <li>- Scale the supply chain in phases to avoid spending unnecessary capital on expensive overcapacity.</li> <li>- Base the forecast on accurate sales data when planning for the future.</li> <li>- Identify uncertainties in supply and demand and determine the appropriate supply chain strategy.</li> </ul>	<ul style="list-style-type: none"> <li>- Build long-term relationships based on trust and openness.</li> <li>- Exploit the network to find sufficient funds.</li> <li>- Exploit the learning curve through growing together with your partners.</li> </ul>

*Manage and overlook the transition from entrepreneurial to a more complex organization.*, in order to grow and develop the business (Cavusgil and Knight 2015). Kalogeropoulos (2018) emphasized the difficulties of an entrepreneurial startup to go from a R&D focus to a sales focus. However, this change is needed to achieve greater returns. *Produce close to the HQ when possible during the initial stages of the startup life cycle*, to reduce costs and increase flexibility in the supply chain. Hult Johansson (2018), Arnesson (2018), and Johansson and Tudosoiu (2018) all discuss that when possible and cost efficient, a startup should produce locally to gain flexibility and make it easier for rapid modifications of the production. *Scale the supply chain in phases to avoid spending unnecessary capital on expensive overcapacity*. This CSF is concerned with the fact that startups tend to overestimate future demand projections, hence designing their supply chain with overcapacity. Kalogeropoulos (2018) commented on this topic and stated that a startup should scale in phases to avoid expensive overcapacity and underutilized assets. *Base the forecast on accurate sales data when planning for the future*, and not on a hunch, since, as stated before, a startup tend to too optimistic about its future demand. However, if the forecast shows a large demand increase in the future a company should trust it. *Identify uncertainties in supply and demand and determine the appropriate supply chain strategy*. To build an efficient supply chain, a startup should use Lee (2002)'s to determine the best strategy for the business.

*Build long-term relationships based on trust and openness* refers to the importance of maintaining an extensive network for both supply chain, investor and professional relationships. All interviewees as well as Cavusgil and Knight (2015) have expressed building, learning from and maintaining external relationships as one of the most critical activities for a startup. *Exploit the network to find sufficient funds* is connected to the previous critical success factor and refers to the importance of



finding funds to make the firm survive the startup phase. Johansson and Tudosoiu (2018), Lindroth (2018), and Arnesson (2018) all addressed this issue and added that the network of investors not only contribute with funds but also with knowledge and further network connections. *Exploit the learning curve through growing together with your partners*, thus finding long-term partners will benefit the company. Johansson and Tudosoiu (2018) expressed this concern explicitly but most interviewees mentioned the importance of long-term relationships.

Although only five companies were interviewed, the authors are reasonably confident that the presented critical success factors are valid and generalizable for many high-tech manufacturing startups. The authors propose for future research that the CSFs should be quantitatively tested for further verification. Also, interviewing more companies with the same method as this research might result in additional CSFs to be found. However, based on our interviews and learning, the presented CSFs are the most important for a startup to assess when scaling its supply chain.

### **6.1.3 Research Question 3: What key performance indicators (KPI:s) are relevant to track in order to measure the performance of a startup's supply chain?**

Based on the survey, the most desired attribute of the supply chain according to the correspondents is agility. However, the most relevant KPI:s during the growth phase of sales volumes for a startup are *order fulfillment cycle time*, *cash-to-cash cycle time*, and *cost of goods sold*. As stated in the analysis, the trade-offs between the KPI:s should be in favor of order fulfillment cycle time as flexibility is preferred over efficiency in the supply chain as demand increases for the startup.

From the analysis, however, the conclusion can be drawn that additional research needs to be done in order to properly be able to suggest KPI:s for a startup to monitor at a particular stage. The correspondents of the survey have different opinions on which metrics to use to evaluate the performance of the supply chain as it experiences an increase in sales volumes. Therefore, correlating factors should be investigated further before recommending a set of KPI:s that are particularly relevant for a startup during the growth phase.

## **6.2 Theoretical Contributions**

Theoretical contributions have been made in the form of the Startup Supply Chain Strategy Framework that is to guide a startup in choosing an appropriate strategy for its supply chain. A combination of already existing strategic tools have been presented and recommended to use in the process of identifying a supply chain strategy for the startup. When the right strategy is found, methods for identifying internal and external capabilities are presented. The combination of the

right strategy and right capabilities makes up the future supply chain strategy a startup should consider implementing. Capabilities that were found to matter the most for startups where network capabilities such as the management of partners, contracting best practices and payment terms, as well as a sound internal management and transformation process. Based on the limited theory that currently exist on supply chain design and supply chain management for startups, the authors hope that the recommended process will contribute with new insights to help startups understand and choose a suitable supply chain strategy.

Furthermore, the authors know that this study has provided startups with better knowledge of what is critical to managing the supply chain for the business to be successful. Also, it has been found that rapid growth in sales volumes is not the only factor that has an effect on which metrics to use in order to best measure the performance of a startup's supply chain. Several critical success factors and key performance indicators have been presented for startups to consider when moving from a transition phase to a scaling phase. Much research has, previous to this report, been conducted in this area mainly on larger corporations. However, this report gathers CFSs and KPIs that are meant to be used by startups, which may differ from the theory on larger corporations.

The framework, as well as the critical success factors and the key performance indicators, can be used by all startups that are looking to develop a superior supply chain strategy for future growth. However, the framework is most suitable and will result in the most appropriate strategy, when used by a startup that has a global supply chain and operates in the electronic hardware industry.

### **6.3 Future Research**

As the study is exploratory in its nature, one of its main purposes is to provide a foundation for future research. This study has provided a rather broad framework that is to be used for a startup to apply a matching supply chain strategy depending on specific contextual factors. As there has been limited research done on the topic of startup's and supply chain strategies, one suggestion for future research is to evaluate the applicability of the Startup Supply Chain Strategy Framework and further develop it to best suit the characteristics of a startup. The evaluation of the framework could, for example, be done through a quantitative analysis as a complement to the more qualitative approach to this research study. Furthermore, it would be interesting to make a more extensive study on performance measurements in the supply chain related to startups. As we have argued in this report, objectives might differ between a startup and a large enterprise. Thus, metrics that are preferred to monitor and measure may also vary between the two types of businesses. This type of study is however not something we encountered during our literature review. One suggestion is to develop the Startup Supply Chain Strategy Framework by adding suggestions of metrics to monitor for each supply chain strategy.

As we have noticed the importance of partners in the supply chain network of a startup to support the profitable growth of the business, another suggestion for future research would be that of investigating contracting best practices for a startup regarding incentives and penalties in outsourcing relationships. This is believed to differ significantly to contracting best practices in outsourcing relationships for large enterprises, who often benefit from larger order volumes (meaning bigger businesses for partners in the supply chain network) as well as a greater financial capability. Another area that would be interesting to investigate further is that of how to set up payment terms for startups to improve cash-to-cash cycle time. Improving the cash-to-cash cycle time for a startup would mean a higher cash flow for the company, thus allowing the firm to make either more or larger investments to grow its business.

Lastly, another area that we find interesting to research further would be how a startup should go about designing a tax aligned global supply chain to avoid or reduce tariffs and other costs associated with import and export of goods and services for a company. This would hopefully provide some guidance for how startups are to succeed in a global market whilst at the same time avoid unnecessary expenses or delays in its supply chain.



## Chapter 7

# Application of Theoretical Framework

### 7.1 Industry Characteristics

Minut is a new player in the *security alarm services industry*, a market that is estimated to surpass \$100 billion in 2020 according to Daga (2018). Minut is offering private homeowners an "Internet of Things" application: a smart, simpler, and cheaper home alarm system compared to other home alarm systems that are currently out on the market. Home security systems are expected to account for \$47 billion of the total security market (ibid.).

#### **Threat of New Entry**

Bauer, M. Patel, and Veira (2015) claim that the most innovative IoT applications are most likely to come from startups, but players from all industries might also integrate smart functions into their current products to compete with on the IoT market. What drives the barriers to entry up in the IoT market, according to Michael E Porter and Heppelmann (2014), is the relatively high fixed costs due to more complex product design with more advanced, embedded technology. What lowers the barriers to entry is the potential of leapfrogging with new technology that already established companies in the market do not possess (ibid.).

In order to be able to compete with current players on the security alarm services market, the company must be able to ensure that the product is reliable. This is considered to be key in order to attract any customers from incumbents. However, current players might see their products becoming obsolete due to rapidly evolving new technologies that can provide a better service (Daga 2018).

## **Supplier Power**

The power a supplier might have compared to the downstream company determine the type of relationship one might have with another. It also determines what prices and risks associated with sourcing that will incur. (Michael E. Porter 1979) Minut's product is sourced and produced in Shenzhen, China, where a large portion of the world's electronics is produced today. A large supplier, compared to the size of Minut, produces their product and sources most of the ingoing components (Kjellén 2018). According to Michael E. Porter (1979), the size difference makes the bargaining power of the supplier high. However, the supplier wants Minut to succeed since that would mean a higher production rate. The producers of high technology products are fairly concentrated to Shenzhen, which also makes for a high supplier power. To produce the plastic as well as some electronics, expensive tooling is needed. The company owns their own tooling, however, it might still lead to high switching costs, thus high supplier power. Overall, the supplier's bargaining power is relatively high, but the relationship might still thrive while Minut is a fairly small company, since the supplier wants Minut to grow their business.

## **Buyer Power**

Product differentiation is a common strategy among IoT companies, as customers tend to value product quality and service over price according to Michael E Porter and Heppelmann (2014). To be successful in capturing customers, companies must understand their specific customer segment and how they are using the product. As the product is usually connected with a service, companies have the ability to build a closer relationship with the individual consumer. Together with the advanced technology in the product, companies within IoT can collect valuable data from their customers to further enhance their product and strengthen their position in the market. Michael E Porter and Heppelmann (ibid.) argue that the buyer's switching cost to a new supplier will increase due to the capturing of unique and historical user data. Furthermore, Michael E Porter and Heppelmann (ibid.) claim that smart, connected devices allow companies to reduce their dependency on distributors and service partners, leading to a potential increase in profit for the company. What needs to be taken into account when assessing buyer power is the fact that IoT is an immature market. As the products are relatively new and immature, early adopters will most likely be the ones purchasing the product. The characteristics of an early adopter are that they are risk-takers and have a positive attitude towards change, making them less loyal towards a brand (Rogers 2010). The key to success, therefore, lies in going beyond the early adopters to capture loyal customers.

Looking specifically at the homes security systems market, the buyer's switching cost can be considered to be relatively high for current customers. This is due to the fact that they already have invested in security systems, thus if they were to change the system they would need to buy

the new hardware and re-install it in their home. However, there is a big potential to capture non-existing customers by creating a niche in the market. According to Daga (2018), the trend for millennials is to move to apartments or other gated communities which offer some type of safety systems. However, these systems currently offer incomplete services and millennials are looking for something that will help them to easily monitor their home in the form of an app-based system. Here companies have the potential to gain first-mover advantage to capture market share.

### **Threat of Substitution**

The threat of substitution can be reduced for IoT products if the company is able to provide the market with an inimitable and uniquely tailored service based on collected customer data, giving the company an advantage compared to other possible substitutes. Examples of substitutes are traditional home alarms as well as installed camera systems. However, IoT might also increase the threat of substitution. According to Bosche and Crawford (2018), the most worrying part of IoT products is the security of the system. Traditional, local systems that cannot be accessed remotely might stand as a more secure alternative to internet connected devices. For Minut, the goal must be to provide a better price/performance experience than its substitute competitors. On the performance part, Minut, and the IoT industry has an advantage of delivering easy accessibility to the connected device, as well as a multitude of possible functions that can be added, even after the customer purchase point.

### **Competitive Rivalry**

For a company in a certain industry, it is vital to find its niche as well as being competitive compared to the rest of the industry. The maturity of the industry also determines the competitive landscape and the possibility of success. This is somewhat further covered in section 7.3, product life cycle. Anyhow, as the industry matures, the competitive landscape becomes rougher and the profit declines. The IoT industry, according to Bosche and Crawford (*ibid.*), will continue to grow the coming years, which provides for a promising competitive landscape. In the smart security alarm market, there are not many direct competitors on the market. However, with the growing IoT industry, more companies are expected to enter this market in the future. According to Michael E. Porter (1979), there are four other factors that influence the competitive rivalry: high exit barriers, high fixed costs, customer loyalty, quality differences. Concerning the exit barriers as well as fixed costs, the authors determine these factors affect the competitive rivalry slightly. Concerning customer loyalty and quality differences, the industry is too immature to assess these factors today. The authors assess the competitive rivalry to relatively low today but might grow as the industry matures.

## 7.2 Product Type

Minut's product, called *Point*, is a connected device that registers data regarding motion detection, temperature, humidity, and tampering with advanced technology. *Point* is a so-called "Internet of Things" (IoT) application, which is characterized by having the value creation coming from a combination of hardware, software, services, and integration of activities. In a study made by the McKinsey Global institute it was concluded that by 2025, the Internet of Things would generate between \$4 trillion to \$11 trillion in value globally (Bauer, M. Patel, and Veira 2015). To identify what type of product demand that *Point* is believed to experience, the demand pattern for smart home security systems on the market will be investigated. When looking at the market for smart home security systems in the US, which is one of the markets that Minut is serving, the demand is expected to increase 10 % per year to reach 11 billion in 2025 according to Wood (2018).

When looking at the product life cycle, Fisher (1997) argue that a functional product has a life cycle of more than two years whereas the life cycle of an innovative product only spans between three months to one year. As *Point* consists of both software, firmware and hardware components, the level of flexibility when it comes to updating the product varies greatly. The hardware is a permanent part of the product that only can be changed by exchanging an old version of the physical product to a new one. The software and firmware can, however, be updated remotely from Minut's office without the customer being forced to acquire a new physical product to access new features. Additional features can, therefore, be added on a continuous basis to the software, thus transforming the *Point* to a new type of product without having to update the hardware. As new technology is constantly emerging in the market for home security systems, companies should be agile in integrating these new technologies into their products. This may require specific components to be added to the hardware of the product in order to remain competitive on the market. Because of this rapid emergence of new technology, it can be concluded that a product such as *Point* has a relatively short lifespan, and *Point* should, therefore, be categorized as an innovative product.

Other factors that need to be taken into consideration when determining whether a product is functional or innovative is the product's contribution margin and the level of product variety according to (ibid.). As *Point* is the only current product that Minut has on the market, it contributes significantly to the margin. This places *Point* in the innovative product category, as Fisher (ibid.) argues that an innovative product has a contribution margin between 20-60 % while a functional product only has a contribution margin between 5-20 %. Regarding product variety, an innovative product can have millions of variants per category according to Fisher (ibid.), whereas a functional product only has 10-20 variants per category. The high level of product variety for innovative products is due to the high level of customization that innovative products typically are associated with. *Point*'s software can be seen as highly customize-able, whereas the physical product itself currently only comes in one shape and form as of today. However, as *Point* needs to



comply with specific regulations of different geographical markets, the product will be customized to a specific market. The country-specific products do not exceed 20 different types as of today, thus in this aspect Point will be categorized as a functional product.

Additionally, average margin error in the forecast at the time production is committed, average stock out rate, and average forced end-of-season mark-down as percentage of full price are factors that determine whether a product is functional or innovative. Looking at these factors and applying them on Point, it is challenging to draw the conclusion regarding margin error in the forecast as the product is new on the market and there is a lack of historical data. However, due to the high uncertainty of the organization as it is in the earlier stages of the startup life cycle, it is assumed that the margin of error in the forecast is extremely hard to predict, thus Point falls into the category of an innovative product regarding this factor. The lack of historical data for Point also makes it difficult to categorize it as an innovative or functional product in regards to average stock out rate. A spike in demand has not yet occurred and the minimum-order-quantity (MOQ) is relatively high, which results in high inventory levels of the product. Thus, this places Point in the functional product category.

The conclusion can be drawn that Point falls into the category of an innovative product when looking at the aspect of average forced end-of-season markdown. If a new version of Point was to be introduced in the market, or a similar product from a competitor, the product with the most updated features and newest technology will be the one that customers prefer to purchase compared with the version with now outdated technology. As stated before, IoT products have the benefit of updating the software of their product without exchanging the physical product itself. However, if there are missing components that are needed to apply the new technology, the design of the physical product will be affected. Thus, the conclusion can be drawn that once new technology is introduced that requires changes to the design of the physical product, the version that is currently out on the market will become outdated and force markdowns to take place. This places Point in the innovative product category.

The last factor that Fisher (1997) brings up when determining whether a product is functional or innovative is the lead time required for made-to-order products. After having discussed this with Kjellén (2018), Point has a lead time that lies in the span of an innovative product. A summary of the aspects of demand which Point falls into can be seen in table 7.1.

Table 7.1: Product Demand for Point

<i>Aspects of demand</i>	<i>Functional product</i>	<i>Innovative product</i>
<i>Product life cycle</i>		x
<i>Contribution margin</i>		x
<i>Product variety</i>	x	
<i>Average margin error in the forecast at the time production is committed</i>		x
<i>Average stock out rate</i>	x	
<i>Average forced end-of-season markdown as percentage of full price</i>		x
<i>Lead time required for made-to-order products</i>		x

From the table it can be seen that Point falls into the category of an innovative product.

### 7.3 Stage in the Product Life Cycle

The authors argue that Minut, and more specifically Minut's product Point, can be placed early in the growth phase. This is shown in the right graph in figure 7.1. According to Bosche and Crawford (2018), the market of internet of things has grown lately and will continue to do so over the next two years. Bosche and Crawford (ibid.) estimate that the market will double to 520B\$ in 2021. As stated before, the market of smart home security systems in the US is expected to increase 10% per year to reach 11B SEK in 2025 (Wood 2018). This is evidence that the life cycle of smart home alarms will continue to grow, with no decline in sight, hence a placement at the beginning of the growth phase in the product life cycle. After determining the right phase, some critical factors to assess emerges. A company in this phase should firstly, shift their targeted customer from first mover to the mass market. Secondly, a company needs to achieve higher efficiencies in production and marketing. Thirdly, the supply chain needs to provide product availability as well as high responsiveness. In order to achieve these factors, the decisions taken need to shift focus from short to long-term. For further details, see section 3.4.2, growth stage. In the case of Minut, they have shifted focus to target the larger mass. For the second and third statement, the company need to add some resources, especially in marketing and supply chain effectiveness.

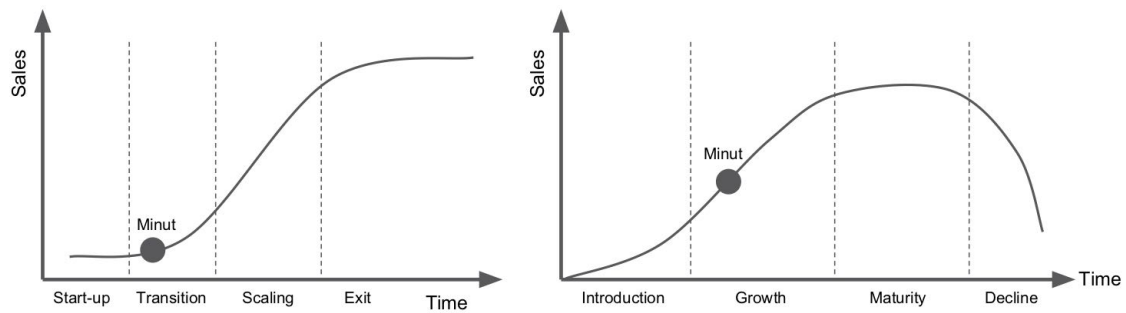


Figure 7.1: Minut's Startup Life Cycle and Product Life Cycle

## 7.4 Stage in the Startup Life Cycle

As Minut is growing their business, especially in marketing, sales and support departments, the authors conclude that the company is in the transition stage of the startup life cycle. Minut's product Point was released onto the market spring 2018 and the business started to gain attention and trust in the marketplace (Kjellén 2018). This means that the company moved to the transition stage recently and are still placed in it. As Picken (2017) proposes, there are a number of obstacles to overcome in this startup life cycle phase. In Minut's case, the authors identified most of the obstacles as significant. However, some were identified as very important to address. Firstly, develop and structure the organization and management team. The company need to assess the internal structure and role of management, especially when expanding their workforce. Secondly, secure financial capabilities for growth. For Minut this might seem trivial, however it certainly needs to be addressed since it crucial for the survival of the company. Thirdly, maintaining a responsive organization and develop effective decision processes. For Minut, this means assessing the internal processes to stay responsive when growing the workforce. As seen in figure 7.1, the left graph shows the company in the transition phase.

## 7.5 Startup Supply Chain Strategy Framework

Based on the reasoning previously made in this chapter (7) as well as with the previously presented *Startup Supply Chain Strategy Framework*, the authors can draw some conclusions about the superior strategy Minut should implement. Table 7.2 shows the strategic framework with Minut's positioning in bold font. Hence, conclusions can be drawn that Minut should incorporate a responsive as well as an agile supply chain, where the responsive part got six matches and agile five. For Minut, this means that they should aim to design a supply chain that is responsive and flexible to the changing demand and needs of the customer. The supply chain should also hedge for supply uncertainty upstream. For Minut, this means that they should secure production and the opportunity to fast change the forecasted production schedule at the manufacturer. The changing needs

of a customer will most likely be hedged by the opportunity to remotely upgrade the product’s software. However, if the customer needs changes drastically, a newly designed hardware might be needed, and this should be mitigated in the supply chain strategy. A flexible distribution model is also crucial for the company to develop since the demand is uncertain, not only by volume but also by geography.

As the framework further states, the company should also take the following tools into consideration when designing their supply chain; Porter’s value chain, Porter’s diamond model and The learning curve. These models will help develop the internal and external capabilities Minut need to build and execute a well-performing supply chain. Porters value chain will help the company analyze their processes and assess the functions that do not match the chosen strategy. The diamond model will help the company to analyze their role in a cluster, and the opportunity a cluster provides. The learning curve will help the company to understand the value of growing together with your supplier. Finally, 3.6 provides some more areas to assess, such as startup size effects, analyzing the surrounding network and collaborations with partners and strategic suppliers. When Minut has taken all tools into consideration, they have enough knowledge to develop and implement a thoroughly developed supply chain strategy for their startup.

Table 7.2: The Startup Supply Chain Strategy Framework

	Industry Characteristics				Product Type		Product Life Cycle				Startup Life Cycle			
	Demand Uncertainty		Supply Uncertainty		Functional	Innovative	Introduction	Growth	Maturity	Decline	Startup	Transition	Scaling	Exit
	High	Low	High	Low										
Responsive	x			x		x	x				x	x		n/a
Agile	x		x			x	x				x	x		n/a
Efficient		x		x	x				x	x			x	n/a
Risk-hedging		x	x		x									n/a

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## Chapter 8

# Appendix

*Hereafter follows appendices, from A to D containing additional information not covered in the main report*

# Appendix A - Porters Five Forces

*A compiled table of Porters Five Forces and their respective distinction in attributes*

Table 8.1: Porter's Five Forces

<i>Force</i>	<i>Aspects</i>
<i>Threat of new entry</i>	Economies of scale Product recognition Capital requirements Time and cost of entry Access to distribution channels Technology IP
<i>Supplier Power</i>	Number of suppliers Size of suppliers Uniqueness of products Switching costs Ability for supplier to integrate forward
<i>Buyer Power</i>	Number of customers Size of each order Uniqueness of products Switching costs Ability for buyer to integrate backward
<i>Threat of substitution</i>	Substitute performance Cost of change
<i>Competitive rivalry</i>	Number of competitors Switching costs High exit barriers Customer loyalty Quality differences

# Appendix B - SCOR Metrics

A compilation of SCOR metrics based on (Council 2008)

Attribute/level	Level 1	Level 2	Level 3
Reliability	Perfect order fulfillment	%orders delivered in full	delivery item accuracy delivery quantity accuracy
		delivery performance to customer commit date	customer commit date achievement time customer receiving delivery location accuracy
		Documentation accuracy	compliance documentation accuracy other required documentation accuracy payment documentation accuracy shipping documentation accuracy
		Perfect condition	% of faultless installations % of orders/lines received damage free Orders delivered damage free conformance orders delivered defect free conformance warranty and returns
Responsiveness	Order fulfillment cycle time	Source cycle time	Authorize Supplier Payment Cycle Time Identify Sources of Supply Cycle Time Receive Product Cycle Time Schedule Product Deliveries Cycle Time Select Supplier and Negotiate Cycle Time Transfer Product Cycle Time Verify Product Cycle Time
		Make cycle time	Finalize Production Engineering Cycle Time Issue Material Cycle Time Produce and Test Cycle Time Release Finished Product to Deliver Cycle Time Schedule Production Activities Cycle Time Stage Finished Product Cycle Time Package Cycle Time
		Deliver cycle time	Build Loads Cycle Time Consolidate Orders Cycle Time Install Product Cycle Time Load Product & Generate Shipping Documentation Cycle Time Receive & Verify Product by Customer Cycle Time Receive Product from Source or Make Cycle Time Receive, Configure, Enter, & Validate Order Cycle Time Reserve Resources and Determine Delivery Date Cycle Time Route Shipments Cycle Time Schedule Installation Cycle Time Select Carriers & Rate Shipments Cycle Time Ship Product Cycle Time
		Delivery Retail Cycle Time	Checkout Cycle Time Fill Shopping Cart Cycle Time Generate Stocking Schedule Cycle Time Pick Product from Backroom Cycle Time Receive Product at Store Cycle Time Stock Shelf Cycle Time
		Return Cycle Time	
Agility	Upside supply chain adaptability	Upside Adaptability (Source)	
		Upside Adaptability (Make)	
		Upside Adaptability (Deliver)	
		Upside Return Adaptability (Source)	
	Downside supply chain adaptability	Upside Return Adaptability (Deliver)	
		Downside Adaptability (Source)	
		Downside Adaptability (Make)	
		Downside Adaptability (Deliver)	
	Overall value at risk	Supplier's/Customer's/ Product's Risk Rating	
		Value at Risk (Plan) Value at Risk (Source) Value at Risk (Make) Value at Risk (Deliver) Value at Risk (Return) Time to recovery	
Asset Managment Efficiency	Cash-to-cash cycle time	Days sales outstanding	
		inventory days of supply	Inventory Days of Supply ( Raw Material ) Inventory Days of Supply ( WIP ) Recycle Days of Supply Percentage Defective Inventory Percentage Excess Inventory Percentage Unserviceable MRO Inventory Inventory Days of Supply ( Finished Goods )
		Days Payable Outstanding Supply Chain Revenue	

	Return on Supply Chain Fixed Assets	Supply Chain Fixed Assets	Fixed Asset Value (Deliver)	
			Fixed Asset Value (Make)	
			Fixed Asset Value (Plan)	
			Fixed Asset Value (Return)	
			Fixed Asset Value (Source)	
	Return on Working Capital	Accounts Payable (Payables Outstanding)		
		Accounts Receivable (Sales Outstanding)		
		Inventory		
Cost	Total Supply Chain Management Costs	Cost to Plan	Cost to Plan Supply Chain	
			Cost to Plan (Make)	
			Cost to Plan (Deliver)	
			Cost to Plan (Return)	
		Cost to Source	Cost to Authorize Supplier Payment	
			Cost to Receive Product	
			Cost to Schedule Product Deliveries	
			Cost to Transfer Product	
			Cost to Verify Product	
			Direct Material Cost	
	Cost to Make	Indirect Cost Related to Production		
		Direct Labor Cost		
	Cost to Deliver	Order Management Costs		
		Order Delivery and / or Install Costs		
	Cost to Return	Cost to Source Return		
		Cost to Deliver Return		
		Mitigation Costs	Risk Mitigation Costs (Plan)	
		Risk Mitigation Costs (Source)		
		Risk Mitigation Costs (Make)		
		Risk Mitigation Costs (Deliver)		
		Risk Mitigation Costs (Return)		
Cost of Goods Sold		Direct Labor Cost		
		Direct Material Cost		
		Indirect Cost Related to Production		

## Appendix C - Interview Questions

*Below are the questions that were used in the interviews with the case companies. All interviews were held in Swedish, hence the questions are also in Swedish. Notably, the interviews were semi-structured interviews and therefore where questions added and retracted depending on the course the interview took.*

### *Introduction*

Vad är din historia inom företaget?

Vilken roll har du i företaget idag?

Vill du berätta lite om produkten och om företagets historia?

### *Industry Dynamics*

Hur ser er industri ut? Vad finns det för competitors, suppliers, buyers?

Hur är det att vara en liten spelare på marknaden när kunder och leverantörer ofta är större än er själva?

### *Business Objectives & Competitive Strategy*

Hur tänkte ni igenom era strategiska go-to-market alternativ, och vad var det som fick er att besluta er för det strategiska alternativet som ni valde?

Vilka marknader har ni valt att finnas på? Började ni med Sverige och sen expanderade eller tvärtom? Hur kopplas er Corporate Strategy och er Supply Chain Strategy ihop?

Finns det några network effects?

Har finance varit ett problem för er? Har ni haft investerare som hela tiden stöttat er?

### *Supply Chain Strategy*

Vad låg ert fokus på i er supply chain under tillväxtfasen? Förändrades ert fokus i takt med att ni växte? Varför?

Vilka var era nyckelfaktorer för att skala framgång i er Supply Chain under tillväxtfasen?

Supply Chain objectives?

Vilka strategiska val gjorde ni för operations under tillväxtfasen? (outsource manufacturing, low cost offshore, delayed customization...)

Forecasting, hur har ni gjort och hur gör ni nu? Vad är det viktigt att tänka på?

Hur valde ni vilka aktiviteter som skulle outsourcas? Hur mycket outsourcade ni under er tillväxtfas?

Har detta ändrats? Varför?

Hur valde ni era suppliers? Hur arbetar ni med era suppliers?

Evaluate supplier performance? Vad använder ni och varför: Make-to-order, Assemble-to-order/finish-to-order, make-to-stock, engineer to order?

Vilka försäljningskanaler använde ni? Har det ändrats till idag? Varför valde ni just denna kombinationen av kanaler?

Hur är er Inventory Management?

Hur ser er Supply Chain ut med Warehouses osv? Transportation?

När blev returer kritiskt att hantera?



## Appendix D - Performance measurements in the supply chain during growth phase survey

*All interviewed companies filled out a quantitative survey about performance measurements. Below are the questions. Each question had various attributes, which was ranked from one to five by the respondents.*

Which attribute do you consider to be the most important during the growth phase?

Reliability, Responsiveness, Agility, Asset Management Efficiency, Cost

Which level-1 metrics do you consider to be the most important to monitor during growth phase?

Please choose no more than 5. *This question should not be ranked, but five of the following measures should be chosen instead*

Perfect order fulfillment, Order fulfillment cycle time, Upside supply chain adaptability, Downside supply chain adaptability, Overall value at risk, Cash-to-cash cycle time, Return on supply chain fixed assets, Return on working capital, Total supply chain management costs, Cost of goods sold.

Which metrics do you consider to be the most important to monitor during growth phase for perfect order fulfillment?

% orders delivered in full, Delivery performance to customer commit date, Documentation accuracy, Perfect condition.

Which metrics do you consider to be the most important to monitor during growth phase for order fulfillment cycle time?

- Source cycle time (includes transfer product cycle time, verify product cycle time, select supplier and negotiate cycle time)
- Make cycle time (includes issue material cycle time, produce and test cycle time, package cycle time, finalize production engineering cycle time)
- Deliver cycle time (includes loading product time, installation time, receipt of product, route shipment cycle time, consolidation of orders cycle time)
- Delivery retail cycle time (includes checkout cycle time, fill shop cart cycle time, stock shelf cycle time)
- Return cycle time

Which metrics do you consider to be the most important to monitor during growth phase for upside supply chain adaptability?

Upside Adaptability (Source), Upside Adaptability (Make), Upside Adaptability (Deliver), Upside Return Adaptability (Source), Upside Return Adaptability (Deliver)

Which metrics do you consider to be the most important to monitor during growth phase for downside supply chain adaptability?

Downside Adaptability (Source), Downside Adaptability (Make), Downside Adaptability (Deliver)

Which metrics do you consider to be the most important to monitor during growth phase for overall value at risk?

Supplier's/Customer's/ Product's Risk Rating, Value at Risk (Plan), Value at Risk (Source), Value at Risk (Make), Value at Risk (Deliver), Value at Risk (Return), Time to recovery

Which metrics do you consider to be the most important to monitor during growth phase for cash-to-cash cycle time?

Days sales outstanding, Inventory days of supply (raw material), Inventory days of supply (WIP), Recycle days of supply, Percentage defective inventory, Percentage excess inventory, Percentage unserviceable MRO, Inventory days of supply (finished goods), Days payable outstanding

Which metrics do you consider to be the most important to monitor during growth phase for return on working capital?

Accounts payable (payables outstanding), Accounts receivable (sales outstanding), Inventory

Which metrics do you consider to be the most important to monitor during growth phase for total supply chain management costs?

Cost to source (receive, schedule delivery, transfer, verify product), Cost to make (direct material, indirect costs related to production, direct labor costs), Cost to deliver (order management costs, order delivery/installation costs), Cost to return (cost to source & cost to deliver return), Risk mitigation costs

Which metrics do you consider to be the most important to monitor during growth phase for cost of goods sold?

Direct labor costs, Direct material cost, Indirect cost related to production