A Supply Chain Perspective on Post-Merger Integration
Pursuing Synergies at Axis Communications AB

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Abstract

This thesis researches present integration possibilities during an acquisition of a Czech company by a Swedish company. Mergers and acquisitions are increasing in popularity worldwide even though achieving success in them has been proven to be difficult. The solely most critical part of the M&A is the integration. Previous research also indicates that there is a direct correlation between successful supply chain post-merger integrations and merger success. Yet, post-merger integration of supply chains has gained little attention by the academic community. The supply chain integration of a merger is also often down-prioritized by management because of its notorious complexity. To fill the academic gap and simplify decision making for top management at the firms, the aim of this study is to find and evaluate synergies in the integration of the upstream supply chain of Axis Communications AB and 2N Telekomunikace a.s.

Axis Communications AB is a Swedish-based high technological company owned by the Japanese camera producer Canon Inc. Axis operates globally and has in recent years shown rapid growth. In order to maintain their growth Axis decided to diversify their product portfolio and therefore also acquired 2N, a medium-sized company within IP-intercoms who, just like Axis, had grown rapidly. With an award-winning supply chain, Axis hopes to be able to find synergies which can enable continuous growth for the entire corporate group.

Since there was little theory established in the field of supply chain integration within mergers and acquisitions and in order to reach the purpose, a theoretical work-model was developed. The model was developed in an exploratory way by examining both M&A as well as supply chain literature. The work model included four phases: firm strategies and compatibility, supply chain structure, finding synergies and synergy selection. The model is believed to be general and applicable to other cases within post-merger integration of supply chains.

The thesis resulted in the discovery of five synergy packages, which were evaluated against the achieved value and effort needed to carry out actions to achieve each synergy. This was further summarized in a recommended course of action for the companies to pursue. The recommended course of action is believed to lead to an increased ability for the companies to manage both product mix and volume flexibility as well as to minimize risk and improve industrialization of new innovations within the supply chain.

Key words: Post-merger integration, Supply chain integration, M&A-integration, Synergies
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Chapter 1

Introduction

1.1 Background

Axis Communications AB, further referred to as Axis, has been successful in the surveillance and safety sector with innovative IP-network camera solutions. During recent years the board has however expressed a need to diversify the product portfolio. To further broaden their product and service portfolio a new division was founded. This division was named New Business and puts its efforts on ideas outside of Axis current focus on network video. The division is responsible for evaluating and prototyping new business ideas from both a technical and a commercial perspective. The group has both market oriented business development resources as well as product development resources. Within the business development department of New Business an M&A-team was set up. The small team consists of one manager, one business developer and one integration manager. The team has since its founding been successful in finding and acquiring Citilog, Cognimatics and 2N.

Axis main driver for these acquisitions has primarily been to get access to the technology these companies has.

- Citilog, is a small French-based company which offers Intelligent Transportation Solutions with video analytics
- Cognimatics, is a small Swedish-based company that sells intelligent video analytics software
- 2N, is a medium sized Czech-based company within IP-intercoms with products for elevator systems and telecommunications for door stations

Besides technology Axis has expressed enhanced offerings and accelerated growth as other important drivers for their acquisitions. The acquisition of 2N has clear potential of accelerating Axis’ growth and is aligned with Axis vision of creating a smarter and safer world. 2N has in recent years shown a growth rate of over 20% and has at the same time been able to retain their profitability. 2N is believed to broaden Axis product portfolio and open-up a new market segment within IP-intercoms. Axis could also use 2N’s well-established sales channels to enter the elevator industry where 2N at the same time could take great benefit in being in the product portfolio of Axis 90.000 sales partners. 2N was because of this as of 1st of January 2018 fully integrated into Axis sales channels in the Americas through the Channel Partner Program which is expected to ramp up sales.

Axis has besides the sales channels, lacked a clear integration strategy for the acquired company. The initial thought from the board was to let 2N continue with their own brand and to work independently from each other to allow each other to focus on their own vision of growth. However, recently its been argued that they might have overrated the meaning of independence and now looks for a strategy to integrate 2N fully.
Since 2N is a mid-size company with approximately 200 employees, the board set up 10 workflows to integrate the different divisions. The workflows consisted of the broad spectrum from HR, R&D, Sales and Operations. The new directions desires that the level of integration shall go from independent to fully integrated. The acquired company has been positive to the cooperation climate and was expecting more integration measures as early as 2016 when the acquisition was made.

1.2 Problem statement

Mergers and acquisitions, M&As are increasing in popularity worldwide and has for example been used as an alternative way to grow, lower competition or increase market share (Statista, 2018). However, achieving success in acquisitions has proved to be difficult as the acquisition process is notoriously complex. The solely most critical part for a successful merger or acquisition is the integration process (Schweiger and Very, 2003). The integration process is associated with uncertainties and high degrees of change. This often leads to heavy pressure on management to make difficult decisions. Therefore M&As on average have not lived up to the financial expectations set in the due diligence, especially in cases where the price paid for the target includes an expected synergy value (Brouthers, Van Hastenburg, and Van Den Ven, 1998) (Schweiger and Very, 2003).

The main objective of the merger is to enable growth for Axis corporate group, where both Axis Communications and 2N is included. Both companies has grown rapidly and are now facing issues to scale their Operations to meet the increased demand. With an expectancy of continued growth, where sales channels of the companies are increasingly leveraged, the firms may face growing pains due to increased complexity and lack of scalability in their Operations.

Since Axis has not had a clear integration strategy for their Operations functions, next to nothing has been done to integrate the acquired companies in the operational processes. But the objective of enabling growth still remains which puts great pressure on Axis’ and 2N’s Operations to handle larger volumes and build a more flexible supply chain to be able to capture growth opportunities when they occur.

With a virtually non-existent integration plan for the supply chains there are numerous activities that lies ahead for the case company. One important aspect to carry out before an integration plan can be set is the task of identifying synergies to pursue. With clear deliverables of the merger it is easier to plan and manage the integration process. This leads to this thesis main purpose.

1.3 Purpose of the thesis

The study aims to find and evaluate present synergies in the integration of the upstream supply chain of Axis and 2N in order to enable growth for Axis corporate group.

1.3.1 Clarifying the purpose and the main goal of the thesis

The study aims to find synergies that enable growth in volume and product mix for both companies and subsequently simplify the integration of the acquired company. The analyzed integration has a focus on increasing flexibility in the upstream supply chain to handle both expected and unexpected volume and product mix growth.

By analyzing the particular business case of the integration of Axis and 2N, the study will utilize and develop a theoretical framework to provide an appropriate approach to finding these synergies.
1.4 Directions and delimitations

Directions

- The thesis shall only consider aspects regarding the integration of the Operations department of Axis.
- The thesis shall consider previous work within the integration of the two companies.

Delimitations

- The thesis will not consider cultural aspects of the integration.
- The thesis will not consider change management aspects of the integration.
- The thesis will not consider the reverse supply chain.
- The thesis will not consider integration of the IT-infrastructure present at both companies i.e. the companies ERP-systems.
Chapter 2

Company descriptions

2.1 Axis AB

Axis AB is a Swedish public limited corporation with headquarter in Lund, Sweden. Since 2015, Axis AB is part of the Canon group. Axis AB is the parent company of Axis Communications AB, Citilog, Cognimatics and 2N.

Axis Communications AB

Axis Communications AB is a Swedish-based market leader in network video with approximately 2600 employees and a turnover of 8,6 billion SEK as of 2017. The company is based in Lund, Sweden but has employees in more than 50 countries. Furthermore the company has a global reach through its 90.000 partners in 179 countries. The majority owner of Axis Communications AB is the Japanese camera producer Canon Inc (Axis AB Q4-report 2017).

Products

Axis delivers a wide range of products originating from the early encoders released in the 1980s and network cameras that was first released 1996. Axis has always had a strong focus on innovation and has now branched out into the product segments: Network cameras, Recorders, IP-Audio, Encoders and Surveillance software.

A selection of Axis’ innovations is presented in fig. 2.1

Figure 2.1: A visualization of some of Axis innovations during the years.
Axis Supply chain

Axis has a central role in its supply chain and functions as a final assembler at the configurations and logistics centers, CLCs, as well as the orchestrator of their network of partners. Axis has a central position in the supply chain with both upstream flows and downstream flows that needs to be coordinated. The Operations division has also been awarded supply chain professional of the year for their cross-functional improvement projects and demonstrated how the modern value chain can contribute to both increased efficiency and growth.

The Operations department has a vision of: Enabling growth for Axis in a cost effective way. Which consists of the following objectives:

- Maximize Axis growth through a scalable supply chain.
- Generate growth by high & predictable supply flexibility.
- Industrialize innovative, high quality products and solutions.
- Build customer and partner loyalty.
- Design and deliver a responsible and cost efficient supply chain.

The key aspect in the vision for the supply chain is to enable growth. The growth is expected to come in both new product launches but also scaling the supply chain for current products and its increased demand.

Downstream the supply chain consists of distributors that sell Axis products to system integrators and resellers, also referred to as partners which then provide the end customer with the products and services. Axis has a partner network of more than 90,000 partners to this date. The distributors play a central role in covering major areas of the potential market and provide channels to reach customers in need of solutions provided by Axis. The distributors stock the products and manages the supply chain further downstream. Axis has a continuous dialogue with the distributors to capture important information about stock levels, forecasted demand and inventory levels as well as market trends (Axis Communication AB, 2017).

Upstream Axis manages the supply chain through component suppliers and Electronic Manufacturing Service providers, also referred to as EMS providers or contract manufacturers. The component supplier supplies the contract manufacturers with supplies which in turn produces the products for Axis. This outsourced structure provides Axis with a flexible, sustainable and strong upstream supply chain which has the primary goal to ensure customer demand can be met (Axis Communication AB, 2017).

Axis employs a set of different strategies in their upstream supply chain management. First it employs a strategy of "10-35-35" which means that Axis will only make up 10 to 35% of a contract manufacturers total capacity while not more than 35% of Axis production should be carried out by one EMS. These levels are set to assure of high level of influence on the EMS provider while at the same time avoiding creating a high dependency on Axis business at the manufacturer. Axis also employs a segmentation of their supply chain in the sense that larger customers are provided with a more flexible supply chain that infuses higher service levels at a higher cost if needed while smaller customers are provided with products where for instance configuration of products are carried out at the EMS provider which lower costs but make the supply chain as a whole less flexible. Suppliers are also continuously both integrated with the company as well as subject to fierce competition in order to keep quality high, cost down and supply abundant (Axis Communication AB, 2017). The described supply chain is visualized in figure 2.2.
Figure 2.2: A schematic visualization of the main product flow in the supply chain of Axis.

**Axis Operations organization**

As described above the main role of the Operations team at Axis is to manage the supply chain and ensure that customer demands are met. The Operations department is further divided into sub-departments with different functional focuses. A breakdown of the Operations department can be seen in figure 2.3.

Figure 2.3: A schematic visualization of the organization of departments within the Operations department of Axis.
2.2 2N Telekomunikace a.s.

2N Telekomunikace a.s, further referred to as 2N, is a Czech-based company and has since May 30th 2016 been a part of Axis AB. 2N is a leading player in IP intercom with a total of just over 200 employees and a turnover of 200 million SEK at the time of the acquisition. 2N is as of 2017 in market leading positions in the Czech Republic, Germany, UK and the US and aspire to become number one in IP intercoms in the regions of Northern America, Europe, Middle East and Africa. 2N is thought to complement Axis products and together meet the increased demand for integrated intercom solutions. Furthermore 2N has well-established sales channels, through electricians, elevator manufacturers and Telecom installers 2N exports to 140 countries around the world which is believed to complement Axis present global sales channels (Axis AB Q4-report, 2017).

Products

2N offers solutions in a wide range of product categories which can be divided into the following product families: Intercoms, IP-access, Elevator systems and IP-audio. Further visualized in fig. 2.4.

![Figure 2.4: A visualization of a part of 2Ns product portfolio.](image)

2N's Supply chain

2N has similarly to Axis, a central role in their supply chain where assembly of certain products are mainly the focus for the company itself.

Upstream 2N produces and assembles a small fraction of the total volume in-house. The majority of the production however is outsourced to 3 different Czech EMS providers. Further upstream 2N works with different suppliers that has the role of suppling these EMS providers with material for production.

After production the EMS deliver products to warehousing facilities operated by 2N. 2N has up until 2018 used two warehouses, one located in Prague, Czech that delivers worldwide and one warehouse located in Miami, US which delivers to US and Canada. The warehouse in Miami has however as of the integration with Axis sales channels been replaced with an Axis operated warehouse.

To reach the end customer 2N uses a similar distribution model as Axis. Where distributors supplies resellers and system integrators with products which these parties later provide to the end customer.
Chapter 3

Theory

3.1 Outline

The theory of the thesis is presented in the chapter below. The structure of the chapter closely follows the approach the authors have taken in order to gather relevant literature for the research.

First a review of important topics in mergers and acquisitions will be presented. Because of the logistical nature of the thesis this is in part included to give a reader with little prior knowledge in the field of M&As the chance to be introduced to important concepts and terminology present in the field.

After this the current status of research in post-merger integration of supply chains is described. First the authors establish the present consensus in the literature regarding the importance of the integration of supply chains during M&As. Thereafter literature reviews carried out by other authors on the subject are presented. After this issues found during post-mergers of supply chains are presented coupled with best practices to handle the post-merger integration of the supply chain.

By researching both the supply chain and M&A-literature with a focus on post-merger integration of supply chains the authors finds that present research lacks the tools to successfully enable the authors reach the purpose of this thesis. Inspired by Häkkinen et al. (2004) non-existent findings during her extensive literature review coupled with Dung and Thanh (2012) conclusions that M&A literature until this point has lacked a practical implementation approach the authors reviews other supply chain literature to form a theoretical based analytical tool in order to provide a solution to the stated purpose of the thesis.

The supply chain literature of the remaining part of thesis is therefore presented as follows.

First the authors present and compare two popular frameworks to organize supply chain processes, the SCOR model and the General Supply Chain Framework, GSCF. After the review the more appropriate framework to use for the purpose of this thesis, the GSCF, is presented in more detail.

After a synthesis of the GSCF it is concluded that the reminder of the theoretical framework should be focused on 3 distinct areas of supply chain management. These are: supply chain strategy development, supply chain flexibility and supply chain risk assessment. All with a particular focus on the present purpose of the thesis.
3.2 Mergers and acquisitions, concepts and terminology

Merger and Acquisition, further referred to as M&A, is a general term that refers to the consolidation of companies or assets. A merger refers to when two companies combine forces to create a new company. But it can also mean that the acquired company ceases to exist and becomes part of the acquiring company. The contrary is an acquisition which refers to when a company buys another and does not change its name or legal structure. A more hostile version of the acquisition is when a company shows resistance in being bought, these transactions is often called takeovers. In a takeover the acquired company often ceases to exist and the assets of its becomes part of the acquirer (Gaughan, 2010).

Brouthers, Van Hastenburg, and Van Den Ven (1998) describes three different motives for a merger: Economic, personal and strategic. Economic motives includes increasing profitability, risk spreading and cost reductions by achieving economies of scale. Personal motives includes increased prestige through increased sales and company growth but also belief in being able to manage the acquired company better than the current management. The last general motive is believed to be strategic, which includes pursuing market power by acquiring a competitor or acquiring a supplier to create barriers of entry (Brouthers, Van Hastenburg, and Van Den Ven, 1998). It could also be extensions of different forms such as geographically, markets, products or channels.

The different types of mergers and acquisitions is according to Gaughan (2010) horizontal, vertical and conglomeration.

A horizontal merger is when two companies that are in direct competition and share the same products consolidate. Since they often operate in the same space and offer the same good or service the competition is often high and the benefits from a merger is high (Gaughan, 2010). A vertical merger is the merger of two companies producing different goods or services for the same end-product. It is often an acquisition on a different level of the supply chain. The objective for a vertical merger is to reduce costs and improve the supply chains efficiency. The last type Gaughan (2010) describes is conglomeration which stands for a merger of two companies in two completely unrelated businesses.
3.2.1 The deal process

The process of a merger or acquisition is defined as the process where a company acquires or merges with another company. The process is commonly broken down into smaller segments to clarify the different stages the stakeholders of an acquisition undergo during the process of a deal (Häkkinen, 2014). Galpin and Herndon (2000) segments the deal in 6 major stages in a deal flow model to describe the fundamental stages of the deal process. The stages are formulated as:

1. Formulate - The first stage where the organization formulates strategies and objectives. It is in this phase the company evaluates what constitutes the ideal company in various factors i.e. cost structure, market channels, organizational structure etc.

2. Locate - After the template for a desirable company to acquire is set. The time for locating these companies follows.

3. Investigate - When a target is found the third phase initiates. It is during the investigative part of the process the acquirer explore the desired company in detail. The investigation is done through a thorough due diligence process. The due diligence team identify and summarize key findings in important aspects of the company such as financial, operational, legal and strategic aspects. These are usually used to set negotiation parameters, bid prices, pre-maturely find deal killers and provide a foundation for initial integration considerations.

4. Negotiate - The fourth stage of the process is to reach an agreement with the target.

5. Integrate - After a successful negotiation the company stands to the question of how fast the acquired company should be integrated in the acquiring company and to what extent. Other questions to answer during this stages is also the speed of the integration, how disruption should be managed and how to reach out to all stakeholder groups.

6. Motivate - After the initial integration it is time to focus on the long-term value of the new organization and to achieve ongoing performance improvements.

3.2.2 Integration and synergy

Literature on Mergers and Acquisitions frequently point out the importance of managerial actions after an acquisition to realize the value of the combination potential in transactions of companies. These actions are commonly refereed to as the post-merger integration process (Häkkinen, 2014). According to Häkkinen (2014) these actions does to a great degree determine the results of the expected benefits of the combination potential of the companies that make up the transaction, often refereed to as synergies.

To explain the complex nature of these actions a brief explanation of value creation in mergers and acquisitions follows as it constitutes the basic understanding of the integration process and its definitions. As previously mentioned the key driving force for a merger or an acquisition is to create value. Value creation is according Schweiger and Very (2003) defined as the realization of expected cash flows which constitutes the pricing of the deal. These cash flows are realized through the realization of potential synergies that in turn is defined by the strategic objectives of the merger or acquisition.

Synergies can further be broken down in different categories based on the type of value that is sought. Synergies can take many different forms and authors have used different classification systems to structure the different types of synergies that exist. Both Schweiger and Very (2003) and Sevenius (2003) use a four-folded approach.

Cost synergies is the process of reducing cost to increase cash flows. Because of the ease to capture this type of synergy it has historically become the most common form of sought synergy to create value (Schweiger and Very, 2003) (Sevenius, 2003).
Revenue synergies are connected to creating value through cross-selling products or services by complementary distribution and sales channels. Often to reach and serve a broader geographic market, other technologies or new customer segments. This by either serving a different market with the same products or broadening the product portfolio in an attempt to expand the product offering. Schweiger and Very (2003) also highlights the importance of reaching these types of synergies without adding costs that offset the increased revenue e.g. increasing sales volumes with the same amount or less sales personnel.

Market power synergies is described by Schweiger and Very (2003) as the result of an elimination of a competitor by acquiring the competitor. This is typically the synergy sought in a mature market where overcapacity is present and prices are pushed down by fierce competition. Sevenius (2003) also describe that the bargaining power of the new organization on the market towards suppliers and customers is central in this type of synergy.

Sevenius (2003) describes the last synergy as financial synergies where lowered cost of capital and lowered financial risk can create value. Schweiger and Very (2003) instead describes the last synergy category as intangible synergies where brand name extension and knowledge sharing create a possibility of increased value.

Aside from the positive side of synergies there is also the possibility that the merger create disruptions with the consequence of value loss also referred to negative synergies. This is among other studies exemplified by Paruchuri, Nerkar, and Hambrick (2006) who shows that productivity drops are present during integration of R&D departments after an acquisitions. These as well as the positive synergies should be managed in order to achieve value creation. It should also be highlighted that all types of synergies can be present in the same deal and to varying degrees depending on the certain level of integration and the underlying strategic objective of the merger (Schweiger and Very, 2003).

Goold and Campbell (1998) also discusses the double-sided nature of synergies. It is described that synergy initiatives in most cases fall short of their managers expectations. One reason for this is the broad and vague terms often used while setting the goals of the synergy program. Goold and Campbell (1998) instead suggest a focus on disaggregation of synergy programs into smaller more precise parts or as described by Goold and Campbell (1998) "meaningful components that could be addressed individually". This in order to better evaluate costs and benefits of the synergy and help develop implementation plans.

To find synergies McKinsey (2010) proposes a framework where three layers of value creation in an integration should be investigated. These three layers are:

- **Protect the base business** - Where effort should be put to preserve value of the pre-merger state and focus on the maintenance of core business activities.

- **Capture combinational synergies** - Where the effort is more focused on the traditional value creation of integrations. Economies of scale and efficient use of combined resources are key factors to consider here.

- **Seek select transformational synergies** - Where effort instead is focused on value creation through radically transforming specifically selected functions, processes or business units.

While trying to capture synergies Goold and Campbell (1998) also presses on the focus on risk during an intervention. There should be an assessment of the synergy and the appropriate managerial actions that both capture the synergy value but also makes it easy to implement as well as avoids the downside risks.

Integration level in M&As

The level of integration is commonly structured in accordance to the following framework, the levels can differ depending on the authors preferences, although Schweiger and Very (2003) describes them overall as fairly similar and are described below.

Consolidation is described as a level of integration where separate functions or activities at the companies are merged into one activity.
Standardization on the other hand is a level where separate operations are kept at both companies but the individual processes are standardized.

Coordination describes the type of integration where activities are kept separate and untouched but are coordinated between the firms.

Intervention describes the type of integration where the acquiring company intervenes in the acquired companies activities, usually to carve out unprofitable activities or products.

**Strategic objectives in M&As**

The strategic objective of a merger does to a large part drive the approach to an integration of the acquired company and the type of synergies that could be achieved (Schweiger and Very, 2003). The strategic objectives are described by Schweiger and Very (2003) as:

- Consolidate within a geographic area
- Extend or add new products, services, or technologies
- Enter a new market
- Vertically integrate
- Enter a new line of business

Consolidate within an geographic area is defined as the goal of acquiring a competitor in the same market geographically. By doing this there are some potential synergies that could be achieved. Schweiger and Very (2003) mainly presents synergies related to economies of scale in operations and larger bargaining power e.g. more efficient utilization of assets, pricing power towards customers. The integration level is because of this often set to the consolidation level or standardization level, where all or most of the organizational functions and activities, operations included are integrated in this fashion.

Extend or add new products, services or technologies is the strategy of reaching for opportunities to extend the product offering to the customer. This means that the strategy is to increase competitive capabilities by utilization of different and complementary products, technologies or channels. Synergies related to this type of strategy is described by Schweiger and Very (2003) as mainly revenue synergies but market power synergies as well as intangible synergies could be present. Increased revenues could be driven from more and better capabilities through new technology, the bundling of services to provide a more complete service or an increased market share by increased and more complete product lines. Integration wise this type of strategy points to an integration level where overhead functions and operations are to be standardized or consolidated in regards to the extent of what is possible in reference to which new products that fit the current operating structure. Coordination between sales forces are also required if cross-selling are to be done.

Enter a new geographic market defines the objective of a firm to access a geographic area where it as of now don’t have a clear presence or knowledge. The synergies mainly sought in this type of strategic objective are revenue synergies e.g. increased sales volumes because of the larger geographic reach. This leads to an integration level where little consolidation is sought but standardization, mainly best practices, are implemented in operations and other business functions.

Vertically integrate constitutes the strategy of taking control of the supply or distribution. Here the main synergy that is present is market power. Bargaining power increases as the acquiring company takes control of a larger part of the supply chain and can to a larger extent dictate pricing on the market. The integration level here is mainly aimed at keeping business as usual and neither standardization or consolidation of business functions such as operations occurs.

Enter a new line of business is the strategy of entering in to a line of business that the company has no prior experience in. Schweiger and Very (2003) describes this type of strategy as low on potential synergies but there is some possibility of both cost synergies and intangible synergies such as elimination of redundant resources in staffing or the broader knowledge base of the combined firms. By operating a completely different type of business there is no possibility to either consolidate or standardize the operations of the companies.
3.2.3 Previous research on post-merger integrations of the supply chain

Integrating the supply chain properly is described in literature as a prerequisite for a successful post-merger integration. Langabeer and Seifert (2003) finds that there is a direct correlation between successful supply chain integration and success in the deal process after researching hundreds of mergers. Herd, Saksena, and Steger (2005) describes that supply chain integration is both usually down-prioritized by management during an integration process as well as being critical to creating deal value. Evidence has also been found of efficient supply chain management being proportionally related to financial performance (Dung and Thanh, 2012).

Issues of horizontal post-merger integration of operations and logistics in particular has, however, gained little attention by the academic community. Häkkinen et al. (2004) does a thorough literature review of published work in six major journals with a focus on logistics, distribution, purchasing and supply chain management between 1989-2002 and finds a total of three articles published that discusses these types of issues to some degree. The three articles found are presented in short here: Currie (2000) researches consolidation of IT-service providers but did not discuss integration of supply chains, Caputo and Mininno (1996) discusses horizontal supply chain collaboration but does not mention mergers and acquisitions and Ojala (1993) discusses mergers and acquisitions of Nordic logistic service providers but does not address industries such as the manufacturing industry. By complementing the literature review, examining the same journals as Häkkinen, the authors conclude that no new work has been presented on this topic during the time frame of 2002-2018 in these journals.

Häkkinen et al. (2004) also reviews current M&A literature on the subject and finds that authors in this field mainly concentrate on strategic management issues and financial or human aspects. They also point to supply chain management synergies and issues but does not elaborate on this particular subject in detail.

Häkkinen et al. (2004) provides an analytical framework for further research in the field where the sub-functions sourcing, manufacturing and distribution of logistics are distinguished. Furthermore the dimensions of processes and structures/resources are added under each sub-function to provide further analysis into either the logistic structure or the logistic process within either sourcing, manufacturing or distribution. The framework could then be used to assess the combination fit and potential of the companies, the level of integration appropriate, the potential realized synergies or the difficulty of the synergies.

Extending the literature review of Häkkinen et al. (2004) within M&A research as well the authors found a small amount of contributions in the field of horizontal post-merger integration issues in the operations practice.

Zhang et al. (2010) uses a network configuration approach to "understand the organizational features of different types of networks, including intra-firm and inter-firm operations for manufacturing, engineering and supply chain functions". As previously presented the linkage between the strategic objectives of the merger and the post-merger integration is considered a vital part of the analysis. Here objectives are divided in to three categories: Growth: Where expanding to new markets, strengthening market power, expansion of product line among others resides and namely revenue synergies are sought. Efficiency: Where economies of scale, consolidation in geographic area and reduce operational costs resides focusing on cost synergies and Others: Basically factors that are driven by personal, legal or financial objectives. However, this factor is only present together with some of the other objectives and does not always need to be present according to Zhang et al. (2010).
They present a framework consisting of 5 key elements of network configuration and analyze 10 international mergers and acquisitions with a focus on merging manufacturing networks. The 5 key elements of network configuration are presented as:

- **Network structure** which represents the geographic dispersion and interdependence between units of the network.
- **Operations flow** which describes the current operational processes that is present in the network by different members in the network.
- **Governance and coordination** which represents the systems for performance measures as well as coordination mechanism of the system.
- **Support infrastructure** which describes supporting aspects as people, culture and IT-systems.
- **Relationships** which describe how the members of the network are linked to the external environment such as customers or suppliers.

While the particular strategy behind the merger or acquisition could be the source of certain types of integration issues Harrison, O’Neill, and Hoskisson (2000) argues that the power position in the supply chain for both parties are of importance. They present a reasoning where changing the power position for a certain supply chain member is the hardest part of an integration. It is therefore reasonable to follow the logic and assume that an acquisition where the "center of gravity" of the supply chain remains the same would be most likely to create the fewest integration issues.

When searching for best practices in handling supply chain issues Herd, Saksera, and Steger (2005) finds, after studying 15 mergers, that there are four components that should be implemented in order to succeed with an implementation. These are:

1. Establishing the supply chain leadership and team - A leader that is dedicated to the supply chain should be identified early in order to ensure a supply chain focus during the whole process. The integration team also needs to be formed in an early part of the integration.
2. Identifying realistic goals - To identify realistic synergies at the very start is crucial for the success to be present. Goals that are too high are common and supply chain synergies should be carefully evaluated.
3. Developing the implementation road map - To establish the 1 day and 100 day plan of the merger is also important. Identifying the supply chain activities and initiatives that are important to attend to gives the company the possibility to be better prepared for the merger. In addition it is suggested that the initiatives are to be ranked in order of speed of integration and speed of value creation.
4. Measuring the outcome - Lastly it is proposed that the progress of the integration should be measured. This to ensure visibility and focus on key priorities. These metrics should be connected to the realization of the synergies that are determined in an earlier stage.

DePamphilis (2009) also points out that planning is important during the post-merger phase. To integrate certain functions it is suggested that a benchmark should be determined and compared to first and foremost. This to form a solid ground on assessing if a processes should be integrated. During the integration of procurement activities DePamphilis (2009) emphasizes that a list of critical suppliers should be developed by both parties to determine overlaps and suppliers that should remain in the supply base for both parties. To integrate manufacturing operations it is suggested that the facilities should be examined to assess overall capacity as well as manufacturing capabilities that are duplicated at present facilities. Process efficiency should also be examined. This is done by examining production planning processes, materials ordering, order entry procedures and quality control. Here it is important to standardize processes in order to begin plant consolidations.

There are both present issues with integrating the supply chain during a merger or acquisition and proven evidence of the large implications on the merger or acquisition that successful integration of the supply chain have. However, Dung and Thanh (2012) points out that research has been focused on the determinants of supply chain integration while not researching how to create detailed processes and guides for implementation of supply chain integration.
In summary, it can be concluded that there is a pressing need to further examine possible tools within the supply chain literature to help develop guidelines, processes and implementation tools to capture possible issues in an early state of the integration, develop a plan to resolve these issues to enable growth for the case company as well as develop a systematic approach that could be used in future mergers. By existing literature we can conclude that:

- The integration of the supply chain in a merger or acquisition is a crucial part to conquer to successfully acquire and integrate a company.
- There is a correlation between the strategic objective of the merger and the possible synergies that are most likely to be realized.
- Planning for and managing operational issues during post-merger integrations within manufacturing, sourcing and delivery is needed at some level to realize certain synergies.

And that the approach should particularly consider the following:

- Synergies should be broken down into meaningful and clear objectives.
- An assessment of risk, benefit and ease of implementation should be carried out before synergy programs commences.
3.3 Supply chain management theoretical framework

In this section we will present the basics of supply chain management and two established supply chain management theoretical frameworks. These were evaluated and it was found that one framework was better suited to achieve the purpose and was therefore chosen and synthesized. The framework was later used to map and analyze the supply chain.

3.3.1 Supply chain management theory and competitive performance

Supply chain management is described by Lockamy III and McCormack (2010) as a philosophy that has its basis in the belief that independent firms in the supply chain has an effect, indirectly and directly on the performance of its participants in the chain. Tang (2006) goes further and defines supply chain management as "the management of material, information and financial flows through a network of organizations (i.e., suppliers, manufacturers, logistics providers, wholesalers/distributors, retailers) that aims to produce and deliver products or services for the consumers. It includes the coordination and collaboration of processes and activities across different functions such as marketing, sales, production, product design, procurement, logistics, finance, and information technology within the network of organizations".

In order to understand and model the supply chain. The first step is to figure out the driving forces and constraints behind the supply chain. According to Min and Zhou (2002) these are customer service initiatives, monetary value, information/knowledge transactions and risk elements. Customer service initiatives can be hard to quantify however the ultimate goal of a supply chain shall always be customer satisfaction. Which commonly contains the two elements of: Product availability and response time. Product availability can for instance be measured by the inventory days of a supply. Response time instead represents the supply chains flexibility, examples here might include time-to-market, order-processing time and lead-times (Min and Zhou, 2002). Monetary value is commonly defined as ratio of revenue to total cost. The value is thereafter categorized in asset utilization, return on investment (ROI) and cost behavior. Risk element of the supply chain is the risk of failure in quality and information.

Supply chain constraints and freedom is the limitations of a firm to alter their supply chain. The constraints include capacity and service compliance. Capacity is the supply chain members financial, production, supply and technical capability. Furthermore, capacity includes space for inventory and manufacturing. Another supply chain constraint is service compliance. Since the ultimate goal is to satisfy the customer, firms usually have constraints in what the customer accepts. Examples are delivery time windows and manufacturing due dates. The freedom the firm has in the supply chain must be in the time window limits. Amongst the possible decision variables is: Location, allocation, network structuring, inventory levels, extent of outsourcing. Allocation refers to which locations that should serve which suppliers, customers etc. Network structuring determines centralization and flow for instance (Min and Zhou, 2002).
To emphasize the interrelated nature of activities in supply chain management, Lambert and Cooper (2000) presents a conceptual framework for supply chain management. It consists of three elements which are closely interrelated: the supply chain network structure, the supply chain business processes and the supply chain management components all that needs to managed to be successful in managing the supply chain.

![Figure 3.1](image)

**3.4 Management Components of SCM**

This element of supply chain management is described as nine components to sustain how to assess the management of the chain. These components can further be divided into two separate groups. The tangible physical and technical group which are more easy to change, measurable and visible while managerial and behavioral components are less tangible. These are:

- **Physical and technical components**
  - *Planning and control* of operations are essential in order to move a supply chain in a desired direction.
  - *Work structure* shows how well the firm executes its tasks and activities.
  - *Organizational structure* could either be the structure of the firm or the whole supply chain.
  - *Product flow facility structure* constitutes the structure of which sourcing, manufacturing and deliveries are carried out in the supply chain.
  - *Information flow facility structure* refers to the structure of which information is passed along in the supply chain.

- **Managerial and behavioral components**
  - *Management methods* involves the techniques for management and the corporate philosophy.
  - *Power and leadership structure* in the supply chain constitutes how the supply chain will run, one powerful leader in the channel could drive the direction the whole supply chain takes.
  - *Culture and attitude* is also very important to consider as it will affect the supply chain.
3.5 The supply chain network structure

The supply chain network is described as the links between the firms of the supply chain and describe the key members where processes needs to be linked. Lambert and Cooper (2000) stresses the importance of the knowledge of the structure of the supply chain and the configurations present. Three primary aspects are presented which gives insights into this element:

- The members of the supply chain: To list every member of the network would be a complex task and it is therefore suggested that members that need managerial attention and resources should be included.

- The structural dimensions of the network: Both a horizontal and vertical dimension of the supply chain can be modeled as well as the focal company’s position in this network. Horizontal does in this context refer to the width of the supply chain in the sense that a wide supply chain contains a lot of tiers between raw material and end consumer, the vertical dimension in this context refer to the amount of companies in each of the tier stages and the horizontal position is refereed to the focal company’s position in the network

- The different types of process links across the supply chain: There is according to Lambert and Cooper (2000) a distinction between process links in the supply chain which are more or less managed by the company.

3.6 Supply chain business process frameworks

The concept of organizing the activities of a firm as business processes was introduced to the public through the books of Hammer and Champy (1993), and Davenport(1993) (Lambert, Garcia-Dastugue, and Croxton, 2005).

Since the mid-1990s, academics has tried to describe supply chain management through processes. This is based on a literature review including (Srivastava, Shervani and Fahey 1999; Supply-Chain Council 1996;Cooper, Lambert and Pagh 1997;Bowersox, Closs, and Stank 1999) done by (Lambert, Garcia-Dastugue, and Croxton, 2005). The analysis Lambert, Garcia-Dastugue, and Croxton (2005) did, shows that only two out of the five frameworks includes business processes that can achieve cross-functional integration. Lambert therefore also believes the two are more appropriate for management since they are described in enough detail to draw strategic conclusions. The analysis was made through a comparison of SCOR and the GSCF.

SCOR

The Supply-Chain Council, SCC developed the Supply-Chain Operations References (SCOR) framework, the study consisted of 69 case companies which with its growing popularity came to grow to over 750 members in a later study. According to Council (2005) the SCOR framework consist of five major processes:

- Plan
- Source
- Make
- Deliver
- Return

Each process is analyzed around: business process re-engineering, benchmarking and best practices analysis (Council, 2005). This is done by describing the current process and later on determining a "to-be" state. Benchmarking is used to determine key performance indicators. Lastly the best practices analysis aims to identify management practices to reach the desired to-be state and see the top performers by using their roadmap for implementation.
The General Supply Chain Framework

Lambert and Cooper (2000) defines eight SCM business processes which are key in order to achieve successful supply chain management. A full implementation of the eight process could indeed be challenging but could also be necessary in order to avoid sub-optimization. The eight processes are described in short below:

1. Customer relationship management process: This process is concerned with the identification of key customers and customer groups which is targeted as critical for the company.

2. Customer service management process: This process is the key point of contact with the customer and provides the customer with real-time information regarding the products or services that is delivered to the customer.

3. Demand management process: Customer demand is both variable and irregular. Firm demand management is therefore essential to effectively manage the supply chain. This is done by balancing the requirements of the customer in contrast to the firm’s supply capabilities.

4. Customer order fulfillment process: There is also a present need to meet customer deadlines. This is done by effectively integrating manufacturing, distribution and transport plans. The objective here is to develop a process that ensures a smooth flow to the customer.

5. Manufacturing flow management: The manufacturing process is also a key process to master in order to achieve successful supply chain management. Manufacturing processes need to be flexible in order to achieve both mass-customization and responses to market changes.

6. Supplier relationship management: The process where a structure for how relationships in the supply chain towards suppliers are determined and how they are maintained.

7. Product development and commercialization: This process realizes both new products and the time this products reaches the market.

8. Returns process: There is a present need to manage the return of products to utilize a competitive advantage.

Comparison of the GSCF and SCOR

In a comparison of the frameworks Lambert, Garcia-Dastugue, and Croxton (2005) found that the two is very similar, however GSCF is very broad in its scope, which is seen as its biggest strength but also its weakness. The GSCF broadness is believed to increase opportunities for management to provide value. However, the downside of GSCF is that it does not include the return flow. But the most clear distinction between the two is, the strategic driver. GSCF is closely linked to the corporate strategy and the functional strategies, SCOR on the other hand is developed based on the operations strategy. According to Bolstorff and Rosenbaum the operations strategy should be developed on the corporate strategy and be aligned with the functional strategies and not the other way around. Lambert, Garcia-Dastugue, and Croxton (2005) implies that SCOR does not consider corporate strategy nor the functional strategies. Additionally SCOR does not attempt to describe every business process or activity for instance, sales and marketing or product development. SCOR instead focuses on the forward and backward movement of the products (Council, 2005). Lambert, Garcia-Dastugue, and Croxton (2005) implies that SCOR focus on interaction between a few key functions, while GSCF focuses on integration across all functions.

In summary managers have four ways to generate value: increasing revenue, reducing operating cost, reducing working capital and increasing asset efficiency (Lambert, Garcia-Dastugue, and Croxton, 2005). However, the main objective of SCOR is operational efficiency, which means the framework is centered around cost reductions and asset utilization. GSCF is more broad and intends to identify revenue implications from suppliers and customers as well as operational efficiency. Based on the strategic objective of the merger analyzed in this thesis, the GSCF framework is therefore more suitable to use, as the strategic objectives are more geared towards increasing revenue rather than increasing operational efficiency.

A comparison has been made and is illustrated in table 3.1.
Table 3.1: Comparison of supply chain frameworks according to Lambert, Garcia-Dastugue, and Croxton (2005)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>GSCF</th>
<th>SCOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>Strategic Driver</td>
<td>Corporate and functional strategies</td>
</tr>
<tr>
<td></td>
<td>Breath of Activities</td>
<td>All activities related to successful</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation of 8 business processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-company</td>
<td>Connectedness</td>
<td>Organization-wide</td>
</tr>
<tr>
<td>Connectedness</td>
<td></td>
<td>cross-functional integration</td>
</tr>
<tr>
<td>Inter-company</td>
<td>Connectedness</td>
<td>Relationship management</td>
</tr>
<tr>
<td>Drivers of Value</td>
<td>Generation</td>
<td>Economic Value Added</td>
</tr>
</tbody>
</table>

3.6.1 Strategic sub-processes of supply chain business processes

Croxton et al. (2001) describes a set of sub-processes connected to each business processes that Lambert and Cooper (2000) presented. These are divided into strategic and operational processes. Where strategic processes establish the strategic framework for management and a blueprint for implementation under each business process. Operational processes on the other hand is the acts upon this blueprint or commonly refereed to as the day-to-day activities connected to the process. It is highlighted that these processes might not be applicable to all companies but stands from a point of view of a manufacturing company near the middle of the supply chain, much like the case company present in this thesis. It is also highlighted that the relative importance of each of the eight processes also varies from firm to firm and from business case to business case. Below are the strategic sub-processes regarded as important for this thesis presented. Operational processes are determined to be to specific to be applicable to the certain business case and therefore not presented.

Strategic sub-processes of demand management

Croxton et al. (2001) describe the demand management process as centralized around forecasting and synchronizing. It is therefore a priority to first and foremost determine the appropriate forecasting methods that are about be used in the supply chain as well as the data that is about to be included in the process. After this the information flow structure is to be determined. This to facilitate that the right channels of information is being used. Both in the sense of data collection as well as distributing the present forecasts among other functional parts of the company and the supply chain. Thereafter the synchronization between the forecast and the manufacturing, sourcing and delivery resources needs to be done. Here it is important to analyze capacity and flexibility constraints in the supply chain. When concluded the team should develop contingency plans in order to assess disruptive events of either a external or internal side. This since plans and guidelines are developed in case of interruptions in supply or unexpected demand variations. Lastly and common for all strategic sub-processes a set of metrics should be developed in order to monitor performance. In this type of sub-process metrics connected to forecasting error and capacity utilization is suggested.

These processes and key activities are summarized in 3.2:
Table 3.2: Demand management

<table>
<thead>
<tr>
<th>Strategic sub-processes</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine demand management goals and strategy</td>
<td>Review Firm’s strategies</td>
</tr>
<tr>
<td></td>
<td>Study supply chain network and bottlenecks</td>
</tr>
<tr>
<td></td>
<td>Determine focus and goals of the process</td>
</tr>
<tr>
<td>Determine forecasting procedures</td>
<td>Determine level of forecast</td>
</tr>
<tr>
<td></td>
<td>Determine sources of data</td>
</tr>
<tr>
<td></td>
<td>Choose the most appropriate method</td>
</tr>
<tr>
<td>Plan information flow</td>
<td>Determine data requirement</td>
</tr>
<tr>
<td></td>
<td>Determine sources of data</td>
</tr>
<tr>
<td></td>
<td>Determine how forecast information will be shared</td>
</tr>
<tr>
<td>Determine Synchronization Procedures</td>
<td>Outline procedures for synchronization</td>
</tr>
<tr>
<td></td>
<td>Determine long-term planning requirements</td>
</tr>
<tr>
<td></td>
<td>Examine supplier/manufacturing capabilities</td>
</tr>
<tr>
<td></td>
<td>Determine allocation procedures</td>
</tr>
<tr>
<td>Develop Contingency Management System</td>
<td>Develop list of potential interruptions to supply</td>
</tr>
<tr>
<td></td>
<td>Determine event response procedures for each possible event</td>
</tr>
<tr>
<td>Develop Framework of Metrics</td>
<td>Determine appropriate metrics and set goals</td>
</tr>
</tbody>
</table>

Strategic sub-processes of customer order fulfillment management

Croxton et al. (2001) describes order fulfillment as a key to successful supply chain management. Because one meets customer requirements through order fulfillment, the process is first and foremost considered with the strategies of manufacturing, logistics and marketing to be able to meet these requirements, hence these strategies need to be reviewed. Afterwards the requirements for the order fulfillment needs to be specified. This includes researching manufacturing capabilities, lead-times and service requirements to see if there are potentially service differentiating. Next the logistics networks needs to be evaluated. This to ensure cost effective logistics and meet customer requirements. This includes evaluating geographic locations of plants, suppliers and warehouse as well as product distribution among the facilities. With this done there is a present need for a plan that determines how orders from specific customers are to be filled. Lastly a framework needs to be determined in order to keep track of performance. Metrics proposed in this category is order-to-cash time, order fill rate and order completeness (Croxton et al., 2001).

These processes and key activities are summarized below in 3.3:

Table 3.3: Customer order fulfillment

<table>
<thead>
<tr>
<th>Strategic sub-processes</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review marketing strategy, supply chain structure and customer service goals</td>
<td>Review Firm’s strategies</td>
</tr>
<tr>
<td></td>
<td>Understand customer requirements</td>
</tr>
<tr>
<td></td>
<td>Determine capabilities of the supply chain</td>
</tr>
<tr>
<td>Define requirements for order fulfillment</td>
<td>Review the order-to-cash cycle and supply capabilities</td>
</tr>
<tr>
<td></td>
<td>Define lead-time and customer service requirements for each customer segment</td>
</tr>
<tr>
<td></td>
<td>Define operational requirements</td>
</tr>
<tr>
<td></td>
<td>Evaluate core competencies</td>
</tr>
<tr>
<td>Evaluate logistics network</td>
<td>Determine if the current network can support the requirements</td>
</tr>
<tr>
<td></td>
<td>Determine: Which plants produce which products, locations of warehouses, plants and supplier, transportation modes.</td>
</tr>
<tr>
<td>Define plan for order fulfillment</td>
<td>Determine how to fill the orders from each customer segment</td>
</tr>
<tr>
<td></td>
<td>Make decisions about payment terms, order sizes and packing requirements</td>
</tr>
<tr>
<td></td>
<td>Determine allocation rules</td>
</tr>
<tr>
<td></td>
<td>Assess the role of technology</td>
</tr>
<tr>
<td>Develop framework of metrics</td>
<td>Determine appropriate metrics and set goals</td>
</tr>
</tbody>
</table>

Strategic sub-processes of manufacturing flow management

Croxton et al. (2001) defines the manufacturing flow management process as the process that ensures manufacturing flexibility needed for the markets targets as well as the production of the products for the markets. First and foremost there needs to be an assessment of the manufacturing infrastructure and the underlying strategies of marketing, logistics and manufacturing.
The second sub-process is instead geared towards determining the degree of manufacturing flexibility that is needed in the supply chain. This in turn determines the degree of push and pull boundaries that is set in the system. This among other things establishes the degree of postponement that could be used in manufacturing depending on the products. Next the manufacturing constraints and requirements are determined. This both to identify short-comings in the present supplier base as well as help determine the supply chain capabilities. After this the manufacturing capabilities are determined and are translated into deliverables to customers. Lastly a set of metrics is developed in order to measure performance. Here it is suggested that inventory levels, cycle time and product quality all give insight in the performance of the manufacturing flow.

These processes and key activities are summarized below in 3.4:

<table>
<thead>
<tr>
<th>Strategic sub-processes</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop manufacturing strategy</td>
<td>Review firm’s strategies, Establish preparedness for future market changes, Forecast expertise needed and laws and regulations</td>
</tr>
<tr>
<td>Determine degree of manufacturing flexibility requirement</td>
<td>Determine customer tolerance time, batch size, cycle time, quality control, Plan capacity growth, Establish make vs buy decisions</td>
</tr>
<tr>
<td>Determine push/pull boundaries</td>
<td>Review customer service goals, Determine inventory points, Evaluate postponement opportunities</td>
</tr>
<tr>
<td>Identify manufacturing constraints and requirements</td>
<td>Document capabilities, Determine stock quantities and locations, disposal requirements, Develop contingency plans, supplier development strategies, communication mechanisms</td>
</tr>
<tr>
<td>Develop framework of metrics</td>
<td>Determine appropriate metrics and goals</td>
</tr>
</tbody>
</table>

**Table 3.4: Manufacturing management**

Strategic processes of supplier relationship management

Croxton et al. (2001) defines this process as the process where the company defines how it will interact with its suppliers. First and foremost there needs to be a review of the corporate strategy as well as the strategies for manufacturing and sourcing to identify the key components needed for success of the organization. With these key drivers identified the next step should be to categorize the suppliers. This could be done in reference to growth, stability or profitability of the suppliers as well as the suppliers technological capabilities or the volume purchased and the capacity available at the supplier. After this the appropriate method for measuring the suppliers in reference to the category should be determined. When determined guidelines for customization at the suppliers are specified as well as the purchase and sales agreement. Thereafter it is proposed to develop guidelines and metrics to sustain and measure the performance of the process. These metrics should stand in straight correlation with the impact that the suppliers have on the overall business and should be chosen in this regard as well. In this process it is also important to highlight the win-win situation that should be present in the relationship. It is therefore important to also develop guidelines for sharing improvements and benefits with the suppliers.

These processes and key activities are summarized below in 3.5:

<table>
<thead>
<tr>
<th>Strategic Sub-Processes</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review corporate, marketing, manufacturing and sourcing strategies</td>
<td>Review firm’s strategies, Identify components that are key to organizational success</td>
</tr>
<tr>
<td>Identify Criteria for categorizing suppliers</td>
<td>Identify most important criteria i.e. Profitability, growth, stability, capacity</td>
</tr>
<tr>
<td>Provide guidelines for the degree of customization in the product/service agreement</td>
<td>Determine if the current network can support the requirements, Determine: Which plants produce which products, locations of warehouses, plants and supplier, transportation modes.</td>
</tr>
<tr>
<td>Develop framework of metrics</td>
<td>Determine appropriate metrics and set goals</td>
</tr>
<tr>
<td>Develop guidelines for sharing process improvement Benefits with suppliers</td>
<td>Outline options for sharing the benefits of process improvement</td>
</tr>
</tbody>
</table>

**Table 3.5: Supplier management**
3.6.2 Synthesizing the GSCF and the strategic sub-processes

From the presented framework of Lambert and Cooper (2000) and Croxton et al. (2001) there are present similarities in the strategic sub-processes of different functions in the supply chain. To develop a framework that provides the holistic overview that is required while merging two different firms supply chain the processes needs to be synthesized to provide a tool for deeper analysis of the supply chains. While the chronology in the different sub-processes varies, common themes with in each of the processes are described below and ordered in the, to the authors, most logical order.

A present theme in the GSCF is the connection to the overall strategy of the firm. It is in some form present in all of the strategic sub-processes that are presented by Croxton et al. (2001). This will therefore constitute the first process of the strategic sub-processes. These strategies are often put in contrast to the requirements of the customer and it becomes important to define both requirements that the processes needs to fulfill to satisfy the customer as well as the capabilities and the competitive advantages that are order winning. As described in the M&A literature the strategic objective also have strong impact on the deal process.

Secondly the sub-processes does to some extent evaluate the present resources. The manufacturing processes needs to be flexible and have the right capacity to support the strategies reviewed in the first process. Suppliers needs to be able to supply the network with products that answer the demand of the customers. Forecasting procedures and network configurations needs to be known in order to evaluate if there is alignment between the strategy and the supply chain.

Thirdly the sub-processes describe different ways of segmenting the business processes. In supplier relationship management it is important to find the right criteria to segment suppliers on. In the same way the manufacturing process describes how requirements for capacity and flexibility in the processes should be translated to customer deliveries. The segmentation process and the process of mapping resources are indeed chronologically differently order in different processes. However, to be able to sort something it is only logical to first determine the substance that is to be sorted first. Hence the present chronology in the framework is set in this way as well.

After this, there is a component of synchronization present in the sub-processes. In the demand process it is important to synchronize planning, in both the customer order fulfillment processes as well as the supplier management processes there is a need to determine how the product flows should be set up. In the manufacturing the customer deliveries needs to be translated in to actions.

Lastly, the processes emphasize measurement. Appropriate measures needs to be choosen. It is also described that the processes should assess risk connected to the activities.

<table>
<thead>
<tr>
<th>Strategic Sub-Processes</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review firm strategies</td>
<td>Understand customer requirements</td>
</tr>
<tr>
<td></td>
<td>Determine capabilities and competitive advantages</td>
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<tr>
<td>Evaluate the present resources</td>
<td>Evaluate the present network configuration</td>
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<tr>
<td></td>
<td>Determine if the current network can support the strategy</td>
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<tr>
<td></td>
<td>Plan capacity growth</td>
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<tr>
<td>Identify criterias for segmentation</td>
<td>Define lead time and customer service requirements for each customer segment</td>
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<tr>
<td></td>
<td>Determine criteria for capacity and flexibility</td>
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<tr>
<td></td>
<td>Determine other criteria for supply chain segmentation</td>
</tr>
<tr>
<td>Determine synchronization procedures</td>
<td>Determine which plants produce which products, locations of warehouses, possible supply base consolidation</td>
</tr>
<tr>
<td>Determine new possible network configurations</td>
<td>Determine appropriate metrics and goals</td>
</tr>
<tr>
<td>Develop framework of metrics</td>
<td>Develop contingency plans to assess risks.</td>
</tr>
</tbody>
</table>
3.7 The strategy of the firm

The GSCF-framework emphasizes the importance of reviewing firm strategies to understand customer requirements and determine capabilities.

There are two major opposite perspectives in strategy theory: Resource-based and position-based (Wit and Meyer, 1998). Resource-based views the firm from an inside-out perspective. From this perspective the company strategy should be built from the firm's internal capabilities and competences (Barney, 1991). In the position-based theory, the company is viewed from an outside-in perspective. The outside-in perspective promotes building the firm's strategy from its competitive environment (Porter, Millar, et al., 1985).

Traditionally logistics strategy research has used the outside-in perspective and seen logistics as a support rather than what drives the strategy (Kihlén, 2005). The opposite and an emerging picture is seeing the inside-out perspective in logistics. Inside-out sees the firm as a bundle of resources and tries to trace back to the specific resources in the firm which is valuable for the customer (Barney, 1991).

Persson (1991) describes logistics from a positioning perspective and the role it has in a company’s strategy. He implies that logistics is what delivers superior competitive advantage, since competition to a large extent is delivering more attractive products faster and more reliably than the competitors. Persson (1991) also suggest that logistics historically has been seen as a barrier rather than support for a competitive strategy which he also points out as a flaw in Porters five forces (Porter, Millar, et al., 1985). Persson (1991) instead argues that companies should formulate a logistics strategy on the materials flow level. The importance of the materials flow is derived from two factors:

- Importance of logistics as a unique driver
- Importance of logistics as a cost driver

Where unique driver is seen as the competitive advantage an excellent logistics performance has on customers behavior. The other one is the importance of logistics as a cost driver, where the key is the logistics cost share of total cost (Persson, 1991). With this illustration Persson implies that logistics can be seen not only as support to the strategy but rather a strategy driver. Person sees logistics as a strategy to improve performance, quality and productivity and should therefore be a more vital part in the business strategy.

However, Kihlén (2005) has expressed flaws since Person refers solely to Porter when discussing strategy. The odd being that Porter argues that operational effectiveness is not strategy, Porter sees operational improvements as necessary but not sufficient enough to form a strategy. If one sees strategy from a resource-based perspective the logistics role might instead be to attain distinctive and not easily imitated capabilities such as described by Olavarrieta and Ellinger (1997). That is however more difficult since the development pace in the logistics industry is high, which means its ultimately difficult to remain unique. However, Olavarrieta and Ellinger (1997) argues that by being continuously in the forefront of logistics one can use logistics as a competitive advantage.

3.7.1 Differences of SC strategies in SMEs and large corporations

Different perspectives of supply chain management and supply chain strategy in the context of large and small and medium sized companies

Small and Medium sized Enterprises, further referred to as SMEs comprise of a total of 99% of all businesses in the European Union (Commission, 2018). A SME is defined by the European Union as a company of a maximum of 250 employees and a turnover of less than 50 million euros or a balance sheet of a size of total of 43 million euros.

Hong and Jeong (2006) uses a broader definition and includes companies of up to 500 employees which constitutes a total of 99.7 percent of all businesses in the US as of 2003. He further describes the key roles that SMEs play in supply chain management and in the process of creating value.
Supply chain literature has mostly had a large firm perspective on supply chain management and Hong points out that supply chain strategies and growth patterns can deviate when comparing SMEs and larger corporations from a supply chain perspective and growth path perspective. Supply chain management practices are compared in five distinct areas between large corporations and SMEs, namely Competitive priorities, Key strategies, External control structure, Internal control structure and Goals of supply chain management processes.

Competitive priorities is concerned with where the firms choose to compete. SMEs does to a larger extent compete in niches of the market by keeping a profitable position in this particular market. Larger corporations on the other hand exhibits market dominance through a large share of the market.

Key strategies is focused on the particular strategies used in the supply chain. Where SMEs tends to build unique competencies, use effective supplier and customer management while focusing on a special market. Larger corporates does instead impose large influences in the supply chain both upstream and downstream coupled with strategic alliances with both distributors and suppliers.

External control structure comprises of the type of control of the external environment that the companies have. SMEs have a smaller control in the sense that they are more prone to accept control by other members of the supply chain i.e. OEM1, 1st tier suppliers who leverage their negotiation strengths or seek collaborations with other SMEs. Larger corporations on the other hand strives for command and control of the whole supply chain.

Internal control structure does instead describe the type of control that the company has over its own assets. An SME has in this context often a structure that is centralized around their key strategic operations while larger corporations use a more decentralized structure with a larger part of autonomy in each part of the supply chain.

Goals of the supply chain management processes of the two types of companies are similar in multiple areas of supply chain management processes namely customer relationship service management, demand management, order fulfillment, manufacturing flow management, product development and commercialization and returns management. However, they differ in the scope of the informations flows, where larger enterprises may formalize their documentation system practices.

3.8 Evaluating and developing supply chain strategies

Numerous research has been focused on how the strategies of supply chain should be developed to create successful supply chain management. With a particular focus on the supplier base, these theories are presented below.

3.8.1 Developing strategies for the supplier base

In the global business climate where fierce competition, cost cutting and fast technology development managers around the world acknowledge that a firms suppliers are of large importance to utilize in order to succeed with strategic goals. The supply base is defined as the portion of the suppliers that is actively managed by the company and when firms grow especially through mergers and acquisitions or outsourcing the complexity of this network and how it should be managed increases. Previous research suggest that this complexity is a major concern while managing the supply base (Bygballe and Persson, 2015). According to the literature there are central themes of challenges within supply base management. Bygballe and Persson (2015) points to the challenges of both complexity and dependency in the supply network. Complexity could stand from both the quantity of suppliers and the specific structure of the network as well as in terms of the products quantity, variety, novelty and uncertainty. The other challenges is to handle the dependencies that may arise when purchasing products and services as well as the relationships and dependencies that exist between suppliers. Gadde, Hakansson, and Persson (2010) categorizes the general challenges of managing the supply base in three categorize. These are variety, complexity and heterogeneity.

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1Orginal Equipment Manufacturer
*Variety* describes the supply markets variance in goods and services. There are different suppliers that supply different goods and services. They can differ in their focus and technology such as how product oriented they are as well as how technologically advanced they are. To handle this mix is important to achieve efficiency and effectiveness while managing the supply base.

*Complexity* describes the complexity of the supplier mix. There are solutions where a large number of components suppliers supplies specific parts, small number of suppliers distributing a large part of the products as well as everything in between. To manage the composition and the relational ties with in the network is therefore a challenges that needs to be dealt with.

*Heterogeneity* describes how the resources supplied by the suppliers are assessed. There are multiple ways that the buying company can use the resources supplied in order to succeed.

The basic structure of the supply base will influence how well the company manages these challenges. These challenges creates certain issues for supply base managers to handle, the most common issues are presented by Holmen, Pedersen, and Jansen (2007). These are: the number of suppliers, reducing the supplier base, relationships between the buyer and the supplier, how suppliers are organized, how buyer-supplier relationships change over time and management of supply performance.

Bygballe and Persson (2015) analyzes the development of strategies to cope with the issues that are present in the case company that is examined in their study. Many of the issues that are presented by Holmen is present in this case as well. They examine a company primarily producing and selling wheelchairs and related products that grows through acquisitions. The company is described to have a segmented, customer-driven supply chain model which has affected the development of supply base strategies, post-merger. After a merger the variety as well as the complexity of the supply base increases. When companies merge they also bring their respective supply bases (Bygballe and Persson, 2015).

The case company faced both the challenge of reducing the number of suppliers, how to organize the suppliers as well as how to manage the relationships within the supply base. By segmenting suppliers into different categories based on the importance of the product and the resources of the supplier, a differentiation strategy emerged. They also organized a commodities team to standardize these kind of purchases and used delegated sourcing when needed and regional sourcing. To handle dependencies the differentiation was used to craft how relationships should be maintained in the new structure. For suppliers where dependency was deemed to high spreading out responsibilities through multiple sourcing was used.

This development process is summarized in a framework for developing supply base strategies. It is described by Bygballe and Persson (2015) as:

- **Mapping** - Analyzing the supply and existing strategies
  - Identify basic characteristics in terms of complexity and dependencies
  - Analyzing if supply base strategies are aligned with the overall company strategy

- **Evaluating and prioritizing** - Developing supply base strategies
  - Analyzing the spend situation and economic implications
  - Identify and evaluate alternative options for the design of supply base and the implications
  - Prioritize alternatives and create action plans

- **Acting and interacting** - Implementing supply base strategies
  - Segmenting, standardizing, consolidating and delegating as means of responses for different situations
  - Coordinating processes with suppliers through information sharing and planning
  - Developing new solutions through collaboration
3.8.2 Aligning supply strategies and corporate strategies

To be successful in achieving the corporate strategy Cousins and Lamming (2008) describe that there should be an alignment between the specific strategies of the different functional units of the supply chain and the overall strategy of the firm. The corporate competitive priorities becomes important in this stage. These will emphasize a certain focus on one or a mix of key priorities to gain a competitive advantage, primarily of the following: Cost, Quality, Flexibility, Delivery and Innovation as illustrated in fig. 3.2.

![Figure 3.2: The competitive priorities as proposed by Cousins and Lamming (2008)](image)

Alignment is according to Cousins and Lamming (2008) a prerequisite for success. It is described that in order to achieve alignment the company needs to follow a set of steps. These are described as:

1. Develop corporate strategy
2. Set competitive priorities
3. Translate competitive priorities into supply function objectives
4. Translate supply function objectives into supply chain practices

Development of competitive priorities are generally carried out in the operations function. Following the approach of Porter, Cousins and Lamming (2008) describe that there is a need for the organization to focus on a small set of priorities. When the priorities are set operationalization can begin in each function of the supply chain. In excess of this, alignment at the product level is also needed according to Fisher and Review (1997). Supply chain strategy should from this point of view be aligned with the certain characteristics of the products where a responsive supply chain is needed for innovative products and an efficient supply chain is needed for more functional products.

When translating the competitive priorities Cousins and Lamming (2008) suggests that objectives should be specified into measurable targets. The SMART-model is suggested as a basic framework for forming good objectives. Lastly when the supply function objectives are set, different supply chain practices are relevant according to the result in the former stage.

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2 Specific, Measurable, Achievable, Relevant and Time bound
3.8.3 Aligning relationships and strategies

Cousins and Lamming (2008) describes that both the relationship and the strategies should be aligned. Relationships have two key variables, dependency and certainty. Various amounts of dependency will drive the relationship and create room for either development or manipulation from the supplier or buyer. The other dimension described by Cousins and Lamming (2008) is the level of risk or in this context trust that is present in the relationship. Balancing these levels of certainties and dependencies creates a set of generic relationship strategies that could be used. These are:

- Arms-length contractual relationship where there are low levels of risk and dependencies
- Opportunistic relationships where there are high degrees of dependencies and low degrees of certainties.
- Tactical collaboration relationships where certainties are high but dependencies are low
- Strategic collaboration relationships where both certainties and dependencies are high

In the same fashion different approaches to categorizing the products and services that are being bought could be constructed. Kraljic (1983) proposes a model to classify products depending on the impact on the business a product has and the market complexity. The impact a product has on the business is defined as the total cost of the product or the value-adding or margin effect the product has. The market complexity is in turn defined as the number and bargaining power of suppliers and buyers as well as the barriers to entry and substitutions on the market. The dimensions does in turn define 4 quadrants of products which require different strategic approaches. The different types of products are:

- Routine: These products are low on both impact and complexity leading to a preferred strategy of efficiency.
- Bottleneck: These products are low on impact but in most cases necessary for the company. Supply is also usually low which leads to a preferred strategy of maintaining continuity in supply e.g. with long-term contracts containing liquidated damages clauses.
- Leverage: These products are in abundance on the market and also have a high impact on business. This leads to strategy where optimization of order quantities and best deals should be sought.
- Critical: These types of products have a high impact on business and supply is relatively low. This leads to strategies where the firm needs to carefully evaluate suppliers, evaluate the make-buys option as well as create close relationships with suppliers whom are chosen to reduce risk in supply.

Kraljic (1983) also proposes a framework for how suppliers and products should be assess based on the own power of the company as well as the power of the supplier. The matrix is divided in 9 different segments. Where segments with high power of the own company in relation to the supplier should be leveraged so that prices and other variables are more aggressively negotiated. Where the power is equal there is a need to balance the relationship and nurture the relationship. In the section where supplier power is larger there is need to instead diversify and reduce dependencies.
Van Weele (2010) later combines the two matrices into a combined matrix shown below in fig. 3.3. It is argued that suppliers as well as products could be segmented in this fashion.

![Supplier matrix diagram](image)

Figure 3.3: The supplier matrix as proposed by Van Weele (2010)

Cousins and Lamming (2008) connects the Kraljic matrices, the matrices for relationships as well as sourcing structures and argues that all should be aligned in order for a successful supply strategy. By using the matrices the firm could choose both the appropriate type of structure for the product and the appropriate strategy and relationship.

3.9 The strategies behind outsourcing within the supply base

As Axis supply base mainly consist of outsourced solutions the strategies in the literature behind these decisions are discussed.

There are according to Kremic, Icmeli, and Rom (2006) three different types of motivations for outsourcing that drive the outsourcing decision. These are cost, strategy or politics. As described only two of the three motivations drive outsourcing in the private sector mainly cost or strategic motivations, these will be explained in more detail below.

Cost driven outsourcing is a subject that has been extensively covered in literature (Kremic, Icmeli, and Rom, 2006). Outsourcing in this regard strive to cut costs for the outsourcing company so that in theory the sum of the added overhead to manage an outsourcing partner coupled with the cost for the outsourcing partner to deliver the service is lower than the sum of the same service delivery done in-house. This can be achieved by the outsourcing partner through for example economies of scale and specialization as well as external factors which reduce costs such as the economic landscape in different countries.
However, as described by Kremic, Icmeli, and Rom (2006) there has been a shift in the main drivers for outsourcing. More and more companies are now outsourcing because of strategic reasons such as focus on core competencies and flexibility. The most cited strategic reason for outsourcing is to allow to focus on core competencies. This as an answer to fierce competition where resources needs to be utilized in the best possible manner. Other strategic issues could also be to restructure in order to allow for rapid organizational growth, access to changing technology and greater flexibility (Größler et al., 2013). Both flexibility and risk management are important drivers in the search for strategic drivers of outsourcing. There is a larger demand now for companies to quickly be able to answer to changing demands of customers and outsourcing is seen as way to accomplish this. In the same way outsourcing and the partnerships that comes from it could be seen as a way for the company to share risks through out the supply chain. The partnerships could also result in enabling world-class performance. With different functions outsourced the organization could start to resemble a "virtual organization" with capabilities that over-perform any configuration of resources that the organization could manage by it self (Kremic, Icmeli, and Rom, 2006).

3.10 Supply chain flexibility

As flexibility is one of the central strategic drivers for outsourcing the subject of supply chain flexibility is covered below.

In todays competitive environment, the markets are becoming more dynamic and customer-driven. Customers are demanding more variety, better quality and service. According to Duclos, Vokurka, and Lummus (2003) the three main strategic imperatives are low cost, high quality and improved responsiveness (both delivery time and flexibility of products). Buyers have become more sophisticated, demanding more customization as a result manufacturers found they could not maintain the large volumes of production and cost efficiency with the higher levels of change and uncertainty. Therefore companies needs to solve the trade-off between efficiency and flexibility (Duclos, Vokurka, and Lummus, 2003). Morash, Droge, and Vickery (1996) defined supply chain flexibilities based on previous operations literature and states that supply chain flexibility should be examined from an integrative and customer oriented perspective. From which they state that the following factors is measurements of flexibility:

- Product flexibility - Ability to customize product to specific customer demand
- Volume flexibility - Ability to adjust capacity to meet changes in customer quantities
- New product introduction flexibility - Ability to launch new or revised products

However, according to Duclos, Vokurka, and Lummus (2003) previous mentioned factors fails to consider the cross-functional, cross-business nature of supply chain management. Flexibility impacts both internal and external functions of a firm. Flexibility in the supply chain adds the requirement of flexibility within and between all partners in the supply chain. From which Duclos, Vokurka, and Lummus (2003) defines six components to strategic supply chain flexibility:

1. Manufacturing and service - Ability to configure resources to react to emerging customer trends (product changes, volume and mix)
2. Market flexibility - Ability to mass customize by having close relationships to customers and modifying both existing and new products
3. Logistics flexibility - Ability to cost effectively receive and deliver product as sources of supply and customers change (locations and postponement)
4. Supply flexibility - Ability to alter the supply chain and sourcing of products
5. Organizational flexibility - Ability to align labor force skills to the needs
6. Information systems flexibility - Ability to align information architectures as customer demand changes
From which Duclos, Vokurka, and Lummus (2003) proposes a framework to attain strategic flexibility that provides a broad picture of flexibility for an organization. The framework identifies six characteristics:

- Manufacturing capabilities
- Skills and knowledge
- Organizational transformation
- Mass customization
- Development of skills and capabilities in the future
- Swift change of manufacturing strategies and competitive priorities

In summary flexibility is measured in a supply chain's capability to change products, equipment, people and processes within the operations function. Furthermore, one can see flexibility from two different perspectives, either "Bottom-up" from the resources in an organization or "Top-down" from a business strategy perspective and the environment of the firm.

Which according to Duclos, Vokurka, and Lummus (2003) leads to either:

- Resource flexibility - The extent to which resources can be applied to a range of alternative use.
- Coordination flexibility - Reconfiguration of processes, product strategies and chains of resources to produce products and re-deploy those resources needed to produce the product.

Manufacturing flexibility

In determining the manufacturing requirements of manufacturing flexibility there are several factors that are needed to be considered. As with the strategic business processes themselves there are different criteria that are at play when choosing an apparent manufacturing process.

Manufacturers have over the years become increasingly more dependent on outsourced production activities. This stands from the need of different types of manufacturing flexibility (Scherrer-Rathje, Deflorin, and Anand, 2014).

Mason et al. (2002) looks at the impact contract manufacturing can have in reference to supply chain agility. Both the facility location, customer service and product distribution have effect on the agility of the supply chain.

The location of the contract manufacturer have some implication. First the specific type of cost-region where production is carried out has effect on the overall cost of the outsourced service. However, Mason et al. (2002) argues that a manufacturer that is close to the OEM is often easier to collaborate with when dealing with highly complex products as well as when trying to reduce transportation costs and lead times.

By utilizing information sharing between OEMs and contract manufacturers agility could also be achieved. By being able to quickly respond to changes in customer demand the contract manufacturer can increase supply chain agility and service levels while decreasing inventory levels (Mason et al., 2002).
Mason et al. (2002) also addresses the importance of the selection of contract manufacturers. Partnering with the right contract manufacturer, where appropriate relationships are being forged in conjunction with a good leverage of each others strengths and weaknesses will improve the ability to achieve supply chain agility.

When choosing and evaluating contract manufacturer Hu and Vincent (2016) describes criteria that should be considered after reviewing the literature and summarizing the most common criteria mentioned. Following the research of Miller (1956) where it is concluded that a majority of decision makers cannot process more than 7 to 9 factors when trying to make a decision they present a 4-dimensional criteria model for selection of electronic contract manufacturers. The dimensions are flexibility, quality, delivery and costs. Flexibility is further broken down in to sub-criteria. These are reaction to demand, supply variety, technical support and financial payments. Quality is further broken down into quality system, product defect rate, parts reliability and process yield. Costs are broken down into, price, operating costs, logistics costs and service costs. From these distinct criteria the model is further based on the management decisions to include and weight the criteria.

Kim et al. (2002) is comparing contract manufacturing selection to supplier selection in the sense that the manufacturer like the supplier needs to deal with an uncertain demand which would lead to OEMs reserving capacity in the same way a procurer could reserve a stock at the supplier. Goldsby and Garcia-Dastugue (2003) is also highlighting that if the manufacturing process is outsourced a larger responsibility falls on the supplier management team. It is also important to consider the capacity to meet demand (Goldsby and Garcia-Dastugue, 2003). Capacity constraints could therefore be included in the decision of contract manufacturers and in the long run to determine the manufacturing flexibility that is sought. Criteria for capacity constraints are however not common in the literature regarding contract manufacturer selection. This could stand from the notion that contract manufacturers are often modeled as having infinite capacity (Mason et al., 2002).

**Supply flexibility**

Supply flexibility is according to Mendoncca and Gimenez (2007) needed for different reasons. These include the various sources of uncertainty in volumes, mix and delivery of products in the supply chain. The drivers of these uncertainties are also mapped and the conclusion is that there are both internal and external factors that increase the need for supply flexibility. On the internal side, uncertainty in production scheduling where scheduling is planned close to delivery in order to reduce inventory, low component commonality where production has a wide arrange of products that should be produced, JIT purchasing where small purchases are carried out to reduce inventory and manufacturer slack capacity where large excess capacity allows for larger orders without negative impact on profitability are all factors. On the external side demand volatility, low forecast accuracy and seasonality all drive the need for supply flexibility.

To enable supply flexibility Mendoncca and Gimenez (2007) found that firms usually employ one of two strategies. Either improving supplier responsiveness or employing flexible sourcing. To improve supplier responsiveness means to improve the suppliers capabilities to respond to change in demand by the focal company. This by for example improving the suppliers ability to increase short-term flexibility in changing small quantity orders efficiently or to be able to produce small batches more efficiently. Flexible sourcing in this context is instead to retain a larger supply base but improve the ability to coordinate the higher number of suppliers by easily switch partners in the supply base. In this type of strategy the localization of suppliers are usually further away from the focal firm than in the improve responsiveness approach. However, Mendoncca and Gimenez (2007) argues that a longer transportation time is often countered by the suppliers having excess capacity to raise flexibility on that side instead. These strategies are often based on the focal firms ability and cost to find new suppliers and switch suppliers. A firm that easily switches suppliers with low transaction costs are more likely to adopt the flexible souring strategy while firms with a hard time finding and switching suppliers instead looks to increase present supplier performance (Mendoncca and Gimenez, 2007).
**Agile Vs Lean**

Agility is defined as the ability of an organization to rapidly respond to changes in demand both in terms of volume and variety. To become more responsive to the needs of the markets, the companies of today need more than just speed, their supply chains also need to be easy maneuverable (Christopher, 2000). A key characteristic of an agile organisation is flexibility.

Agility should however not be confused with lean. Lean is about doing more with less. Lean often implies a just-in-time approach and has a focus on reduction of waste and zero-inventory. Therefore the both approaches are suitable for different types of environments. In fig. 3.4 Christopher (2000) states that agility is more appropriate in environments with high variability and low predictability, while lean works best in high volume and highly predictable environments.

![Figure 3.4: Lean Vs Agile (Christopher, 2000)](image)

Furthermore, Stratton and Warburton (2003) adds that agile supply drivers are defined by innovative products and unstable demand. These characteristics are often common in high technological companies. Christopher (2000) emphasizes that the agile supply chain is market sensitive and its appropriate for organizations which are forecast-driven rather than demand-driven. Which leads to the role of the decoupling point.
Decoupling point

The decoupling point is the point in the supply chain's material flow where the product becomes tied to a specific customer order. Common names for different decoupling points are: Make-to-Stock, Assemble-to-Order, Make-to-Order and Engineering-to-Order (Olhager, 2012). Which also can be seen in fig. 3.5.

<table>
<thead>
<tr>
<th>Decoupling points</th>
<th>Engineer</th>
<th>Fabricate</th>
<th>Assemble</th>
<th>Deliver</th>
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<tbody>
<tr>
<td>Make-to-stock</td>
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<tr>
<td>Assemble-to-order</td>
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<tr>
<td>Make-to-order</td>
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<td></td>
</tr>
<tr>
<td>Engineer-to-order</td>
<td></td>
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Figure 3.5: Decoupling points (Olhager, 2012)

The different choices states where the strategic inventory is held. The strategic stock-point determines the delivery promises since the promises is based on current stock levels, lead times and capacity availability. One well-known consequence of information failure is the bullwhip effect, where upstream supply chain members tend to exaggerate the true consumption. One way of reducing such risk is to postpone the final assembly until they are needed. The concept can therefore utilize the opportunity to postpone the design configuration and therefore reduce the impact of variation further upstream. Which furthermore minimizes the consequences of holding inventory in its final differentiated form. Beyond the decoupling point demand variation is primarily managed through investments in protective capacity rather than inventory (Stratton and Warburton, 2003). The aim of the agile supply chain is therefore to carry inventory in a general form, that is semi-finished products awaiting final assembly. Therefore it will also be less inventory in total and it increases flexibility since the same components can be embodied in a variety of end-products. The concept of postponement is therefore vital in any agile strategy (Christopher, 2000).

3.11 Supply chain segmentation

Global companies can have hundreds of actors such as suppliers, manufacturers and distributors in their supply chain across the world. This has increased the complexity and different needs has emerged for the supply chain (Xu and Ma, 2008). According to Roscoe and Baker (2014) all authors discussing supply chain segmentation agree that the "one-size-fits-all" supply chain is inappropriate for growing companies. Therefore supply chains have to be segmented to match different needs. Today supply chain success resides in flexibility, where customers can get tailored solutions. To obtain tailored solutions different situations and needs requires different strategies (Xu and Ma, 2008).

The challenges lies in doing it timely and profitably, but also capturing synergies across different supply chains to reduce complexity and achieve economics of scale. David Simchi-Levi, a professor at Massachusetts Institute of Technology (MIT), further implies that synergies can be found in five areas: product design, procurement, order fulfillment and planning (Simchi-Levi, Clayton, and Raven, 2013).

Dell Inc. created four different supply chains, each dedicated to a different customer segment but all configured to be able to capture synergies across the different supply chains. The build to order strategy is focused towards low-volume configurations in the online business. Build to plan is used for the retail channel. Build to stock is used for the popular products. Build to spec is used for corporate client with tight relationships and low demand uncertainty. The transformation was successful and increased product availability with 37% and shortened order lead time with 33%.
By capturing synergies and effective matching between the different supply chains both transportation and manufacturing cost was lowered by 30% (Simchi-Levi, Clayton, and Raven, 2013).

### 3.12 Assessing risk in the supply chain

To share risk and manage risk is one of the drivers for the strategic outsourcing decision, a closer look at the literature regarding supply chain risk is therefore presented.

Risk assessment, benefit and the ease of implementation are all described by Goold and Campbell (1998) as important in order to select viable approaches to synergies. As they describe, sometimes the best approach is to do nothing at all to mitigate the present risks connected to the approach to capture the synergy.

Christopher (2016) describes that supply chain risk is driven by the probability of disruption times the Impact of the disruption. In order to assess these risks it is proposed that a multi-product firm should review the main profit drivers with respect to disruptions from five sources, these are:

- Supply risk: The vulnerability of the revenue streams by disruptions in supply.
- Demand risk: The volatility in demand and the correlation of demand of certain products to others
- Process risk: The variability in processes, the excess capacity of processes as well as bottlenecks
- Control risk: The disruptions caused by processes within the firm i.e. order quantities and batch sizes which can distort real demand
- Environmental risk: Vulnerability across the supply chain of external forces

To manage these risks Kaplan and Mikes (2012) proposes a framework to first classify different risks in order to take appropriate action. The following differentiation is suggested:

- Preventable risks: These risks are created within the organization and are controllable and should be eliminated or avoided. These types of risks are best managed through a rule-based management approach where monitoring and developing guidelines to mitigate risks are common.
- Strategic risks: These risks are risks that the firm voluntarily accepts to create larger returns or profits. Here it is proposed that a thorough risk management system is put in place as the rule-based management approach is not enough. This should improve the firms capability to manage and contain risky events if they occur.
- External risks: These risks are outside of the companies control. Here foresight to identify and mitigate the impact of these risks are important as the company is unable to prevent these types of risks from occurring.

Pettit, Fiksel, and Croxton (2010) view risk in the form of vulnerabilities where vulnerabilities are a precursor for risk. The common risk assessment, where probability and impact are assessed is, according to Pettit, Fiksel, and Croxton (2010), weak in terms of dealing with low probable high impact risks in the supply chain. They instead propose a model where both vulnerabilities and capabilities are mapped in order to assess if the firm is overly or underly protected against risk. Where an under protection is not preferable if an unwanted event would occur and over protection to vulnerability is costly. Therefore both vulnerability factors and capabilities to mitigate vulnerabilities should be mapped and matched in order to mitigate risk.
Chapter 4

Clarifying the purpose

4.1 Outline

This chapter will clarify the purpose and specify the tasks through a problem decomposition with regards to the current situation, theory and the purpose. This is presented by breaking down the purpose and defining the studied system as well as by presenting the work-model and research questions this study has followed.

4.2 Breaking down the purpose

The purpose of the thesis is to find and evaluate synergies during the integration between 2N and Axis in the upstream supply chain. This with a certain focus on enabling continuous growth for the corporate group as a whole. This is believed to result in the proper tools and results that are needed in order for Axis to develop an implementation road-map for the integration. Thus taking the first steps towards a future where the upstream supply chain of the complete corporate group is better prepared for future growth, as well as better utilized in its current state. The importance of the integration of the supply chain has been established in the literature, see for example Langabeer and Seifert (2003) Dung and Thanh (2012) and Harrison, O’Neill, and Hoskisson (2000). Inspired by the approach of Herd, Saksena, and Steger (2005) identifying realistic synergy goals is believed to create the foundation needed for Axis to create an implementation road-map.

According to Goold and Campbell (1998), when trying to realize synergies in a post-merger environment it is important to turn often vague synergy goals into more precise and defined goals that could be assessed individually. To enable growth in this sense falls into this category of vague synergy goals.

Growth can be measured and achieved in various ways why it is necessary to break down the meaning of enabling growth in reference to the present business case. Looking at the present case and description of the merger, the company wants to primarily achieve revenue growth with sustained profitability. To break down this even further one should assess the particular drivers of growth under sustained profitability. As the purpose of this thesis is only concerned with the integration of the supply chain this should also be done from a supply chain perspective.

As described by Schweiger and Very (2003) the strategic objective of the merger is connected to the synergies that are present while merging. Looking at the present case there are two distinct objectives present.
First the acquisition is believed to enhance the product offerings of the combined entity. When products and services are bundled together this creates opportunities for new solutions that could be presented to the end customer. As described by Schweiger and Very (2003) this is the typical strategic objective of extending the product line. From a supply chain perspective this would put pressure on the supply chain to cope with a larger set of products. The new products could also drive larger demand because of a better customer offering, more aligned with present customer needs. This would in turn create drivers for growth of both volume and product mix which the supply chain needs to cope with to achieve these synergies.

Secondly the acquisition is believed to enhance the acquired companies ability to reach the customer. Axis has a partner network that is far larger than 2N. This strategic objective is mainly in line with Schweiger and Very (2003) description of entering a new geographical market. With these additional resources the combined sales forces of the companies could drive larger demand in the sense that the companies reach a larger customer base. From a supply chain perspective this increased demand drive growth mainly from a volume perceptive where the supply chain needs to cope with larger production volumes.

This reasoning leads to the conclusion that synergies in this matter should be of a nature that increases the supply chain’s ability to cope with increases in either the product mix of the supply chain and or the volumes carried in the supply chain. At the same time there is a constraint on profitability for the synergies. A synergy that dramatically increases the supply chains ability to cope with these drivers of growth but at a cost of lower overall profitability does not fully achieve the purpose of the acquisition.

With the synergies better defined a model to find and capture synergies are needed. This model should provide a logical approach which generates synergy outputs that reflect the current goal of the acquisition. Furthermore, the thesis should evaluate how well these synergies fulfill the main goals of the acquisition, mainly to support growth in volume and product mix with sustained profitability.
4.3 The studied system

The studied system is described in figure 4.1.

Lambert and Cooper (2000) describes that studying a part of the supply chain processes could create situations where sub-optimizations are present. However, as described in the system above there presently is an established integrated connection downstream in the supply chain. There is a possibility to examine this part of the supply chain and further optimize the flow in that part of the supply chain. However, the main driver for growth in this area is assumed to already be established and working to a degree that will not suppress growth. The main control of this part of the supply chain also resides outside of Axis according to the company description. Furthermore, it is assumed that logistics centers of the companies have infinite capacity hence will in any type of configuration be able to support the growth in volume of the two companies.\textsuperscript{1} This means that the upstream supply chain functions are going to be researched in further depths leaving the product flow further downstream outside the researched system.

\textsuperscript{1}This assumption was carefully discussed with the case company who also suggested that the assumption should be made in the first place.
4.4 Work-model of the thesis

In this section the structure of the research questions will be presented. The research questions has been evolved through the clarified purpose and literature.

To structure and break down the purpose Oskarsson, Aronsson, and Ekdahl (2013) suggests a well-thought and structured work-model to ensure that the problem can be seen from a holistic perspective and facilitate avoidance of sub-optimization. The developed work-model describe the different phases needed to be taken in order to reach the purpose of the thesis as well as its key activities with important factors to consider see fig. 4.2.

Häkkinen (2014) concluded that there is little to no previous research in the field of supply chain integration within mergers and acquisitions. Therefore a work-model was developed by the authors by examining both M&A-objectives and supply chain integration. The work-model was inspired by the synthesis of the GSCF described by Lambert and Cooper (2000). The synthesis of the GSCF was derived from the strategic sub-process for demand management, customer order fulfillment, manufacturing and supplier relationships. Some strategic sub-processes were out of scope or irrelevant for the thesis and were therefore excluded to achieve a more adapted model for the purpose. The process to synthesize the GSCF is more closely described in chapter 3.

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<table>
<thead>
<tr>
<th>PHASE</th>
<th>KEY ACTIVITIES</th>
<th>FACTORS TO CONSIDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review the compatibility of the firms</td>
<td>Identify and review current strategies in the supply chain management</td>
<td>Visions and supply chain strategy Products and customer demand Competitive priorities</td>
</tr>
<tr>
<td></td>
<td>Analyze the strategic fit of a merger</td>
<td></td>
</tr>
<tr>
<td>Map the supply chain structure of the firms and evaluate performance</td>
<td>Identify key resources of importance in the upstream supply chain</td>
<td>Critical suppliers Actors and responsibilities Product and information flows</td>
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<tr>
<td></td>
<td>Analyze performance</td>
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</tr>
<tr>
<td>Find synergies</td>
<td>Identify gaps and overlaps</td>
<td>Segmented performance findings Combinational synergies Transformation synergies</td>
</tr>
<tr>
<td></td>
<td>Analyze possible opportunities</td>
<td></td>
</tr>
<tr>
<td>Evaluate synergies</td>
<td>Evaluate found synergies to ease decision</td>
<td>Post-merger value Needed workload</td>
</tr>
</tbody>
</table>

Figure 4.2: A schematic visualization of the work-model.

The work-model is furthermore of significant value for the project owner. The model was therefore created together with and for Axis management, to visualize the steps required to find and evaluate synergies between an acquired firm in their supply chain.
4.4.1 Key activities of the work-model

The initial phase of the work-model consists of mapping the strategy and identifying the compatibility of the firms. The purpose of the strategy mapping is to get a deeper understanding of the firms' competitive advantages and objectives for the firms' specific supply chains. This to identify strategic supply chain drivers as described by Persson (1991) but also the supply chain mix, which includes how the firms values service levels against costs (Oskarsson, Aronsson, and Ekdahl, 2013). In this thesis the objective has been broadened to include growth in the supply chain factors. Which means it is desired to maintain service levels and cost levels even when scaling the supply chain for growth. Therefore when analyzing the strategies one needs to evaluate the compatibility of the firms through a strategic mapping of objectives and visions for their supply chain with customer service level demands, sourcing strategy and supply chain constraints.

Secondly the work-model addresses the Supply chain structure in the companies respective supply chain. It is believed to be necessary to describe the current situation and evaluate both the key strengths and weaknesses of each resource in the supply chain. It is also in the companies interest to see how each component fulfills the strategic objectives set for them as described by Cousins and Lamming (2008).

The work-model thereafter addresses the third phase, Finding synergies. After a review of the present strategies and the network structure there is a need to be able to identify synergies based on the strategic map and the strengths or weakness of the respective supply chain network. Since the study is comprehensive and the needs differs from one firm to the other Xu and Ma (2008) implies that one should segment the different needs. Thereby the work-model will be able to sort the different needs and capabilities in segments which will help identify gaps and overlaps in the combined supply chain. Simchi-Levi, Clayton, and Raven (2013) states that the analysis can lead to synergy capturing and effective matching between the different supply chains, which will increase the companies competitiveness.

The fourth phase of the work-model addresses Synergy selection and should be established and validated against the company strategy and M&A-objectives. In this phase the identified synergies needs to be revised and evaluated in terms of how easy the synergy is to achieve and which value it creates in the upstream supply chain. This requires a holistic analysis to capture the upside as well as the downside of the identified synergies. The analysis aims to simplify decision making and give a concrete decision-model.

4.4.2 The work-models underlying factors

In this section the work-model connects the phases with its underlying elements. The work-model shall via these data elements answer a set of research questions. Each of these research questions are motivated by directives and the situation description together with the theory presented in chapter 3 of the thesis.

Compatibility phase

The first phase covers the identification of strategies and objectives to examine the compatibility of the two firms supply chains. The strategic mapping is believed to show competitive advantages and the prioritization of cost or service level as described by Oskarsson, Aronsson, and Ekdahl (2013). But also how the overall strategy is acted out in the supply chain.

Compatibility is a central aspect in an integration project. In M&As this is referred to strategic company fit and a critical aspect in an integration according to Häkkinen (2014). Furthermore it can be seen from a supply chain integration perspective where Persson (1991) implies that supply chain strategy is a vital part of the business strategy and has a major impact on a firms future performance. From this reasoning the following question has evolved:
1. How compatible are the firms supply chain strategies?

The question is broad and needs to be further defined. Therefore the initial key is to identify the firms strategies separately. Persson (1991) emphasizes the importance of finding the supply chain key drivers: Cost or service. A strategy can also be set from an inside-out perspective or outside-in according to Wit and Meyer (1998). This is important because of the impact the acquisition and integration might have on the firm's supply chain. For instance in an inside-out/resource-based view were the strategy is built upon internal capabilities and competences an integration can both increase competitiveness by bundling the new set of resources in better ways but also diminish competitiveness by not taking this into consideration when finding effective synergies. But losing the outside-in view for a firm may lead to losing its key customers. This because the supply chain does not simply follow the market needs (Barney, 1991). Therefore it is important to analyze the market needs in this question as well. Hong and Jeong (2006) describes usual differences in supply chain strategies between SMEs and large corporations and emphasizes five distinct areas, from which two of is competitive priorities and key strategies which are part of our first phase. To further determine the compatibility of the firms it is therefore crucial to first answer the questions:

- 1.a. Which key visions and priorities are present in the supply chain of each firm?
- 1.b. Which customer needs should be met by the supply chain of each firm?
- 1.c. Which are the competitive priorities of focus for supply chain management in both firms?

The above reasoning is further visualized in fig. 4.3.

Figure 4.3: A schematic visualization of the decomposition of the questions connected to compatibility.

Supply chain structure phase

Supply chain structure is the second key area to describe the situation phase. In this section there is a need to know how the companies resources are being used to fulfill the strategic objectives (Cousins and Lamming, 2008). The mapping of the resources is therefore done to get a greater understanding of how the upstream supply chain works from different perspectives according to these strategic objectives (Björklund and Paulsson, 2003). Zhang et al. (2010) uses this approach to analyze supply chain issues in horizontal mergers and Lambert and Cooper (2000) also describes that it is important to map the structure of the supply chain and the managerial components of the supply chain in order to achieve efficient supply chain management. This is done by identifying the different actors of the supply chain, their responsibilities and position in the supply chain as well as the product and information flows in them. Lambert and Cooper (2000) further suggests that the work structure which could be translated to the performance of the supply chain should be evaluated. In regards to the present objectives of the merger it is therefore of interest to investigate the current structure of the supply chains as well as the readiness of growth, which leads to the following question:
• **2. Are the supply chains structured and performing to handle growth?**

To answer this question there is therefore also a need to first identify the present structures in the supply chain as described by Lambert and Cooper (2000) and Zhang et al. (2010). This should give a holistic view of the supply chain and leads to the following question:

• **2.a. What is the structure of the two firms upstream supply chains?**

Furthermore Lambert and Cooper (2000) presses on the importance on the focus on key actors in the supply chain. DePamphilis (2009) also suggest that identification of critical suppliers should be developed before integration activities in the supply chain commences. From the previously presented initial holistic view of the supply chain it should be more clear to identify the according to Lambert and Cooper (2000) parties which requires managerial attention. Also by focusing on selected suppliers of importance for the two companies one can do an in-depth analysis in how these perform. This leads to the following question:

• **2.b. Which suppliers requires managerial attention during the merger?**

The underlying purpose of the resource mapping is to identify potential opportunities or threats which is done by identifying key strengths and weaknesses of the respective upstream supply chains. However, as described above the performance to some regard needs to be analyzed. In section **Breaking down the purpose** the conclusion found was that to enhance growth synergies that can help the supply chains ability to cope with an increase in product mix or volume are preferred. This is also what Morash, Droge, and Vickery (1996) defines as measurements for supply chain flexibility. Since both analyzed companies has outsourced bigger parts of their upstream supply chain the strategic reasons presented by Kremic, Icmeli, and Rom (2006) could also be used. Gaining flexibility is here also an important reason for outsourcing. It should therefore be interesting to research contract manufacturing flexibility. According to Goldsby and Garcia-Dastugue (2003) capacity is also a key aspect since it determines a manufacturers long run ability to be flexible. Kim et al. (2002) agrees in this matter and compares contract manufacturers excess capacity as a suppliers needs to reserve a stock for uncertain demand. Kremic, Icmeli, and Rom (2006) describes that outsourcing also is associated with risk management and Axis tries to employ a strategy to not become to dependent of a specific manufacturer to minimize risk and spreading both products and businesses to several different manufacturers. Kremic, Icmeli, and Rom (2006) continues to describe that outsourcing has the possibility to enable an organization to achieve the right capabilities.

Summarizing the above reasoning four distinct areas are of importance in regards to the performance of the upstream supply chain. In order to enhance growth Axis needs to be able to capture opportunities when they occur. Which puts pressure on having the right capacity available, meeting unexpected customer demands by being flexible, be capable to maintain quality and introduce new products through good capabilities and minimize risk in the supply chain. Therefore the components of the upstream supply chain should be examined by their performance regarding Capacity, Flexibility, Capability and Risk, CFCR. This leads to the following question which needs to be answered:

• **2.c. How do suppliers perform regarding Capacity, Flexibility, Capability and Risk?**

The above reasoning is described in fig. 4.4 which also shows the course of action.

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**Figure 4.4:** A schematic visualization of the decomposition of the questions connected to supply chain structure.
Find synergies phase

Thirdly the work-model addresses the issue of finding synergies. In this phase the aim is to use the information received in the previous questions and structure it by categorizing key suppliers and EMS providers, sourcing structure and resource network. This in order to answer the question:

- **3. Which synergies could be found?**

When studying horizontal mergers and acquisitions Häkkinen (2014) points out that overlaps of the companies can effect the combination fit and potential synergy between the companies. Simchi-Levi, Clayton, and Raven (2013) emphasizes that synergies can be found in five distinct areas, from which procurement is the one within our scope. Since both suppliers and contract manufacturers can be seen as part of the procurement division and the structure of the supply chain apparent gaps between the firms in this regard needs to be solved.

In a study conducted by McKinsey they identified three layers of value creation in an integration. The layers are: Base business protection, capture combinational synergies, seek transformational synergies. Base business protection refers to efforts to preserve pre-merger core business. Capture combinational synergies refers to traditional value creation efforts through economies of scale and enhanced efficiency. Seek transformational synergies refers to capability-based opportunities to create value by radical transformations of targeted functions or processes (McKinsey, 2010). Hence in order to find a combinational synergy there needs to be an existent overlap and to find a transformational synergy there should be a present gap. This is therefore translated to a search for overlaps and gaps within the previously mentioned factors: Structure and capacity, flexibility, capability and risk. There is therefore a need to investigate the possible overlaps or gaps amongst the two firms. Which leads to the questions:

- **3.a. Is there an overlap or gap in the value creation process?**
  - 3.a1. Is there an overlap in the value creation process?
  - 3.a2. Is there a gap in the value creation process?

- **3.b. How can a change improve structure or performance?**
  - 3.b1. How can the combinational approach be leveraged to improve structure or performance?
  - 3.b2. How can the transformational approach be leveraged to improve the structure or performance?

The process of finding synergies is described in fig. 4.5.

![Figure 4.5: A schematic visualization of the process of finding synergies.](image-url)
Synergy evaluation phase

This section addresses the difficulties in assessing and selecting the identified synergies. Since the area of mergers and acquisition is new for Axis, they have had a hard time making decisions for the integration. In this section the aim is to clarify the opportunities and assess them to simplify decision-making. Häkkinen (2014) has presented an idea of an analytical framework. Häkkinen has pointed out that the framework should assess and decide the following:

- Potential of the identified synergy
- Difficulty to realize the synergy
- Combination fit of the synergy

Furthermore Croxton et al. (2001) defines questions that should be decided such as: Which plants and suppliers should be used, from geographic location and current product distribution. Thereafter one should also evaluate if the current and future network can support the set strategic requirements. Goold and Campbell (1998) argue that sometimes the best approach is to do nothing at all to mitigate the present risks connected to the approach to capture the synergy. This leads to the question:

- **4. Which and how should synergies be pursued?**

An assessment of risk, benefit and ease of implementation should be carried out before synergy programs commences according to Goldsby and Garcia-Dastugue (2003). During the research both benefits and implementation issues should therefore be assessed. By evaluating both the present benefit of the synergy, the connection to strategic objectives of the merger as well as the ease of implementation of the synergy, a decision on how to proceed with the synergy can be formulated. Therefore it is important to answer the following questions:

- **4.a. What is the potential benefit in regards to growth for a certain synergy?**
- **4.b. Is this change compatible with the companies strategic objective of the merger?**
- **4.c. What is the level of difficulty to implement it?**

Since growth is one of the key objectives the selected synergies should increase the possibility to capture growth opportunities. The types of synergies described in the break down of the purpose are namely synergies which increases the ability to handle volume and product mix shifts. The level of difficulty is further defined by the activities needed to change a process, the resources required but also the number of involved actors since it increases the complexity. As described by Goldsby and Garcia-Dastugue (2003) the risks and in this case the implementation risk should also be evaluated. This reasoning is summarized in fig. 4.6 below.

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![Figure 4.6: A schematic visualization of the decomposition of synergy evaluation.](image-url)
Summarizing the research questions

A summary of all research questions are shown below in fig. 4.7

Figure 4.7: A schematic summary of the research questions
Chapter 5

Methodology

5.1 Outline

In order to achieve the purpose of a study there are multiple ways to structure the research. In this chapter the chosen approach the authors has taken to reach the purpose will be described. This by describing the general research approach and methods for data collection as well as the method for answering the research questions.

5.2 Research approach

Björklund and Paulsson (2003) describes the existing knowledge in the subject as a critical part of the research. They describe four distinctive approaches that could be used depending on the different ranges of existing knowledge. These are:

- Exploratory research - This is typically used when there is little existing knowledge and the objective is to create a basic understanding of the subject area
- Descriptive research - This type is typically used when there is basic existing knowledge and the objective is to describe relations but not explain them in detail
- Explanatory research - This is typically used when the objective is both to describe and explain relations to get a deeper understanding
- Normative research - This type is typically used in a situation where there is basic knowledge of the subject and the objective is to provide guidelines and propose actions

The purpose of this study is to find and evaluate synergies in the supply chain and enable growth for the case company. With very little existing knowledge from the literature base on the subject of SCM integration during mergers or acquisitions the study started out in a very exploratory way. With the basic approach set and derived out of the SCM literature the study utilized a more explanatory approach to explain relations in the literature and gain a deeper understanding of the possible integration approaches. This was important as it constituted a more credible foundation for the solutions found in the thesis.

There is also need to determine the extent of the data that is about to be studied as well as depth of these studies. Lekvall and Wahlbin (2001) describes that a study could have either a case study approach or a cross-sectional approach. A case study focuses on a single or a few separate cases with little generalization to a larger context. A cross-sectional approach does instead use a large sample group and while the study is not as deep as the case study approach the degree of generalization is larger. In reference to the purpose the choice were to use a single case approach. This because of the small degree of generality of a post-merger integration. The approach also provides possibilities to form a deeper understanding of the particular case that is studied.
There is as described in chapter 1 a need to set the strategic focus of an implementation plan. This will be accomplished by putting a large degree of focus on the particular case in point.

While developing theories studies typically use either a deductive or inductive approach. Here the deductive approach is the more common, where the researcher based on the available theory develops a hypothesis and then tests the validity of it. The researcher translates this hypothesis into operational terms which then constitutes the basis for the collection of data to test the hypothesis. The opposite of this is the inductive approach. Here the outcome of the research is theory and the input is observations and findings (Bryman and Bell, 2015).

These two types of research approaches has been the dominant approaches in western research. However the abductive research method has become more and more popular. While both inductive and deductive approaches are common in research and also carries a very logical structure the abductive research relies more on intuition and creativity (Kovács and Spens, 2005). The approach originates from the conclusion that major scientific advances mostly didn’t follow either a strict inductive or deductive approach. Where deductive research relies on theory and inductive research tries to generalize observations in a common theoretical framework, abduction research tries to create new frameworks. This is done by an iterative approach where observations and theory matching are done interchangeably to develop new theoretical frameworks to describe phenomena (Kovács and Spens, 2005).

With little literature available in the present study and the need to develop new insights to complement present literature an abductive research approach was used in this thesis. This is believed to create the possible means to use existing logistics theory in combination with observations in management theory about M&As to find a suitable theoretical framework to build analysis and hypothesis from.

Looking at the qualitative and quantitative aspects of the study a quantitative approach is more common when using a deductive approach, while a qualitative approach is more suitable for a inductive approach (Bryman and Bell, 2015). The qualitative research aims to create a deeper knowledge in a particular subject while the quantitative study incorporates measurable information (Björklund and Paulsson, 2003). This study has aspects which both have the need for the creation of deeper knowledge as well as measurable information. However as the research is both exploratory and explanatory in its nature and the subject of growth is hard to with full certainty quantify this research will to a large degree have a qualitative focus.

### 5.3 Methods for data collection

To collect the desired information to fulfill the purpose there are an abundance of methods to use. There are present advantages and shortcomings to every method and different methods are better suited for different situations. The most common tools for data collection are described by Björklund and Paulsson (2003) and are presented below. These are:

- Literature
- Lectures and presentations
- Interviews
- Surveys
- Physical observations
- Experiments

In this thesis only some of these methods were used. As stated before not all methods are applicable, needed or preferable while conducting a particular research. For that reason the used methods will be presented together with the reasoning leading to these choices. In short the study has focused on the use of present literature to gather an understanding of the present theories on, according to the purpose, interesting areas. Additionally the thesis has utilized both lectures and presentations available at the case company in combination with interviews to form a solid understanding of the present situation at the case company.
5.3.1 Literature

Literature has been extensively used in the research. Literature includes all material that is written and presented in various forms i.e. books, journals and articles. This method presented a cheap and time-effective way to gather extensive amounts of information in order to build a solid theoretical framework. However, literature is a secondary source of information. This means that the information gathered and presented in the material is not explicitly presented in accordance with the purpose of this thesis. This opens the possibility for the data to be skewed in certain directions which can have implications on the results of the thesis. How the literature is gathered is also of importance. How the searches through databases and libraries where carried out have an impact of the results of the search which in turn affects the accuracy of the literature search (Björklund and Paulsson, 2003). For that reason the authors used common search words connected to each theoretical area of interest as described in the outline of the theory e.g. "horizontal mergers", "post-merger integration" "supply chain integration" etc.

While conducting the study both electronic and physical material were collected through main tools. Google Scholar in combination with other electronic databases were used i.e. Business Source Premier. By utilizing a number of databases and search tools the credibility in the literature review were raised. There were also need for printed material. This was mainly collected through the libraries at Lund University in combination with the libraries at the Linköping University. To value the results of the different searches the authors used a combination of valuing both the credibility of the source and the relevance to the study based on the abstract description of the material.

5.3.2 Lectures and presentations

Presentations and lectures present mostly the same advantages and disadvantages as literature. However while using lectures and presentations as a source of data it is important to take the intended audience of the presentation in mind. This could affect how the data presented is structured and presented (Björklund and Paulsson, 2003).

This method were among the most common methods that the authors used in the early stages of the research to form a good view of the organization and different groups and functions of the company. After collection of this type of information the authors verified used information in the thesis in this regard together with concerned parts of the company.

5.3.3 Interviews

Interviews can be carried out through different digital instruments such as telephones, e-mail or SMS as well as in person. The central part of an interview is the questioning of the interview subject (Björklund and Paulsson, 2003). There are great advantages with interviews, primarily it gives the user primary data which is to be used explicitly for the purpose of the research. The present short-comings are connected to the time and effort it requires. Interviews could be both time-consuming and require extensive travel and set-up time (Björklund and Paulsson, 2003).

Interviews can be conducted in several ways but mainly there are three distinct methods that can be used depending on the types of questions asked in the interview. These are:

- Structured interviews - Questions in the interview are all defined before the interview and no deviation from the agreed upon structure depending on the answers are done
- Semi-structured interviews - Questions are more open where subjects are set beforehand but questions are formed depending on the answers of the respondent.
- Unstructured interviews - Questions are not set beforehand and the interview are more of a conversation than a questioning.
While conducting the study interviews were frequently used in order to get important primary data directly aimed at the study’s purpose. To ensure that the interviews provided the authors with this data the approach in structuring interview questions presented by Lekvall and Wahlbin (2001) was used. They propose the following check-list which every question of the interview should be evaluated against:

- "Does the respondent have the desired information? Can she answer the question?"
- "Is the question clear and unambiguously formulated?"
- "Is the question written in a, to the respondent, understandable fashion?"
- "Does the question contain several questions?"
- "Is the question free of leading suggestions?"

By following the approach presented by Lekvall and Wahlbin (2001) in preparing the interviews each interview where carried out with both an efficient and credible approach. In the early stages of the study unstructured interviews where used in order to complement the initial organizational information gathered by lectures and presentation material at the company. In the collection of empirical data semi-structured interviews where instead mostly used. The questions were initially driven from the data gathered in the early stages but to allow for previously not uncovered information, semi-structured interviews allowed for the best approach in collecting the data. During the interviews both authors was always present to allow for diverse note-taking and questioning. By taking two sets of notes and then cross-referencing these notes allowed for a credible assessment of the information provided by the respondent. A complete list of the interviews carried out in the study is presented in appendix.

5.4 Credibility

Björklund and Paulsson (2003) describes that credibility of a study is dependent on three distinct characteristics. These are:

- Validity - If the study is measuring what should be measured
- Reliability - If the study will generate the same results if the method is replicated
- Objectivity - If the study is effected by a bias created by the authors

To further explain validity and reliability a dart board is often used to describe the relationship between the two. This is shown in fig. 5.1 where the center of the dart board represents the purpose of the study. A high validity will get the results closer to the center. A high reliability will affect the spread of the results.

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<td>Low Reliability</td>
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Figure 5.1: A schematic visualization of the relationship between validity and reliability

In reference to this study the authors had a focus on achieving both high validity and reliability as well as objectivity. One approach presented by Björklund and Paulsson (2003) is triangulation. By using different sources of information to answer the same question a higher validity can be achieved.
Reliability can also be increased by for example asking control questions to see if the responses differ from one interview with the same person to another. Objectivity can be avoided by a constant focus on avoiding factual errors, cherry picking only "good information" and emotional charged words and phrases. The authors has in this respect used several of the above mentioned approaches. While conducting interviews the authors always strived to use a triangulation approach and allow for data collection with different individuals to get the same information. This to increase both the validity and reliability of the study. This is also reflected in the literature provided for the thesis where additional resources presented in the literature where revised in order to form a firm consensus of what previously been carried out in the academic community. The authors has also tried to motivate decisions and actions taken in the study to let the reader distinguish personal thoughts from facts.

With the above in mind the course of action for this study will be presented. This course of action was created in order to sufficiently achieve a high credibility of the study as a whole.

5.5 Phases of the project

This project has followed a general five step approach in order to reach the purpose of the study. These different phases are described in more detail below and consists of an introductory phase, a planning phase, a data collection phase, an analysis phase and a conclusion phase.

5.5.1 Introductory phase

The introductory phase of the project had the specific goal of getting an introduction to the assignment and be able to take initial decisions of the direction the work should be steered towards. The initial phase of the project is based on the approach presented by Lekvall and Wahlbin (2001) where the initial phase have the objective of presenting the environment around the work and then by motivated choices narrow the perspective of the subject area. From this the problem that should be solved connected to thesis should be presented. From the start of the thesis writing the authors have been present at the headquarters of Axis in Lund. This to be able to early on get to know the case company as well as be able at an early stage to ask clarifying questions and get a sense of the scope of the purpose of the thesis. As described by Björklund and Paulsson (2003) unstructured interviews are a way of forming an initial understanding of the situation and was therefore chosen as the method used in this phase of the project. By interviewing both the head of supply chain development, sourcing managers as well as the M&A team present at Axis an initial understanding of the present situation in the integration of the two companies were gained. By gaining an understanding of the present situation and collecting directives from different parts of the organization the purpose of the study was decided.

5.5.2 Planning phase

After the initial understanding of the background of the problem as well as the formulation of the purpose of the thesis the planning started. This phase was split into three parts containing a situation description, a literature study as well as break down of the purpose. The situation description were collected through interviews at the case company as well as interviews with the acquired companies sourcing managers who at the time were on a 1-week visit at the headquarters. A thorough literature review formed the base of the thesis' theoretical approach. However, by researching the literature the authors found that present research on the subject proved to be insufficient. As described by Björklund and Paulsson (2003) by using secondary data sources the downside of not being sufficiently targeted towards the purpose of the thesis exists. By analyzing the current literature however, a synthesized theoretical framework for the continued approach of the thesis was formed. This theoretical framework then formed the basis of the continued literature review. Based on the literature review and the situation description the purpose of the thesis was broken down into smaller sub-questions to ease the work and plan the data collection phase. This was done by utilizing the work-model presented in chapter 4.
5.5.3 Data collection phase

The data collection constituted the empirical gathering during the thesis. This is in accordance to the work-model namely for the first stages of the thesis, to map the strategy and structure of each firm. This empirical material was namely gathered through direct interviews with Axis and 2N employees who could give important information which could help answer the questions posed in the previous chapter. Interviews were held so that different persons from different parts of the organizations got the same questions in order to triangulate the responses if this were possible. However as one of the companies were based in the Czech Republic, language barriers posed problems. To get a hold on translators were hard to accomplish virtually and therefore persons which were well informed in the specific areas of interest at Axis were this problem arose were used to triangulate responses when this was possible. If important information could be gathered through the internal network space this possibility was also used to gather data and triangulate.

5.5.4 Analysis phase

As shown by the work-model interim analysis is required through out the thesis. The first analysis done were to evaluate the strategic fit of the companies. This to evaluate if a merger is even suitable. To analyze both the supply network as well as the gaps and overlaps in the supply chains a combination of the empirical findings together with the present theory were used. By first assessing each companies individual performance and structure and thereafter look for similarities and deviations the study should be able to provide an subjective assessment of the present situation from both a theoretical and empirical stand-point. When present gaps and overlaps were established theory were used as a starting point to generate solutions. These solutions where then analyzed to see if they generated synergies and indeed created value for the companies. In order to assess the present benefits and workload connected to the synergies the break down of the purpose was used. Each synergy where assessed and evaluated from the basis of the creation of the specific types of synergies that was concluded to be sought during the merger. A synergy that did not create these types of value was not further evaluated after that. The workload required an estimation from the authors as this is hard to benchmark. By breaking down the actions needed in as small parts as possible this estimation was done as precisely as possible.

5.5.5 Conclusion phase

The conclusions were connected to the presented purpose of the study. Namely to find and evaluate the synergies present in the analyzed merger. This was done by summarizing the findings during the analysis phase. It was also important to provide both a recommendation on how to proceed for the company as well as the basic work-model of the project. As these types of tools are not present at the company the work-model serves as an example for how this type of work could be carried out in later acquisitions by the corporate group. The recommended action plan also gives the companies a good foundation for further operational planning of the execution of the integration. During the ending phase the authors carried out a discussion together with case companies to discuss the generalizability of the study and analytical approach as well as the recommended approach to move forward.
5.6 Methods for answering the research questions

The research questions of the thesis is presented in chapter 4 and has formed the foundation for the detailed methodology. How these questions were answered are presented according to each phase of the previously presented work-model.

5.6.1 Compatibility phase

An assessment of the present supply chain management strategies was done in order to conclude the initial compatibility of the two firms supply chain. As described in the description of the work-models underlying elements three important factors needed to be examined. These were how the needs of the customers affect the strategy, which elements that are of priority in the sourcing strategy and the visions and strategies of the firms. This should give a holistic view of the strategic fit and will answer the question:

- 1. How compatible are the firms supply chain strategies?

To answer that question the first question to review was:

- 1.a. Which key visions and priorities are present in the supply chain?

Through semi-structured interviews with executives at both firms an understanding of the present visions of the companies were gathered together with how these visions are translated into supply chain management and growth plans.

Secondly a review of the following question was needed:

- 1.b. Which customer needs should be met by the supply chain of each firm?

This was done through semi-structured interviews with executives at both firms were an understanding of the present customer needs were gathered. Both the present products that were supplied to the customers as well as the current market trends and customer segments were discussed. The interviews were conducted to let the interviewee first explain different customer segments and describe each segment’s corresponding needs. To get a broader perspective of the size of each customer segment an estimation of the size of the segment in reference to the revenue generated by the segment were also conducted.

Thirdly it was important to answer the question:

- 1.c. Which competitive priorities are most important?

To answer this question semi-structured interviews were conducted with the supply chain manager and representatives from the management board at each firm. Different competitive priorities are described by Cousins and Lamming (2008) and through the interview the respondents were asked to prioritize these attributes in order of importance for the firm and explain why.

With answers to these questions there was a possibility to see if there were both different external demands on the supply chain which could affect the compatibility of the supply chains as well as different focuses on how the supply chain adds value to the customer. A concluding analysis of the responses where then done and the strategic fit was evaluated.
5.6.2 Supply chain structure phase

The present structure of the upstream supply chain needs to be examined in order to answer the question:

• **2. Are the supply chains structured and performing to handle growth?**

To be able to answer this question there is first a need to gather appropriate information of the current members in the upstream supply chain of both firms. This was done by semi-structured interviewing of sourcing managers for both component suppliers as well as EMS providers. This to answer the question:

• **2.a What is the structure of the two firms supply chains?**

The questions were firstly centered around aspects such as which the main suppliers are, what they produce, how information and products flows are structured as well as where they are located. Secondly the different processes within the supply chain and the sourcing structure where explained by the interviewees. This to form a holistic view the upstream supply chain as well as to answer the first question.

With the underlying purpose of identifying potential opportunities and threats it is important to find the suppliers which require managerial attention. The following question therefore needed to be answered:

• **2.b. Which suppliers requires managerial attention?**

Van Weele (2010) suggest that the critical suppliers for a firm is the ones which have high impact on business and high supply risk. Since the study has a qualitative approach and aims to help the companies to grow. The requirements for a supplier which requires managerial attention will be based both upon Van Weele (2010) theory and growth. Therefore the suppliers identified was based on impact on growth, power balance and structural supply risk. Impact on growth can be seen as equivalent with impact on business or profits with the exception of not being associated with direct cost but rather growth. Structural supply risk is equivalent with Kraljic (1983) definition of dependency with the exception of being focused on CFCR-failure rather than single and multiple sourced. After the assessment a complete visualization of the present sourcing structure was constructed and critical suppliers, was selected for further analysis.

With this information, order volumes for each supplier as well as type of sourcing structure and critical of supplier was gathered. Secondly there was a need to gather information about the core aspects of capacity, flexibility, capability and risk in the upstream supply chain. This to answer the question:

• **2.c. How do suppliers perform regarding Capacity, Flexibility, Capability and Risk?**

This information was primarily gathered by interviewing sourcing managers as well as reviewing performance reviews about the suppliers that could be access through the internal network. The data that was primarily needed is presented in below for each category.

• **Capacity:** Present excess capacity at supplier
• **Flexibility:** Contractual flexibility in terms of order variability, supply variety of products, reaction to demand
• **Capability:** Unique technical capabilities, amount of the product portfolio that can be produced at the plant, ability to introduce new products
• **Risk:** Prior history in regards to risk management, spread of orders from focal firm, development of contingency plans
5.6.3 Find synergies phase

The assessment of synergies is the first part of the study which carries a more analytical perspective more connected to the explanatory type of research instead of the exploratory type as described by Björklund and Paulsson (2003). This to answer the question:

• 3. Which synergies could be found?

It was concluded that both the overlaps and the gaps in the structure and the performance of the supply chain needed to be examined. For that reason both an overlap and a gap analysis where conducted.

Conducting the overlap analysis

The overlap analysis where focused around getting the material to answer the following two questions:

• 3.a1. Is there an overlap in the value creation process?
• 3.b1. How can the combinational approach be leveraged to improve structure or performance?

The overlap analysis was conducted through mapping up overall strategy, markets, products, supply chain strategy and structure, and lastly the critical suppliers in regards to capacity, flexibility, capabilities and risk. By analyzing the strengths, weaknesses posed by the previously mentioned areas important overlaps where found. Since the procurement process was named as a possible synergy area from Simchi-Levi, Clayton, and Raven (2013) great efforts was put to find these. If things were similar the authors would seek combinational synergies which could be used to leverage or improve both companies structure, capacity, flexibility, capability and risk. Here theory presented in the thesis as well as the empirical findings where used to find solutions that would unlock synergies.

Conducting the gap analysis

The gap analysis were as with the overlap analysis focused around getting the material to answer the following two questions:

• 3.a2. Is there a gap in the value creation process?
• 3.b2. How can the transformational approach be leveraged to improve structure or performance?

In order to conduct the gap analysis, the combined component supply base and EMS supply base where suppliers performance deviated was evaluated on a holistic level. Strengths and weaknesses in the categories of Structure and CFCR were identified to narrow the scope of the analysis. Deviations here would point to possibilities for the firm deviating negatively to benefit from the other firms strengths which would pose the transformational synergy. When the initial analysis was concluded solutions were generated with theory and empirical findings that implicitly would change the present situation towards the requirements established previously to answer the questions.
5.6.4 Synergy evaluation phase

To be able to provide a firm recommendation of which synergies that should be pursued a general-
ized way to evaluate the synergies was developed. This to answer the question:

- 4. Which and how should synergies be pursued?

This method was built on the factors considered most important while making the synergy selection,
mainly the overall benefit of the synergy, the fulfillment of the strategic objective and the ease of
implementing the actions required to achieve the synergy. The basic logic behind the method
is simple. A synergy that creates high value and requires little effort to achieve this value is a
preferable synergy. The synergies were then compared to the overall strategic objectives of the
mergers as described in the break down of the purpose to ensure that these were compatible and
viable options to further pursue.

To provide a tool for this analysis, there is first a need for an assessment of the benefit potential
and the ability to fulfill the strategic objectives to answer the questions.

- 4.a. What is the potential benefit in regards to growth for a certain synergy?
- 4.b. Is this change compatible with the company's strategic objectives of the merger?

The potential benefit was compared to a pre-integration state. By analyzing the possible effects of
the implementation of actions that would achieve the synergy an estimation of the benefit potential
was done in reference to the sought types of synergies. It was also important that the particular
synergy gained the sought types of benefits and an analysis to conclude this was also done.

In the same fashion the difficulty in implementation needs to be assessed in order to answer the
question:

- 4.c. What is the level of difficulty to implement?

This level is defined as the number of activities, the number of needed actors involved as well as the
resources mainly time that is required to implement the synergy. As these parameters are harder
to estimate a qualitative estimation were done where all three dimensions was estimated as well as
the underlying actions required to carry out the action and the implementation risk connected to
it. However since the actions are often intangible, rough estimations were used.
5.7 Method criticism

Supply chain integration in M&A’s is seen as notoriously complex and is often down-prioritized by management because of the complexity. However, it is clear that supply chain integration is a critical part to review in order to achieve the deal value and to capture synergies. In both the authors and Häkkinen (2014) literature reviews one could conclude that little previous research has been done in the topic of supply chain integration in mergers and acquisitions. Since there was little to no previous research in the field of the thesis at the time of writing it was difficult to verify the method. Therefore the study is formed in a very exploratory way. In order to pave the way for the research about supply chains in post-merger environments the study was generalized a step further. Which meant that the authors needed to combine common theory of supply chain management and common theory in M&A’s and synthesize. Therefore the validity of the method is also generated through back-tracing to the two theory areas since the abductive approach shall rely on theory, even though it is used to generate new frameworks. Another approach could have been to put less pressure on the theory itself and use a multiple case study of other companies who has integrated supply chains after acquisitions. That way we would not be as reliant on our own synthesized model as we were. However, we saw a need to fill the academic gap and believe the synthesis will be of more value than a multiple case study. The best solution would be to have both a generalized synthesis for a post merger supply chain integration and to be able to validate towards a multiple case study. Sadly, that was not possible since the authors had limited time.

The empirical findings was gathered through semi-structured interviews where questions were more open, however, the interview topic points was determined before. The questions were formed depending on the answers of the respondent. However, the interviews did differ since one of the companies is located in Sweden whereas the other company is located in the Czech republic. Therefore some interviews with persons from 2N was conducted over the phone. We had planned to visit the 2N headquarter and conduct the interviews at the site, however that was not possible. This led to the difference being that the employees in Sweden had the possibility to use and show their way of working much clearer via for instance using a white-board or showing documents. Furthermore, the number of interviews conducted at Axis and 2N was not equal, since Axis had more processes for the topic and more people involved in the project. Also an unexpected language barrier at 2N made it impossible to conduct some interviews that were of interest. The information needed was instead gathered through other people with second-hand knowledge. To ensure the study did not become biased those interviews were triangulated as far as it was possible.
Chapter 6

Empirical findings

6.1 Outline

The empirical findings will be presented according to the phases of the previously presented work model. As the first and second phase of the work-model, compatibility and supply chain structure, is dependent on empirical material, these empirical findings will be presented below. The rest of the work-model is solely dependent on theory and analysis of the empirical findings connected to these two phases and will therefore be presented in chapter 7 and chapter 8.

6.2 Compatibility phase

The first phase of the work-model is connected to the strategic fit of the two companies. These findings will be presented in four parts, Vision, Products, Market & Supply Chain and lastly competitive priorities. The findings will be presented one company at a time.

6.2.1 Factors of compatibility in regards to Axis

Vision

Axis is a premium brand and stresses the importance of quality in everything they do. On the same level Axis emphasizes their ambitious growth goals of continued growth with double digit percentages yearly. It is also after the ambitious growth goals the supply chain has been designed. Axis believe that growth is best met by outsourcing. Therefore the majority of the supply chain is outsourced. The reasons for Axis' outsourcing is:

- Scalability
- Risk handling
- Flexibility
- Cost

Axis also emphasizes the importance of having partners/suppliers that have the same vision. Therefore they do not work with suppliers that are not scalable. One supply chain executive refers to one of Axis core values, Think Big, when describing that Axis prefer not work with suppliers which cannot scale their operations in accordance with Axis, no matter how good the supplier is.

Axis has a goal that through outsourcing be able to deliver within 10 working days and have a delivery precision goal of 90%. The delivery precision today is down to 80% and this is due to material shortages. The downside of outsourcing can be the delivery uncertainty it brings since one does not have the same control.
For the upstream supply chain, both component suppliers and EMS, the previously mentioned reasons are translated into the following. The EMS’ has scalability in another dimension compared to Axis. It is easier for the EMS’ to invest in new technology since it is in their core business compared to Axis. In the short-run it would probably be more cost-efficient to produce in-house, but high investment cost for new machines and technologies would make it inefficient in the long-run. Also by having several EMS’ compared to having the production in-house in one single factory is believed to reduce risk significantly. Furthermore, it is believed that the EMS’ increase the flexibility of Axis, since order fluctuation does not affect as much if its divided into several sites compared to one single factory.

Products

Axis has a broad product portfolio with mainly IP-based solutions for security and video surveillance. This ranges from network cameras to door stations and software equipment. The core products are the cameras and encoders that Axis from the start was part of developing. From this both software and accessories has been added as well as other surveillance products, door station products and access control units.

Market & Supply Chain

Axis targets their products towards retail, banking and finance, transportation and the industrial segment amongst others. The market has shown high growth rates during the last 5 years, but one can see trends towards a market that is currently overheated. This means that the supply market cannot supply the aggregated demand because of inadequate capacity. For the electronic market overall the capacity limitation has its roots in component shortages. As a consequence Axis has lost some sales due to component shortages, but so has their competitors. Axis has therefore not lost any market shares due to component shortages, nor has their biggest competitors. The situation has however had large impact on the smaller players on the market.

Today there are no indications that the market will stabilize. Axis expects more market fluctuations in the future compared to today. Therefore Axis emphasizes the need to prepare for increased demand volatility.

Axis had a first mover advantage on the market and still has a solid position in the market. The strategy is to target the premium segment but they are also trying to widen the segment by reaching out to value customers as well. In the value segment they are meeting some competition from the leading firms in the market and at the same time competitors are trying to expand their position in the premium segment. Axis has therefore segmented their customers after speed, price sensitivity and service to deliver a more customized customer order experience. One customer segment is targeted to deliver availability and the lead time should be less then 10 business days. Another segment is focused more on customization and demand is therefore fluctuating more. These products has for that reason a customer lead time of 4-12 weeks. The aim there is to not hold finished goods inventory.

Competitive priorities

Axis stresses that their greatest two competitive advantages are their quality and innovation. A high quality output helps Axis to often sell products on low return rate and life cycle cost rather than direct cost. Since the industry moves in a very fast pace innovation is also crucial for Axis in order to stay competitive. This business dynamic makes these two priorities key in order to gain an edge on the market. After these two crucial priorities, flexibility is ranked as the third most important priority which is the key to growth in many regards. For Axis it is important to be able to be agile enough to answer fluctuating customer demand, but also have the capacity to grow. Furthermore, Axis management does not deem time and cost as crucial for either the customers or Axis.
This has resulted in a situation where Axis competes on the market with high quality products and services. The premium offering Axis is able to give gives the customers the support they need in connection to their demanded products. Through customer surveys it was found that Axis excels in being able to deliver this high quality service to their customers in connection with the sale. It is also one of the main reasons Axis is able to make the sale in the first place. Brand awareness is seen as important and the operating model for Axis is therefore also very customer-centric. The supply chain director describes it as trade off between making it easy for the customer to get a product and easier for the Operations of the company to make that product in such a fast paced market environment. Axis has chosen to put the customer first and has for that reason an outside-in perspective on their supply chain strategy. This means that they are ready take the cost of complexity in the supply chain, which also puts a higher importance on the supply chain to be able to answer to demand in a flexible and agile manner.

### 6.2.2 Factors of compatibility in regards to 2N

#### Vision

2N has a vision of being the market leader in the IP-intercom market in the regions Europe, Middle East and Africa commonly abbreviated EMEA and North America. 2N are currently the market leader in both the US and UK while being top 3 in Germany and Italy. This ambitious vision is also coupled with growth numbers in sales for the coming years where 2N expects to grow at a pace of 21% overall annually. The door station segment 2N produces has a forecasted growth rate of 35%. Furthermore, the US-market which stands for 23% of 2N’s total sales has a forecasted sales growth of 50%.

#### Products

2N employs a product portfolio consisting of several different IP-solutions such as IP-intercoms, IP-audio systems and IP-access controls. The core product of 2N is their IP-intercoms or door stations which generate around 70% of the total sales at 2N.

#### Market & supply chain

As with Axis, 2N employs a go to market strategy involving partners which connects them to the end customer. 2N is a premium brand and their ideal target markets include high end retail residential market, office buildings, transportation and educational customers. 2N has a focus on providing high quality, luxurious designed products which has a robust design to cover against any type of damage. The customers interested in these types of products are typically at the highest end of the client base.

The current market trend in electronic components has as with Axis put a strain on the supply chain of 2N. Important electronic components are difficult to source and requires certain attention and planning. Which has created a backlog in ability to supply customer orders. 2N has as an answer to the issue started to stock various strategic components in order to protectively be able to supply production with components. The shortage has in spite of 2N’s proactive activities resulted in longer lead times for the clients because of an inflexible ability to answer demand with insufficient electronic components.

In regards to buying behavior, 2N’s clients rarely purchase off the shelf but rather purchase in form of a project delivery or similar. This means that 2N is focused on delivering a unique solution to the customers needs rather than a common product on the shelf. There is no clear substitutes to their products in the market right now, therefore clients are willing to wait for the unique solution that 2N is able to provide them with. However, it is described that if a situation where this inflexibility to meet higher demand would persist would put new business from the waiting clients at risk.
The supply chain of 2N closely resembles that of Axis, where go to market strategies are similar and even fully integrated in the US market. This means that Axis and 2N share the same distribution network in this region and follows the same product flow, from CLCs and downwards. The new distribution model for 2N has both increased the sales force of 2N 10-folded but also slowed down delivery times. Axis larger distribution channels also requires a more standardized flow of products out to distributors. This means that drop-shipping, an expensive but rather fast way to transport products to distributors is not used by 2N in these markets anymore. Instead regular shipments of products are done which is slower but secures continuity instead.

**Competitive priorities**

2N stresses that their greatest competitive advantages is their Quality and Innovation. On par with the vision of 2N, as the leader in the IP-market, they also feel that it is their responsibility to provide their customers with high quality and at the same time show the market the latest trends in new technology available on market. As described before customers right now are willing to wait for these kinds of products which makes flexibility the priority which is ranked second to Quality and Innovation above time. 2N also describes that cost leadership is not of interest which makes this priority ranked in the bottom of the five priorities described by Cousins and Lamming (2008).
6.3 Supply chain network structure phase

The second phase of the work-model will be presented in three parts. First an holistic view of the supply chain structures will be presented. Secondly a more in-depth presentation of each upstream supply chain is presented and lastly the performance measures for each upstream supply chain is presented.

6.3.1 The supply chain structure of the two firms

The basic supply chain structure of 2N and Axis closely resembles each other in many ways. There are three or in some cases four tiers upstream from the focal firm depending on the sourcing type and 3 tiers downstream of the company. Differences could be viewed in the amount of ownership that the companies have in their Configurations and Logistics Centers. Axis has as of now one company owned CLC, called CLC1 based in Lund and five outsourced CLC facilities around the world. 2N on the other hand has one factory which functions as a CLC for all products of the company. Other than that the supply chains closely resembles each other in regards to structure.

![Diagram of supply chain structure](image)

Figure 6.1: A schematic overview of the basic supply chain structure in the upstream supply chain

However, as of the integration of the US downstream flow the supply chain of 2N has been modified. After the integration of the downstream supply chain for the US market the product flow has been split into two different product flows. For the US market where the integration of the downstream supply chain has been completed, an additional node in the supply chain has been added. The information flow and product flow has because of this become extended. As of now the products designated for the US market flows from the EMS’ to the production site at the 2N factory in Prague to the Axis operated CLC in the US and onwards to the distributors in the US as depicted in fig. 6.2. Axis handles the purchasing from 2N's factory in Prague and further downstream while 2N handles the product flow up until this point. In the rest of the markets the products flows directly from the 2N factory to the distributors and later to the re-sellers and integrators which reach the end customers as shown in fig. 6.1. This means that the product essentially stops at two logistic hubs on its way further downstream. The information in the same regard needs an extra exchange as the Axis operated CLC needs to distribute the information gathered from the distributors to the 2N factory before information can be shared further upstream. In comparison with the regular information exchange where the distributors have direct contact with a logistic hub who essentially flows the information directly upwards. In both cases, both in the product flow and information flow, an extra node in the supply chain has been added. According to the responsible purchaser at Axis this flow and the transfer of responsibility within the product flow between the two companies has created a situation where the flow is complex and requires specialist knowledge. This because of the purchasing process between Axis and 2N which is not the same as in other purchases between an EMS and Axis or between 2N and a distributor. This creates a degree of uncertainty and confusion on both parts. Furthermore, it was also suggested by the purchasing manager that a more standardized flow would push for a standardization of the purchasing process in this product flow and in turn reduce complexity.
When delivering products 2N uses two types of shipping set-ups. The first option is to ship products to the distributors who later distributes products, just like Axis, further downstream in the supply chain. Furthermore, 2N has used another option of delivery which is to drop ship products directly to the re-sellers and integrators in order to shorten lead-times when needed. During 2017 2N had approximately 40% of the sales coming from distributors. The rest of the sales came from lower tier parties, either integrators, re-sellers or even end-customers.

Axis has a firm belief that the same kind of option should not be used at all, in the sense that distributors should not be bypassed at anytime when delivering products. This has also meant that when integrating the distribution chain for the US market, where 2N was included in the Axis distributor network, the option to drop-ship products to shorten lead-times disappeared.

### 6.3.2 The upstream supply chain network of Axis

**Actors and responsibility**

The upstream supply chain of Axis consist of four different actors with various responsibilities. These are Axis which serves as the main buyer in the chain, the EMS' which serves as the producers of the products demanded, the component suppliers which supplies the EMS with materials which are to be produced and the distributors of the component suppliers who in certain cases handles the component supplier distribution. The EMS' buys components and plans the manufacturing according to Axis purchase orders. Axis is responsible for R&D, which delivers a Bill of Material, BOM to the EMS. The BOM includes information about components and their tolerances but also which suppliers are recommended and prices for these. In other words, Axis is responsible for the strategic purchasing which is done in an early stage for every product together with Axis commodity managers and R&D. However, the EMS has certain freedoms in deciding suppliers from within the BOM and are encouraged to give suggestions to complement the BOM. The operational purchasing of components is thereafter done by the EMS in accordance to Axis purchase order.

**The product flow to the EMS**

The EMS’ has three different flows of components depending on the criticality of the component and relationship with the component supplier. The regular situation is that the EMS' buys components from distributors which is described in A) in fig. 6.3. However, some components are Axis specific and manufactured by component suppliers, these component usually have longer lead-times and are also critical for Axis products. Therefore Axis has a critical component storage at the CLC in Sweden, from which the EMS can order components just as if it was a distributor. This has been illustrated in B) in fig. 6.3. Beyond that there is a third product flow in the upstream supply chain, this is specific for the larger EMS’. The large EMS commonly has business large enough to be considered important enough to skip the distributor partner and buys directly from the component manufacturer, this is depicted in C) in fig. 6.3.
Figure 6.3: A schematic overview of the different product flows in the upstream supply chain where flow a) represents a flow where the EMS uses component distributors, flow b) represents a flow of a critical company specific component and flow c) represents a flow where the EMS has direct purchasing contracts with the component supplier.

The produced product

Axis also has the option to buy products on different levels of completion from the EMS. There are three product levels which are differentiated in the value added to the product in production at the EMS. A product with a lower value added to it also has the possibility to be configured into more types of products as there are less specific final model elements built into it. The levels presently used are to either buy the product in a customer ready state where the product is ready to be shipped to the market directly commonly called on Sales Unit level. The other two is to buy it without any final assembly done or software installed which is called Unit Assembly Level or to buy it on Purchase Order level where some assembly is done but it is not completely ready for the market. A schematic view of an example product breakdown is shown in fig. 6.4. This final assembly or material handling if it is a Sales Unit is done at the CLC where Axis either owns the CLC or has outsourced the operations.

Figure 6.4: An example of a product break-down from Unit level assembly to Sales Unit and the connected activities.
The product flow from the EMS

Upon finished product the EMS sends products to one of Axis CLC facilities. The CLC functions as a final assembler and logistic hub for Axis. All EMS' in the upstream supply chain of Axis has the possibility to send products to any of Axis CLC' around the world. These are located in strategic locations to be as close to market as possible. Axis also has one CLC close to head-quarters in Lund which is not outsourced. The choice of CLC is dependent on the proximity to the market where the product is demanded such that the product comes as close to the market as possible. The CLC then does final assembly for the products and Axis’ partner network of distributors later buys the product to deliver it further downstream towards the end-customer.

Ordering and strategic purchasing in the upstream supply chain at Axis

As earlier mentioned Axis has a department for strategic sourcing which works cross-functionally together with the R&D-department in purchasing. The sourcing department has worked to standardize the final products where each product therefore has the same initial interior and one can, by adding modules, modify the final product. The sourcing managers have for these products searched and found appropriate components with appurtenant suppliers and made sure that they are compliant with Axis requirements and code of conduct. In the same phase Axis negotiates preliminary prices for certain forecasted volumes of a component. However, the volumes nor prices are fixed at this point but rather an indication for Axis and the supplier. The commodity managers thereafter sends the Bill of Material, BOM to the EMS' who respond with a Request for Quotation, RFQ. This opens up for price competition between the different EMS'.

The quotations are thereafter compared and occasionally one can see that the EMS' are able to get better prices than Axis from the same supplier since they are larger, in other cases Axis prices are better and the EMS can thereby refer to the Axis price in the negotiation. This since the agreement Axis has with the suppliers is that their affiliates, such as the EMS, should have at least the same price or better. In summary, the tactical purchasing is outsourced to the EMS and they are responsible to negotiate all the practicalities with the suppliers such as price, lead-times, delivery, flexibility and warehousing. Axis has the strategical responsibility to choose suppliers and ensure that they are compliant but also to build relationships and monitor price levels. Purchase orders to the EMS are sent via the ERP-system at Axis and the order lead-times for Axis EMS is 10 days.

For the process this means that Axis send manufacturing orders to the EMS who is responsible to purchase what is needed to manufacture. They use Axis forecast and translate it to forecast the components needed to their respective suppliers, Axis does however not have any visibility in this process. However, some components are Axis specific and critical, these are stored in Axis CLC1, from which the EMS can send purchase orders to be delivered. Axis is therefore also a supplier to the EMS of the most critical products. This can be derived to the issue that the EMS normally does not want to keep stock nor does the component suppliers. Axis encourages both EMS and component suppliers to keep inventory by promising to buy 3 months of material in the end of life for products, which minimizes the risk the supplier takes in keeping inventory for Axis. However, Axis also requires that all suppliers and EMS has 30% overcapacity available to increase their flexibility towards Axis. But to be able to meet demand even at spikes, Axis hold 1,2 months of demand in finished goods inventory at the CLC and up to 1,5 months of demand of critical components.
6.3.3 The upstream supply chain network of 2N

Actors and responsibility

The upstream supply chain of 2N does as Axis consist of four main actors. Both the component suppliers, component distributors and the EMS serves the same purpose in the upstream supply chain as Axis. 2N's R&D department develops and chooses the components that are to be used in the products and supplies the EMS with a BOM when purchases are made. For 2N the EMS mainly produces PCBA, while assembling and testing is usually done in 2N’s own factory. The EMS is responsible for both strategic and operational purchasing for all components connected to the PCBA. They also carry the responsibility to keep stock of important components in reference to the PCBA. At 2N Purchasing functions as an adviser for the R&D-department in selecting components for production at the EMS, for instance if a component might be more suitable from a market availability perspective. However, the EMS’ are responsible for the actual purchasing and finding suppliers. This means that when 2N provides the EMS with a BOM, the EMS is expected to both find and purchase components to the forecast. 2N’s purchasing department could, in some selected instances, also suggest a supplier with a better quota. From recent cooperation with Axis this possibility has increased as new pricing lists from Axis were received where new quotas have been more favorable. Purchases that are directed for the final assembly carried out at the 2N factory is done by purchasing at 2N.

Product flow to the EMS

As with Axis there are three possible flows to the EMS. However, because of the size of the EMS’ in the EMS base the usage of the different flows deviates compared to Axis. The most common flow used is the flow described in A) in fig. 6.3. This means that most components for production is sourced by the EMS through component distributors. Production quantities is described as the main reason for the low usage of direct sourcing by the EMS’ which also is the preferred way of sourcing products according to sourcing managers at 2N. If the EMS is responsible for final assembly products are also sourced directly from the stocks of 2N where final assembly usually takes place. This is however not a frequent type of production.

The produced product

The EMS’ are able to deliver two types of levels of completion in the products for 2N. The EMS’ usually produces only the PCBA. This resembles the product level at Axis called Unit assembly. The remaining work for 2N to do at their factory in Prague is to provide final assembly of surrounding parts such as chassis etc, software testing and installing as well as packing and shipping. There has been occurrences where the EMS does this part as well and also handles the shipping towards the distributors further downstream, essentially skipping the 2N factory completely. This type of product level is however not so common and closely resembles the at Axis called Sales Unit level. There are no deliveries that are done somewhere in between these two product levels making Production Units as found in the Axis production non-existent in the 2N production.

The product flow from the EMS

Mostly all products from the EMS are sourced directly to the 2N factory in Prague. The 2N facility has the possibility to ship products to all distributors all over the world and does so accordingly. From Prague two different types of delivery methods are used in order to ship products further downstream. Either the products are shipped to the distributor who later supplies system integrators and re-sellers further down-stream or the products are drop-shipped directly to re-sellers and system integrators from Prague. This method is used when lead-times are needed to be pushed down.

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1PCBA - Printed Circuit Board Assembly
Ordering and strategic purchasing in the upstream supply chain at 2N

As described before the EMS of 2N carry a heavier responsibility in the sourcing. Stock-keeping at the EMS is more common as well as the responsibility to find and choose suppliers for components destined for production. The cross-functional work of the R&D and sourcing departments that exist at Axis is not as strong at 2N as at Axis and purchasing has not the same kind of influence in the component selection during development of products. However, there are some similarities in how both companies manage the ordering and stock-keeping of material at the EMS.

The EMS gets a 18 month rolling forecast from 2N. However, 2N has given the EMS early material authorization for 3 months. Early material authorization is a contract agreement that the buyer takes on cost to secure material availability at the supplier. This means that 2N lets the EMS build safety stock to lower lead-times for critical components. Purchase orders are manually sent to the EMS via e-mail and the order lead-times for 2N EMS’ is 8-12 weeks. Purchasing continuously monitor pricing and has a system to monitor prices and the EMS stock levels on critical components. The criticality of the components in the product are decided by the R&D-department where the basic criteria consists of how important the component is for the functionality of the end product. For instance CPU and memory cards are considered critical. There are also systems in place to remove under-performing suppliers. If the suppliers are not performing as expected it is 2N’s replacement management responsibility who could always refer the EMS to not buy from specific suppliers or push the EMS to buy from 2N’s preferred suppliers.

6.3.4 Performance in the upstream supply chain at Axis

Axis uses a lot of EMS’ but the majority of production is allocated to a total of 4 EMS’ spread out on 3 different continents. With a rule-based approach Axis continuously monitor their dependency to them. Axis wishes to be a considerable customer but not too large at each EMS. Therefore, Axis follows determined rules, as previously described, of 10-35-35.\(^2\) Which can also be seen in fig. 6.5 where no specific EMS-spend is more than 35% of their total spend.

Axis yearly EMS-spend is approximately thirty times higher than 2N’s spend. Therefore they have to use the largest EMS-providers available. Today, Axis uses two of the largest EMS-providers in the world. As earlier mentioned scalability in the EMS-base is important to Axis. Axis has earlier used other EMS’, but noticed that some of these particular EMS’ spend reached over 40% of the total EMS’ yearly revenue. Since Axis grew by double digits, it was important to find an EMS that could grow in the same pace. The old EMS did not seem to have a plan for growth that suited Axis and together with other decisive factors it was decided to successively phase out the EMS and phase in a larger one. The larger EMS’ were considered more suitable in regards to matching Axis’ growth.

The larger EMS’ in Axis’ EMS-base, all have good capabilities in quality deliverance as well as capacity and flexibility. Because of their size they also carry most of Axis’ spend on EMS’ and hold a diverse spread of Axis product portfolio. One of the larger EMS’ has also increased their production capacity by building more lines, as volumes and new product introductions has grown.

The smaller EMS’ that Axis uses carries a smaller part of Axis total spend. However, the EMS’ has in spite of their size shown good performances in new product introductions where both responsiveness and ability to perform without Axis’ involvement has been high. Furthermore, they have also been performing well in terms of capacity and flexibility, where cooperations to solve unforeseen demands have been good. However, the larger EMS’ in the EMS base has relatively had a better ability to handle the present component shortages that is experienced on the electronics market as of now.

\(^2\)See Chapter 2 "Axis Supply chain" for a closer description
The performance is also presented in regards to growth were the critical factors are: Capacity, Flexibility, Capability and Risk. This because they all carried importance in order to be able to cope with an increase in volume and product mix. Axis employs several different tactics in order to achieve growth.

**Capacity**

To be able to keep track of the capacity at the EMS Axis employs a strategy to demand capacity reports from their EMS providers. These reports are are carried out in order for Axis to grasp how well the supplier can meet future demand from Axis. By regularly following up numbers on how much of the turnover Axis owns at the EMS insights regarding ramp up possibilities among other things are seen. An assessment of how much space and available resources that is present at the EMS at that time is also included. This includes an assessment of the possible shifts and personnel that could be accessed at the production facility as well as the access to floor space and space for machines.

**Flexibility**

Axis works with different policies in order to raise the flexibility in their base of EMS providers. The segmented supply chain of Axis enables them to produce certain products to maximize efficiency and other to maximize flexibility. This could be done by for example postponing assembly of the products to the CLCs. However, this approach is not so commonly used at the moment. Axis instead spreads products on various sites to maximize flexibility in the supply chain. By placing similar or sometimes even the same products at two different EMS providers capabilities are spread to different nodes of the supply chain which raises the possibility to shift production if need be. Axis also builds flexibility at the EMS providers through contracts. Where Axis expects that the EMS will provide spare capacity to be able to handle a demand increase of up to 30% more than forecasted demand.

**Capability**

According to a sourcing manager at Axis, all EMS providers possess the same capabilities and have worked with various high-technology products. This since they all are amongst the worlds largest providers and a great share of the production is standardized. Similar surface mounting technology lines, which is used for PCBA production, are used at all EMS’. The PCBA is a cornerstone in all electronic products. However, because of the technological complexity present in Axis products, as a camera producer, there is also a need for clean-rooms and other sterile environments as well. This since the optics require cleanliness in assembling which all EMS’ therefore also have.
Risk

Axis EMS-sourcing model has the main purpose of reducing risk in the supply base on many levels. Axis strives to spread out production among several EMS’ as described before. This is done by spreading out similar products or the same product if volumes are high enough on two different EMS’. Should the EMS succumb to failures transferring production to another site is easily managed. In the same way competence of different types of production techniques is also spread out in the supply base and reduces dependency. This does to some degree reduce the possibilities of economies of scale in the supply chain but in turn the flexibility and responsiveness of the supply chain is increased. This strategy has been shown to be successful in the past. During 2011 one of the EMS-providers were flooded which halted production at the EMS for several months. A total of 50% of production was allocated at the EMS but swift transfers to other EMS’ made it possible to rapidly get production up to speed again shortly after the incident.

As described before the electronic markets material shortages has also shown the EMS’ ability to manage supply risk. The larger EMS’, which often operate with direct channels to the suppliers and carries a larger supplier base, has proven to manage these shortages better. This seems to stand from the size of the EMS, where size is in direct correlation with a better management of material shortages. This because of closer relationships, larger buyer power and ability to maintain and manage a larger supplier base.

New Product Introduction capabilities at Axis

New product introductions at Axis is mainly lead by the Industrial Lead unit at Axis. This unit has the responsibility to coordinate activities which are connected to the industrialization process of Axis’ products on a holistic level. This means that the group coordinates activities where the main purpose is to introduce and ramp up production of products which has not been produced by Axis’ EMS partners before. They essentially function as the connection between R&D and Operations. Before Axis had an industrial lead group there was considerable trouble in ramping up production at the EMS’. It was common that production lines were not ready for full scale production which in turn made it more difficult to get products on the market.

The process to industrialize products at Axis follows a documented project model. This model consists of five phases and six tollgates. These are described in fig. 6.6

Figure 6.6: A schematic view of the New Product Introduction Process
Industrialization of the product could be described as groupings of the processes from day one of the execution phase until the product is ready for mass production. This process usually takes 20 weeks to finish but could go faster if the EMS’ has experience with similar products previously. After the first simple assembly process is developed at Axis the EMS’ are involved together with the industrial lead team to do major developments and making sure that the production process is ready for pre-series production. The EMS’ puts some requirements on Axis in order to proceed with development, the right BOMs and specification should be at hand as well as supplier suggestions for scarce components. Softer deliverables such as transparency and good communication is also required.

6.3.5 Performance in the upstream supply chain at 2N

Today 2N uses a total of 3 EMS service providers and spends a fraction of what Axis spends on these services, since 2N is smaller. The EMS providers are all local and located in the Czech republic. The distribution of orders in the EMS base is based on the product families and how familiar each EMS is with a certain product family. For instance, GSM gateways and lift communicators are produced by one of the three EMS’. Similarly IP-audio is produced by another EMS and access control as well as IP-intercoms are produced by a third EMS.

One EMS has grown rapidly in recent years and is now facing minor issues with capacity. The EMS is currently low on personnel and is working hard to solve it by hiring more staff. However, the machine capacity is not as crucial in this regard.

Another EMS only produces in one shift today and are described as a flexible partner. Small batches of products are primarily produced at the smaller EMS today which increases flexibility. They have also when needed often agreed to work overtime when it has been requested from 2N. This when specialty parts are being made or when there is a critical situation in another production resource at 2N.

However, one EMS recently moved to new facilities, also in the Czech republic, in order to increase capacity. This has enabled room to build a new line for assembling and the introduction of half of a third shift.

2N does not employ the same type of policy Axis does regarding dependency and spend at the EMS provider. 2N is as of now responsible for between 20% to 40% of the total revenues of their EMS providers.

![Figure 6.7: A summary of 2N total spend on each EMS as of 2017 as well as their geographic location where all EMS’ are located in the Czech Republic.](image)

From fig. 6.7 one can see that the majority of 2N’s EMS business is centered to one EMS. With a majority of 2N’s yearly spend centered to one EMS 2N clearly exceed Axis rulebased system regarding dependency.
Capacity

2N has no clear strategy to secure capacity but does not see it as a big issue either. Common for 2N’s EMS partners are that they are considerably small and 2N guesses, since they do not get capacity reports from the EMS, that they have between 10-20% in free capacity at each EMS. As earlier mentioned one of 2N’s largest EMS has present capacity issues in regards to personnel and it is estimated that their smallest EMS provider does not have the ability to scale up production considerably.

Capability

2N has clearly distinguished the EMS’ by product families. Therefore the EMS base has a broad spread of capabilities. The EMS providers are in that sense more specialized to a certain product family which also creates the incentive for 2N to place new products belonging to that specific family at the same EMS’ as necessary equipment and know-how is already present.

Flexibility

2N usually orders their products on a unit assembly level from the EMS. Which means that they buy PCBA from the EMS but does the majority of the assembling in the 2N Prague factory. This increases 2N’s ability to swiftly change assembly of products which in turn enables them to postpone final assembly. In regards to volume volatility they adopt a material authorization strategy to secure availability. According to the sourcing managers at 2N some of the flexibility in the supply chain comes from the low volumes of production. With lower volumes swift changes in demand is not as large of a problem. The sourcing managers has however described that a higher volume might impose on the total flexibility in production.

Risk

2N lacks a contingency plan for their most critical suppliers, the EMS’. 2N does not believe that the other EMS’ will be able to handle a transfer of production, especially if their largest EMS fails, who also is responsible for their best-selling product lines.

2N has an outsourced upstream supply chain where the EMS has the producing and sourcing responsibility. However, through a close cooperation with both the suppliers and EMS, 2N has clear visibility throughout the supply chain and traceability.

New product introduction process at 2N

New product introductions at 2N is mainly led by the R&D team, since they do not have an Industrial Lead as Axis. The development process varies from project to project based on issues that could arise during development. After complete development of the product they send a request to the sourcing department that in turn look for a suitable EMS that could ramp up production. There are usually small batches in the first runs of the product and for that reason the smallest EMS is usually the fist EMS chosen, as they have proven good performances with small batch production. If a new product is similar to other products produced at some of the other two EMS’ they are instead chosen.
Chapter 7

Analysis of Empirical findings

7.1 Outline

In order to reach the purpose analysis has been done in order to complement the empirical findings and to reach answers to main questions of the research. These will be presented in order of the work-models phases where empirical analysis is connected to the two phases previously described in the empirical findings: compatibility and supply chain structure. Additionally an overlap and gap analysis will be presented in order to provide analytical material needed in the third phase find synergies.

7.2 Compatibility phase: The strategic fit of 2N and Axis

The analysis presented below is carried out in order to answer the following question:

• 1. How compatible are the firms supply chain strategies?

Looking at the overall strategies and visions of the two firms it is clear that both firms have a consistent focus on growth. 2N strives to reach a position in their field where Axis already is, as market leaders. Looking closer at the supply chain both supply chains has been influenced by the ambition to keep the high growth paces, where the dominant strategy for both firms has been to outsource basic production activities to external producers. This to give the companies a certain level of scalability and flexibility in production which is needed when trying to reach these goals. As a consequence of this both Axis and 2N also have the same type of positions in their supply chain. As described by Harrison, O’Neill, and Hoskisson (2000) this should make integration of the supply chains easier since they argue that a similar position in the supply chain for the merging companies should create a situation where merging the supply chains have small or little issues connected to it.

The result of letting executives at both firms rank their competitive priorities was found highly interesting. A great number of similarities can be seen in how they chose to compete on the market. Both firms rank the quality in their products as well as a high degree of innovation as most important. Second to this, both firms ranks their flexibility in answering demand spikes as important and puts low importance on time and cost. This means that both firms want to compete on the market in the same way which therefore should create a situation where their supply chains as of now are supporting these competitive priorities or strive to be able to support these priorities. What this practically means for the supply chain structure is that the components of the upstream supply chain in both firms i.e. the EMS providers and component suppliers all should have the basic capabilities to create this support.
The products are similar since they are both technological, dependent on good electronics and serves as complements to each other. A complete surveillance system has the possibilities to both include door stations and cameras which enhances the product offerings of the complete entity. Axis is also active in the door station segment and IP audio segment, but according to one executive at 2N important differences makes the products more of complements rather than substitutes. This in turn should lower the degree of cannibalization that could be present in the product portfolio of the merged entity. There is also a different market focus between the two firms which creates a differentiation in the customer bases of the two companies.

The similarities in electronic components has also put both firms in the same situation in regards to the component shortages on the electronics market. This means that both companies in this regard face the same challenge of sourcing certain electronic products. Looking at the market for demand instead of supply both companies has succeed in taking leading positions in their respective product segment in different geographic regions. 2N has a majority of the sales from the EMEA region and the largest market for Axis currently lies in the North American region. Axis great resources on this market can truly benefit the growth of 2N in this region which currently stands for 23% of sales and is the second largest market for them.

The customer needs of both firms are also fairly similar. Both companies are targeting segments of the markets which requires premium products where quality, luxurious design and service is important. Axis products has on average greater volumes and sells in larger quantities for projects, 2N on the other hand has more customized products with varying end-products but sells less quantities. Apart from that the company products are quite similar since they are both premium brands. 2N has put some effort in finding exclusive design to their product and uses expensive material to get a matte finish which puts high requirements on the surface mount in production. On the other hand, the Axis products is more complex in its technology, with more components and associated system support. Therefore the technology used in Axis cameras is far more complex compared to 2N’s technology.

In summary there is a strategic fit between the two companies and a merger of the supply chains should be pursued. This is based on four criteria which has been concluded during the strategic analysis.

Both firms have the same strategic will to grow and strive to compete on the market in the same manner. This is shown by both the visions and competitive priorities of both companies.

By having these same competitive priorities their supply chains are also structured in the same way. There is a high degree of outsourced activities in the upstream supply chain. This means that both the structure and the position in the supply chain of both parties are very similar.

Both firms have succeed in different markets, this means that there are low possibilities of cannibalization and large possibilities to increase sales volumes. The client needs are also quite similar since both brands are premium brands and target the same pricing segments of their respective markets.

The products that the supply chain should carry are also fairly similar, however it was concluded that the technological complexity of Axis products is higher which could imply that Axis have a greater need of a more complex production. This means that Axis' production facilities should have the capabilities to produce 2N products but not necessarily the other way around.

| Table 7.1: A summary of the conclusion in regards to strategic fit |
|-----------------|-------------------------------------------------------------|
| Overall strategy | Both companies share visions to grow                         |
|                  | They have the same competitive priorities                   |
| Supply chain strategy | Outsourced sourcing activities                           |
|                  | Same position in the supply chain                           |
| Markets           | Premium brands that serve premium customers with similar needs |
|                  | Geographic spread in sales between the companies            |
| Products          | Similar products, complementing the product offerings       |
|                  | Different technological complexity                           |
7.3 Supply chain structure phase: The structure and performance of the supply chains.

In order to answer the second main question:

- 2. Are the supply chains structured and performing to handle growth?

Several analyses had to been done. These will be presented in two parts. First the suppliers which requires managerial attention will be determined and then their performance will be analyzed.

7.3.1 Suppliers which requires managerial attention during the merger

As described in the sourcing process a critical part of Axis supply resides at the EMS’. By looking at the order flow it is clear that the EMS’ carries a lot of weight in the ability for both Axis and 2N to be able to supply material to the customers. This has also been shown in the past for Axis. One of their key-suppliers, an EMS, was flooded in 2011 which halted production at the site for several months. At the specific time the EMS carried 50% of Axis total production and by having second source suppliers Axis managed to redirect products and mitigate some of the effects. It can also be argued that the EMS belongs to the suppliers which according to Van Weele (2010) could be classified as strategic. The supply risk is always high as the EMS’ carries almost all the production capability in the supply chain. If production stops at the EMS so does the supply and the specific number of production parties in both the supply chain of 2N and Axis are fairly low. It also correlates to the notion that the strategic supplier should have specific know-how or capabilities as well as having a large effect on the overall profitability which the EMS’ have according to the previous mentioned example.

By being central in the upstream supply chain the EMS’ carries weight both in the decision of component suppliers as well as providing manufacturing capabilities together with capacity and flexibility. The specific order flow of Axis also allows the EMS to carry the operational purchasing as well as assist in finding component suppliers with the right resources to supply Axis with a complete product. At 2N the EMS also carries a large degree of the strategic purchasing making them even more critical for supply.

As with the rest of the supply base there are also other suppliers which are viewed as critical for both firms. By sourcing critical components to stocks controlled by themselves both companies have, however, effectively seized control of the supply of these products to in turn supply the EMS’ with these products. The criticality of these suppliers are therefore lowered and as these products are very company specific synergies in these flows are not investigated furthered as the combinational nature of them are low.

This leads to the conclusion that the EMS suppliers are by far the most critical suppliers in the upstream supply chain and should have managerial attention during the merger. By having the power to control the component supplier decision in various degrees depending on the focal company also leads to the conclusion that the EMS’ base to a large extent determines the possible synergies that could be achieved further upstream.
7.3.2 The supply chain network of the two companies and its performance

The analysis done for the performance in the upstream supply chain will focus on the performance in regards to Capacity, Flexibility, Capability and Risk management. This will be done by analyzing the two supply chains network structures and additionally the components of CPFR it carries.

Structural strengths and weaknesses of the supply chains

As previously stated the supply chain network is centered around the EMS in the upstream supply chain. Outsourcing lets each company focus on its core competence area where neither of the companies has hardware production as a core competence area. This could be concluded based on the product that the companies sell. A highly technological product carries a lot of value when software and other immaterial components are developed and then added. As presented this type of value adding capability as in software development is not carried out at the EMS. This also correlates to the notion presented by Kremic, Icmeli, and Rom (2006) where all non-core competencies should be outsourced. These actions can increase the entire supply chains competitiveness, however, it can also have negative effects as well since there is a possibility to lose control of the supply chain or/and that the supply chain becomes overly complex. This with a larger number of nodes that the product needs to pass where different actors carries different ownership and responsibility of different parts of different processes. This can be seen in the 2N product flow where the products as of now are split into two separate flows with different rules and different processes and ownership. The product flow to the US is partly covered by Axis, partly covered by 2N where 2N essentially functions as a supplier to Axis rather than a partner. For the rest of the product flows, to EMEA and Asia, 2N is solely responsible and does not carry this additional node in the supply chain. This shift and parallel flows in the supply chain puts 2N longer from the market in the US, which in turn is lowering the visibility of forecasts and demand shifts as an extra node through Axis is introduced in this part of the supply chain. This is a result of the integration of the downstream supply chain in the US while keeping the rest of the supply chain untouched. As described while interviewing Axis employees this also created a differentiation in how this flow should be handled. There is a present confusion in who is responsible for which part of the process. This while the rest of 2N’s product flows to other markets are solely handled by 2N.

As described by Hong and Jeong (2006) the command and control strategies in the supply chain are usually different when analyzing the supply chain network of a large corporation and an SME. Here an SME is more prone to let go of the control in the supply chain and a larger company wants to strive for total control of the supply chain. The results of the present structure in the total supply chain of the two companies results in a mix of command and control in the supply chain. It is therefore of interest to examine the visibility and control through the upstream supply chain of Axis and 2N. Axis has processes to examine reasonableness in pricing but does not seem to have sufficient visibility in how the EMS source components and if they really are holding inventory as they promise or not. Although Axis does hold inventory for the most critical components in their own warehouse to keep control. Furthermore, since operational purchasing is in the core business of the EMS, relations with common suppliers might be better compared to Axis. As for 2N the control of the purchasing is also to a certain extent outsourced. However, 2N’s EMS’ does not compare in size to the EMS’ in Axis supply base. What this means is that there is a present situation where the flow of products for 2N is rather complex while there is a lack of visibility for both parties further down the supply chain.

Looking closer at the certain EMS’ that both companies have there are present differences in strengths and weaknesses of each supply base.
Capacity strengths and weaknesses

Today Axis has been partnering with some of the largest EMS' in the world. These EMS' have because of this an abundance of capacity in order to be able to quickly scale up production when their customers needs it. This is on par with Axis vision to think big, where all parties of the Axis supply chain should be able to scale up and strive for growth. Using the 10-35-35 rule also allows Axis to continuously keep the present EMS base under control. As described Axis has a proven record of acting in accordance with this rule. Phasing out a smaller EMS partner which did not have the ability to grow together with Axis and transferred more orders to a much larger EMS provider.

This is also one of the key strengths in Axis supply base according to the supply chain directors, the present scalability of the supply chain. A central part of the integration is therefore if 2N carries this same ability to scale together with the other parties of the Axis supply chain. As of now 2N does have some minor capacity issues with their EMS' partners. It is described that one EMS lacks the manpower to scale up as of now and the smallest EMS is limited in size to scale up their capacity. This makes estimations of spare capacity at the EMS partners of today a concern since estimations of sales growth are as high as 21% per annum where for example growth by 35% per annum is estimated in 2N’s largest segment door stations.

Flexibility strengths and weaknesses

Looking closer at the flexibility of the partners there are some present differences as well. Flexibility can be reached in many ways and also take many different forms. The need for flexibility in both supply chains is apparent. There are present shortages in components and demand is becoming more and more volatile.

In regards to volume flexibility, Axis uses different types of solutions to achieve this. Axis always makes sure that the EMS' under contract has at least 30% spare capacity. This means that contractually the EMS' should be able to answer to a demand shift from Axis of up to 30% deviation from the presented forecast to the EMS. By working with larger EMS providers also shows that supplier flexibility strategies as described by Mendonca and Gimenez (2007) has a proven effect on managing volume flexibility. This is shown by the handling of the latest material shortages in the supply chain. The larger EMS providers can in this sense both employ flexible sourcing by managing a larger supply base as well as increase the supplier responsiveness by forming closer relationships with the suppliers. As described by using direct sourcing alternatives instead of the counter part, sourcing through distributors, affect the EMS performance in flexibility with regards to volume shifts. This is directly correlated to the size of the EMS, where larger EMS providers has the ability, purchasing power and capacity to maintain these two strategies successfully. The smaller EMS providers used by 2N does instead not allow for this type of volume flexibility currently provided by Axis EMS base. Contractually 2N also lacks the flexibility clauses in their agreements that Axis has with its EMS partners which also could stand from both the sizes of the EMS as well as the spare capacity present in the EMS base of 2N.

Product mix flexibility has been shown to be less connected to the choice of EMS rather than the relationship to the EMS and the present product strategy the two firms utilize. As described by Duclos, Vokurka, and Lummus (2003) there is an apparent trade-off between efficiency and flexibility in the supply chain which companies needs to handle. Here Axis has started to implement a segmented supply chain in order to segment customer needs and introduce postponement in the supply chain to customers where this is needed. So far this has had little effect on the way products are ordered from the EMS. 2N instead employs a strategy where large parts of EMS production is postponed to their own assembly factory. This makes the product demands on the EMS smaller and more flexible, since more of the value added is postponed and allows for a higher demand shift. The empirical findings also shows that 2N is more prone to use this type of solution in order to increase flexibility. This could indeed be an answer to the lack of volume flexibility in the supplier base. An additional result of this for the supplier base is a reduction in product complexity on 2N’s part, which makes the possible base of EMS providers that can produce the products larger.
Capability strengths and weaknesses

As described by the sourcing managers of Axis all of Axis EMS’ have a diverse spread of capabilities. This both stems from the attitude of Axis to diversify production of products to different plants as well as the size of the EMS. It is logical that a larger EMS does have a greater set of capabilities than a smaller one. With a larger base of resources there should be room for a higher degree of capability development. In regards to sourcing products the larger EMS’ also have a proven capability to timely and cheaply source products in an efficient manner as described above. New Product Introduction capabilities also varies across the two firms as well. Axis has an early inclusion of Operations in the development and ramp-up process of their products. Here choices of components could be influenced by the sourcing team to avoid the presence of components in the product which are harder to source. 2N instead lets their R&D department finish development of the product and first after that looks for suitable component suppliers that could supply the components needed. This process is faster in its execution as there are less functions involved in each stage of the process. However, there is a great risk of developing a product which is harder to manufacture. In conclusion it makes it difficult to secure availability of components, minimizes negotiation power and makes it harder to make changes in design.

2N has also chosen a different strategy in regards to the placement of their products. Product families are separated at the different EMS’. Choosing the EMS that have the most similar products raises the know-how which should raise both the productivity and quality, since the EMS partner is more familiar with the certain way of production. There is also a possibility to gain economies of scales as equipment and machines are all ready at the site. However, from a capability stand point this puts the range of capabilities at the EMS’ constrained and isolated. This among other things makes a shift of production harder between the EMS’ which lowers flexibility in the supplier base as well as the possibilities to handle risky events.

Risk management strengths and weaknesses

As for risk management there are different strengths and weaknesses within each of the two companies EMS bases. Axis employs a risk management system in the EMS to enhance capabilities to cope with certain vulnerabilities that are present in the EMS base. The reasoning presented by Pettit, Fiksel, and Croxton (2010) where capabilities to handle vulnerabilities are presented could very well be applied in this situation. Axis uses a product strategy to spread out both products and capabilities among the EMS’ in order to be able to have the capabilities to handle the vulnerability that outsourcing to the EMS’ carries. As described above the EMS providers are critical to the Axis supply chain as they both provide a large portion of the production capacity and capability as well as handling parts of the sourcing activities. This creates a vulnerability as dependency on these services are created. To reduce dependency these risk management capabilities are created within Axis’ supply chain so that the vulnerability that the EMS carries is covered by capabilities that handle these vulnerabilities.

2N on the other hand has not reduced the vulnerability of the EMS’ in same way. It could be argued that the specific product family distribution to the EMS also enhances this vulnerability since alternatives for swift transfer of production becomes smaller. The lack of a clear contingency plan for these types of events coupled with the present capacity issues creates a worrisome situation for 2N. These risks mostly resembles the external risks that the classifications of Kaplan and Mikes (2012) describe. They further describe that there is not much the company could do to prevent these risks if they are present. However, by building the right capabilities to handle these vulnerabilities there is a larger chance that the company could withstand a disaster better. Here the longer history of Axis might have affected the two companies views on this matter. By experiencing disasters in the past Axis has learned to create capabilities to handle these types of events. This fact creates an opportunity for 2N to learn from previous mistakes made by Axis which opens new possible sources of intangible synergies which risk mitigation strategies could be classified as. However, the proximity to the suppliers that 2N has and the visibility that is also granted by 2N gives some protection. During the integration it would therefore be important to as Pettit, Fiksel, and Croxton (2010) argues review the capabilities that are taken in order to handle present vulnerabilities and avoid creating a costly overprotection for these vulnerabilities.
7.4 Find synergies phase: Gaps and overlaps between the supply chains

After the review of the suppliers which requires managerial attention, an additional analysis in order to find synergies is needed. By comparing the two firms there is a possibility to find present gaps and overlaps in regards to important factors for growth. Below an analysis of gaps and overlaps in the supply chain will be presented in regards to the present structure and performance of the upstream supply chain.

7.4.1 Present overlaps in the upstream supply chain

Present overlaps could be seen in the structure of the supply chains. As previously established both companies employ a similar supply chain strategy which in turn has effected the structure of both firms’ upstream supply chain. In this regard, both firms have the same basic nodes which carry out the same type of activities in the supply chain. However, how these are used and been configured throughout the merger deviates. A major issue discovered is for example the extra node that has been introduced in 2N’s product flow to the US markets. This extra node has resulted in a longer product and information flow which has increased the complexity and in turn lowered the overall efficiency of the flow, both from a management perspective as well as an operational perspective. In regards to the other actors of the supply chain, mainly component distributors and EMS partners these have essentially the same basic activities to perform, however the performance and organization of these activities are far from equal which is shown in the present gaps in performance.

7.4.2 Present gaps in the upstream supply chain

As described in the previous paragraph several gaps have been identified while comparing the performance of the upstream supply chain in regards to the important factors: Capacity, Flexibility, Capability and Risk management.

Gaps in capacity

Axis and 2N differs on major fronts when it comes to both management of capacity and available capacity in the upstream supply chain long-term. Axis has access to one of the largest EMS’ in the world, for that reason capacity available and scalability in the EMS base is not seen as a present issue. At 2N scalability is questionable and the present EMS base already has minor issues in regards to ability for the EMS providers to scale up production.

Gaps in flexibility

During the analysis two separate flexibility types were analyzed, volume and product mix flexibility. In regards to volume flexibility Axis has a contractual advantage where 30% spare capacity is guaranteed contractually by the EMS if demand should exceed forecast. 2N on the other hand does not have these contractual terms. Supplier flexibility is also provided with regards to the size of the EMS. It was concluded that a larger EMS has the possibility to sustain better strategies in this regard to create volume flexibility. Axis EMS’ are here on average far larger than 2N’s which creates a better performance in this regard. In regards to product mix it was found that 2N in a higher degree employs postponement in their product strategy towards their EMS partners. For that reason there is also a larger degree of product mix flexibility in the supply base of 2N compared to Axis. Axis has started to implement segmentation in the supply chain further downstream but this does not to a great degree affect the present product mix flexibility in the upstream supply chain. However, in the long-term it is expected to deliver a supply chain with an ability to handle different needs differently. For instance improved service level or price.
Gaps in capabilities

As a result of different product placement strategies at the firms the capabilities in the EMS base varies to great extent. Axis employs a strategy where products or product families are spread out among different EMS'. 2N on the other hand uses a strategy where product families are strictly allocated to different EMS providers in the EMS base. For that reason Axis achieves a higher spread of capabilities in the EMS base and substantially increases the available capabilities in the EMS base.

Gaps in risk management

There are major gaps in risk management between the two firms in regards to their supply base. Axis has a clear focus on risk reduction and a rule based approach in the creation of capabilities to counter present vulnerabilities in the supply base. This can be seen by the product allocation strategy together with the 10-35-35 rule. Axis also has contingency plans and experience in case of critical failures at the EMS. 2N on the other hand does not use these types of strategies and does not continuously work with contingency plans to be prepared for failures in the supply chain. A concentration of capabilities to certain EMS' and capacity constraints also leaves the supply base of 2N highly vulnerable for critical failures if they would transpire.

The above discussion has been summarized in table 7.2 below.

<table>
<thead>
<tr>
<th>Dimension of performance</th>
<th>Present gaps and overlaps</th>
</tr>
</thead>
</table>
| Structure of the supply chain | Major overlap  
Both supply chains contains similar actors and activities  
Issues to efficiently use these overlaps has been identified |
| Capacity in the supply chain | Major gap  
Axis' processes to manage capacity in the supply base outperforms 2N  
Axis' available capacity in the supply base outperforms 2N |
| Flexibility in the supply chain | Minor gap  
Axis' volume flexibility outperforms 2Ns to a large extent  
2N's product mix flexibility outperforms Axis to a certain extent |
| Capabilities in the supply chain | Major gap  
Axis' available capabilities in the EMS base outperforms 2N |
| Risk management in the supply chain | Major gap  
Axis' ability to manage risky events in the supply base outperforms 2N |
Chapter 8

Results

8.1 Outline

The results of the thesis is presented in two parts connected to the last two phases of the workmodel. First the gaps and overlaps analysis previously done in chapter 7 will be utilized together with theory in order to close the third phase: find synergies. After this an evaluation of the synergies is presented in accordance with the fourth phase: synergy evaluation.

8.2 Find synergies phase: Found synergies

In this section we will find and present 5 synergy possibilities, also called synergy packages, in regards to growth. The analysis is build upon the gap and overlap analysis of the previously stated empirical findings and should answer the question:

- 3. Which synergies could be found?

From the compatibility chapter we found that the two studied companies are similar in regards to strategy, supply chain, market and products. For instance the companies both serve the premium segment of their respective market. During the interviews it was also found that they have the same competitive priorities from the five possible priorities described by Cousins and Lamming (2008). Axis as well as 2N ranked quality and innovation as primary priorities above flexibility, time and cost. Both companies management made it very clear that cost leadership is not of interest but felt as it was their responsibility to maintain quality and be efficient in delivering innovations to strengthen their market position. Furthermore, time was not crucial since the products quality are superior to competitors and customers are therefore willing to wait for the products. Flexibility was deemed neither a priority nor neglected. Since both companies share the vision to grow and have the same competitive priorities its believed that management of the both companies will be open to an integration. This since no radical business model shifts is required to integrate the companies. However, in order to grow flexibility must be prioritized higher. This since growth is the major driving force of the merger.

The value sought for this specific merger is growth and therefore revenue synergies is the most logical category to pursue. Creating value through cross-selling would in turn create drivers of both volume and product mix which the supply chain needs to cope with, on top of supporting these new channels.
Furthermore, both Axis and 2N currently operates in a volatile market which is not expected to stabilize. Therefore it is crucial to prepare for increased demand volatility. According to Christopher (2000) the best suitable supply chain for a market sensitive company is being agile. Sensitive markets are here characterized with high requirements to read and respond to real-time demand. Since both companies are highly technological they also have short product life cycles, high product varieties and long supply lead times. Just as other organizations in sensitive markets Axis and 2N are forecast-driven rather than demand-driven. In other words because they have little information they are required to make forecasts based on past sales or shipments and convert these forecasts into inventory. Agility is therefore necessary to be able to respond rapidly to changes in demand both in terms of volume and variety (Christopher, 2000).

8.2.1 Securing availability by closing the gaps

In order to achieve growth 2N and Axis must be able to secure availability in terms of volume and variety. There is however various ways of securing availability. Securing availability is important to ensure avoidance of missed sales or dissatisfied customers. But keeping inventory is expensive, ties up capital and is associated with risk of having excess inventory which there is no market for. Because of the possible downside most companies are afraid to hold excessive inventory. However, by closing the apparent gaps between the supply chains several synergies can be achieved and improve the product availability in the supply chains.

Synergy package 1: Increasing volume flexibility

The empirical findings shows that neither Axis or 2N’s EMS’ are interested in holding inventory but rather look for a Just In Time approach for their production. Axis today demand an order lead time of 10 working days towards the EMS, if correctly forecasted. The lead-time for the components the EMS’ need is usually much longer and therefore Axis has given the EMS’ 3 months material authorization and can therefore demand 10 days order lead time. However, since the market fluctuates it is not uncommon that the demand exceeds the forecasts. In this situation Axis brand name and relation with the EMS has shown to be important. Since Axis EMS’ is even larger than Axis, the EMS can leverage their supplier relations and achieve better flexibility both in mean of being prioritized in total component shortages and having the supplier hold inventory to gain business. It is often the lead-time of in-bound suppliers that limit the ability of a manufacturer to respond rapidly to customer demand therefore it is important to nurture the quality of the supplier relationships in the upstream supply chain.

In regards to component supplier relationship, we found a major gap between Axis and 2N’s EMS’. Some of Axis EMS has direct contact with the component manufacturer, 2N’s EMS on the other hand bought their components from distributors. This is believed to be due to 2N not being seen as important/big enough to have direct contact with the component manufacturer. Axis are on the other hand able to leverage their buyer power and demand ability to ramp up 30% over capacity in less than one month at both EMS and component manufacturers . This is also in line with the literature, according to Stratton and Warburton (2003) one shall have protective capacity in order to have a fast responsive supply chain. Stratton and Warburton (2003) also says that this cannot be protected by inventory only. Axis ability to demand 30% overcapacity is believed to be due to Axis buying large quantities yearly and the incentives Axis offer. Axis offers 3 months material authorization and if Axis does not need the material after a certain period, they offer to buy it from the supplier to minimize the supplier’s risk. 2N offers the same material authorization time but does not get the same terms from their suppliers. For instance 2N’s EMS order lead-time is 8-12 weeks. Which means that even though Axis and 2N takes the same actions to increase supply flexibility, they get different results, which is believed to be due to brand name and buyer power.
By letting 2N use Axis brand name and contracts when purchasing components, 2N’s flexibility is believed to increase. By using Axis name, 2N will also be able to set up direct accounts at component suppliers and in a big context be able to eliminate non-specific distributors. A process that is already ongoing where a majority of today’s contracts already include 2N. By eliminating a middle-hand the total complexity of 2N’s supply chain will decrease. Furthermore, the cost of the components will decrease since distributor margins can be eliminated.\(^1\) Axis EMS’ are even larger than Axis in some cases and also responsible for Axis’ operational purchasing and negotiations of delivery and inventory terms with the suppliers. Therefore one cannot exclude that Axis EMS’ buyer power is stronger than Axis. By using contractual terms Axis are however, able to help with both. Axis has in their contracts with both the EMS and component suppliers reserved the possibility for affiliates to use the contract. 2N can be seen as an Axis affiliate since they are in the same corporate group and shall therefore be able to get the same terms as Axis at all suppliers.

To realize the synergy Axis together with 2N needs to set up a process to find suppliers which are currently supplying both Axis and 2N. This will however require a great amount of time since every single supplier needs to be introduced to and approved by 2N. Another alternative is for 2N to use Axis EMS and give them freedom to negotiate terms with suppliers on behalf of Axis AB which includes both 2N and Axis Communications. This way 2N will increase their buyer power and minimize the effort required.

For the upstream supply chain we therefore suggest that 2N starts to transform their supply base and adapts to Axis vision to think big and scalable. By working with larger EMS providers it will increase 2N’s scalability as described by Mendoncca and Gimenez (2007). Since the larger EMS’ will be able to take over the purchasing responsibility, we believe they will introduce a larger supply base with their market knowledge. Furthermore, the larger EMS providers can in this sense both employ flexible sourcing by managing a larger supply base as well as increasing the supplier responsiveness by forming closer relationships directly with the component manufacturing suppliers. Since Axis EMS’ are amongst the largest EMS in the world they will be able to scale up production quickly if needed and when their customers needs it.

Table 8.1: Required actions and achieved synergies to increase volume flexibility

<table>
<thead>
<tr>
<th>Required Action</th>
<th>Achieved synergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduce an Axis EMS in the supply base of 2N</td>
<td>Increased buyer power</td>
</tr>
<tr>
<td>Use Axis contractual terms</td>
<td>Increased capacity in the supply base</td>
</tr>
<tr>
<td></td>
<td>Better contractual flexibility</td>
</tr>
</tbody>
</table>

\(^1\)The component price could in some cases be as much as 30% cheaper at the manufacturer compared to the distributor. However, cost synergies is not in the scope of the thesis.
Synergy package 2: Increasing product mix flexibility

Product mix refers to variety of products. Since both Axis and 2N management had innovation together with quality as their main priority. It is interesting to see and compare how they secure the availability for the whole product line and any development of it. Therefore a search for synergies in product mix flexibility where carried out. From the empirical findings it was shown that Axis purchases their products from the EMS on three different levels: Unit Assembly(UA), Purchase Unit(PU) or Sales Unit(SU). Approximately 15% is bought on UA level, 85% on PU and less than 1% on SU. However, Axis has expressed a wish to increase value add and buy less on UA-level. The majority of 2N’s products are bought on Unit Assembly level from the EMS. Which in this case means that 2N buys PCBA, Printed Circuit Board Assemblies from the EMS. This has shown to raise the ability for 2N to be flexible as the major part of the value added to the product is partly postponed. This allows for a higher reaction time for 2N in case of changing demand in the product mix.

The solution to increased variability and innovation is according to Stratton and Warburton (2003) to utilize the opportunity to postpone the design configuration and therefore reduce the impact of variation further upstream. He further suggests stabilizing the upstream supply chain with decoupling inventory and investing in a responsive capability downstream. Beyond the decoupling point the demand variation shall primarily be managed through protective capacity rather than inventory. The advantages of the postponement strategy are several. If inventory is held at a general product level then there will be less variants and therefore less inventory in total. Furthermore, it will increase the flexibility since the same components can be embodied in a variety of end products. Forecasting will also be easier at the standard product level rather than for customized finished products, since it is easier to forecast worldwide volume rather than local forecast.

Both Axis and 2N clearly stated that customers are willing to wait for products and demand volatility and product variability is high. 2N’s approach to this problem in lack of volume flexibility is to postpone production. This has been part of 2Ns ability to stay flexible in turbulent times and we therefore suggest a general Assemble To Order (ATO) strategy at the EMS for both companies. The strategy requires that the basic parts are already manufactured yet not assembled. When an order is thereafter received one can quickly assemble and send it to the distributor. Today finished goods inventory is held at the CLC where assembling also is done to some extent. However, Axis has expressed that assembling at the CLC is more expensive compared to assembling at the EMS. By moving the tied up capital in inventory to the EMS, the EMS would be able to stock semi-finished products and increase volume and product flexibility to the same cost. Furthermore, the CLC stocks can be transferred to the distributors on the sales side who also keep stock.

Table 8.2: Required action and achieved synergies to increase product mix flexibility

<table>
<thead>
<tr>
<th>INCREASING PRODUCT MIX FLEXIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Action</strong></td>
</tr>
<tr>
<td>Introduce a general ATO strategy in the supply base</td>
</tr>
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<td></td>
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</table>
Supply chain risk is seen as the probability of a disruption times the impact of the event according to Christopher (2016). He describes five sources to supply chain risk: Supply, demand, process, control and environmental. When assessing the case companies upstream supply chain from the previously stated risk categories we found several clear gaps. Axis gives the impression to be well aware of their risks and pro-actively works to minimize them. This is believed to be due to Axis past history of disasters in the upstream supply chain. However, 2N gives the impression of not being aware of their risks and lacks a strategy to handle their vulnerabilities.

In the context of supply risk Axis has a clear strategy to spread out product production to different EMS to improve the EMS capabilities. By spreading out the production Axis believes it will be easier to transfer production in between their different EMS in case of disruptions.

2N has divided their production by product groups which means that they are very vulnerable in case of a disruption to a specific EMS. Since no one of the other EMS’ has worked with the other EMS’ products prior. Therefore it would probably lead to a more extended production stop for an entire product line compared to having a second source EMS who could ramp up if another one fails. This is according to Kaplan and Mikes (2012) a preventable risk and is best managed through rule-based management. Therefore we would like 2N to decide a maximal and suitable product allotment of a specific product line to one EMS. We would suggest no more than 35% of a specific product lines total sales shall be produced at one EMS. Which would mean that 2N would have at least one other EMS that could quickly handle a failure if it occurs. However, the downside of this action would be higher costs since volume will decrease, therefore it is also important that the management takes the strategic risk into consideration. If 2N rather would have lower prices and accept the risk of product line failure to create larger profits then they should create a risk mitigation plan and be prepared for the impact it might have on their business. Pettit, Fiksel, and Croxton (2010) suggest a model where vulnerabilities and capabilities are mapped in order to assess if the firm is overly or underly protected against risk. Protection against vulnerability is costly however, but being underly protected is not preferable since it can have vital damage.

In the context of Demand risk demand is rapidly increasing and scalability is seen as a critical aspect to be able to grow. Therefore it is crucial to have partners which are just as scalable as your own company. Axis does therefore partner up with some of the largest EMS’ in the world. By closely monitoring their capacity levels and assuring they do not become to dependent of the supplier nor does the supplier become to dependent on Axis. Axis has earlier phased smaller EMS-partners which did not have the ability to grow in the same pace as Axis and became to dependent on Axis. One can see that 2N today are in a stage where Axis previously was, where their suppliers are becoming increasingly dependent on 2N’s business and are facing minor capacity issues as it is.

We believe the minor capacity issues 2N are facing today will be fatal soon since the estimated overall growth is 23% per annum which means that the 2N will double its size in approximately 3,5 years². One should also take their previous growth in account, where they have already doubled their size in the last 4-5 years, which consist of a growth of 15-20% annually. This means that they will have quadrupled their size in less than 10 years if the forecasts are correct. This requires a new strategy for their supply base to make sure they can scale fast. It is therefore important for 2N to continuously work with suppliers and monitor their capacity levels as well as dependency to each other.

In the context of Environmental risk Natural disasters has striked hard against Axis but they have managed to handle it since they have had a geographical spread to their key suppliers. 2N who has all their EMS’ in the Czech republic should consider the implications of a disaster in the country. Spreading the EMS providers over several geographical locations will minimize the impact of an external risk. These risks are outside of the companies control, but Pettit, Fiksel, and Croxton (2010) still believes one shall try to identify and mitigate the impact of these risk which the company is unable to prevent.

²Using the formula for compounded annual growth rate
It is in risk management and mitigation we noticed the biggest gaps between Axis and 2N. We therefore believe knowledge and experience in the field should be transferred to 2N. Axis themselves comes from a very rapid growth and 2N could take great benefit in seeing how they managed to scale their supply chain in order to continue to grow. Furthermore, Axis has been victim of several natural disasters which has had major impact on their business, which could motivate 2N to start a risk mitigation project and look over both the spread of products in the EMS base as well as the geographical spread of the EMS base. To be able to introduce these processes we also see that 2N’s existing EMS base is rather constrained from a capacity perspective and a prerequisite to initiate these risk management processes would be to introduce an EMS that enables these capabilities to be developed.

Table 8.3: Required actions and achieved synergies to reduce risk with new processes

<table>
<thead>
<tr>
<th>REDUCING RISK WITH NEW PROCESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Action</strong></td>
</tr>
<tr>
<td>Introduce new EMS</td>
</tr>
<tr>
<td>Start develop contingency plans</td>
</tr>
<tr>
<td>Introduce a rule-based system for production spread</td>
</tr>
<tr>
<td>Introduce capacity report monitoring</td>
</tr>
</tbody>
</table>
Synergy package 4: Securing innovation with new processes

Innovation was seen as both one of Axis and 2N most valued competitive priorities. Innovation is also seen as critical in order to grow as it should be able to support the flexibility in the product mix. Therefore it was deemed important to search and find synergies in reference to securing innovation.

The empirical findings showed that 2N and Axis differs in how they make innovations available. At 2N the responsibility lays on the R&D department. 2N’s purchasing department gets involved first after components has been chosen, which gives purchasing next to no freedom. Time is often seen as a great negotiation tool and if the purchaser gets involved late it is often hard to be able to negotiate terms. This since the company needs the products as soon as possible. By contrast Axis sourcing department works closely with R&D and a majority of the developed products are based on the same core. By adding different features and modules to the core Axis can customize products to the respective projects. There is always a project purchaser assigned to a project which can give expertise and advise while also giving purchasers freedom and better negotiation power.

From our stand point 2N’s R&D seem to be isolated in the process all the way from invention to finished product. Furthermore, the process seems to be ad-hoc and different from product to product. However, with the common ground being that the R&D-department does everything. The R&D-department develops, chooses the components that are to be used, choses suppliers and has direct contact with the EMS. In some cases purchasing is involved as advisers if they do not believe the supplier is suitable. Axis on the other hand has a more standardized processes available and more divisions involved to be proactive in handling issues that can occur. The process to industrialize products at Axis follows a well documented project model. One can see that by involving more stakeholders early in the processes, one can increase the value of the product and lower the Cost of Goods Sold, COGS. For instance by having the sourcing department involved early one can plan supply earlier and also negotiate better prices. Furthermore, by having a team who carry responsibility to lead the industrialization one can work closely with the EMS to identify improvements for volume ramp ups. The documented projects may be seen as bureaucratic however, when comparing the key performance indicators such as time to market and production yield Axis is better prepared. 2N is quicker to get the end product ready since they do not have the same documentation and requirements and involvement from other divisions but Axis seems to have similar or better time to market since problems often occur lately for 2N.

We therefore suggest a more proactive way of working for 2N and involvement of purchasing earlier in the processes to secure availability and build relationships with suppliers prior to determined products. Furthermore, mirroring the organization and hiring somebody who is responsible for the industrial lead. This is especially important since we see that 2N, given that they hit their growth targets, in the future will be working with larger EMS’ who will have high requirements on everything from product design and documentations for assembly and other activities related to the production. We believe 2N can take great benefit of having Axis who has done the same trip and also had problems with production lines not being ready for full scale operations when they were their size. Besides, it gives 2N a great opportunity to learn from Axis industrial lead team and get to know the EMS through observing their strategy. It is however important to not force on documentation for 2N to become bureaucratic, since we believe it can hurt an SME-company’s innovation power.

Table 8.4: Required actions and achieved synergies to secure innovation

<table>
<thead>
<tr>
<th>SECURING INNOVATION WITH NEW PROCESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Action</strong></td>
</tr>
<tr>
<td>Introduce an Industrial lead position at 2N</td>
</tr>
<tr>
<td>Initiate knowledge sharing program with Axis</td>
</tr>
</tbody>
</table>
8.2.2 Synergy package 5: Utilize the overlaps through product flow integration

From the empirical findings we found that the supply chain structure of the companies were very similar. We saw great overlap possibilities since both companies has outsourced the majority of their supply chain. However, we also noticed that both supply chains contained a high number of actors and nodes. Which makes the supply chain complex with ownership and responsibilities spread over different actors, which requires many handovers. The responsibilities of the different actors was similar in the upstream supply chains of 2N and Axis. However, the difference can be seen in the processes of the firms. Combined with having different suppliers with the same responsibilities one can see that a parallel supply chain has been created for both 2N and Axis to handle each others goods in the downstream supply chain. Parallel supply chains tend to be overly complex with a large number of nodes that the product needs to pass, which in many cases is unnecessary, since it goes through two different supply chains. For instance in the downstream integration made in the US, one can see that 2N products are now split into two separate flows with different rules. This because 2N is now seen as a supplier to Axis distribution channels which has put 2N longer from its market and end-customer. Regularly 2N’s products would go directly to the end-customer. This has led to a loss of demand visibility and loss of control for 2N with the rest of the supply chain untouched. Both Axis and 2N employees has expressed confusion of who is responsible for which part of the process. The US-integration has resulted in a confusing mix of command and control of the upstream supply chain.

To better support the integration made in the US, Axis and 2N should standardize the product flow in the upstream supply chain. Since 2N is seen as an supplier rather than a partner in the US-integration we have an odd situation where a horizontal merger has the possibility to either vertically integrate or strategically outsource. Vertical supply chain integration is connected to filling the information gap by partnering up to increase efficiency in between the two firms. By combining the operations of the two firms it gives one more control of the entire upstream supply chain. Usually vertical mergers is done to reduce cost or supply risk of a component needed in the companies end-product. But in this case the vertical integration would be pursuing increased strategic flexibility. Vertical integration includes coordination and scheduling to bridge the differences in processes and information gaps. Successful supply chain integration depends on the supply chain partners ability to share real-time information such as sales forecast, order history, designs and specifications. This would require bridging the businesses IT-systems or installing another system. However, one shall be aware that the greater the extent of vertical integration the lower the degrees of freedom and the greater the bureaucratic cost (Rothaermel, Hitt, and Jobe, 2006). Therefore a narrow horizontal integration can in many cases be far more efficient than an extensive vertical integration. While horizontal integrations instead focus on collaborations and sharing knowledge and processes. Lambert and Cooper (2000) has identified three incremental steps in horizontal collaboration development. Operational horizontal integration is similar to vertical integration and requires sharing information but also includes sharing carriers to reduce cost and responsiveness. With the result being a cross functional purchasing group and consolidated distribution and flows. The next step in Lamberts collaboration framework is to share logistic facilities and to introduce supporting processes to reduce supply risk and facilitate better resource management which is achieved through multi modal collaboration.

From the empirical findings and the previous work done in the US we can conclude that a more standardized and clear product flow is needed and 2N’s position in the US product flow needs to be closer to the market.

We suggest that 2N starts to gradually standardize the product flow. This could be done by phasing in outsourcing of the production to the EMS partners of Axis. By doing that the products will automatically be in the same product flow as Axis, which will lead to more efficient route planning. It will increase the responsiveness since the EMS is already connected with Axis CLC and its distributors. Especially in connection to the information flow which would be substantially shorter. By integrating the Axis EMS’ to 2N’s flow it will also to a great extent be able to skip the current unnecessary node of 2N’s own factory in Czech republic because the same operations can be done in all Axis CLC’s. With the flow standardized it should also be easier to dived responsibility throughout the flow.
In terms of duration this should be a process that is done over a longer period of time. We suggested that in the short run only products who is sold in the US should be a part of the flow integration but in the long run it would benefit both Axis and 2N to integrate the entire product portfolio to Axis supply chain network. Today 2N has had the privilege of having their own factory close to the R&D-department which we believe have given 2N innovation power. Axis has a similar set-up with one of their CLCs which is located in Lund close to the R&D-department, where the employees can test and see the initial product and can make minor changes before they ramp up. However, when a product at this CLC has reached big scale volumes it will immediately be transferred to other CLC’s. We believe 2N should use their own factory in the same way and transfer the storage and high volume production to other actors to make more capacity available for new product introductions and avoid eventual scalability issues that could arise in the future.

Putting the integration of product flow in perspective it is also important to discuss the level of integration needed. From Schweiger and Very (2003) different levels of integration is proposed. We would recommend either consolidation or standardization for this synergy. Some would argue that coordination would be suitable as well, however it has been shown to be a difficulty where both Axis and 2N employees has had problems to handle the US-integration separately with their own company specific processes. Therefore we see a need for 2N and Axis to share the same process which means that consolidation or standardization is to prefer. The difference would instead be the responsibility. By standardizing the individual processes one could separate the operational responsibility more clearly and they could help each other out if something does not go according to protocol. The other perspective is instead to consolidate which means that separate functions are merged into one activity, this would require more effort and is something one could see long-term. This would for instance mean that Axis would be able to get a supply chain office in Prague who operates in the same way as the team in Lund does. Therefore we suggest a standardization short term and consolidation long term.

Table 8.5: Required actions and achieved synergies to standardize product flow

<table>
<thead>
<tr>
<th>STANDARDIZE THE PRODUCT FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Action</strong></td>
</tr>
<tr>
<td>Gradually re-route the product flow</td>
</tr>
<tr>
<td>Introduce information sharing between new EMS’ and 2N</td>
</tr>
</tbody>
</table>
8.3 Evaluate synergies phase: Evaluation of the 5 synergy packages

In this section the evaluation of each synergy will be presented in two stages. First an evaluation of the benefit of the synergy package will be presented coupled with an compatibility analysis to ensure that the synergy achieves sought value of the merger. After this an assessment of the ease of implementation will be carried out for each synergy. This to answer the question:

- 4. Which and how should synergies be pursued?

The results are then concluded in a recommendation to the case company to fully answer the question.

During the analysis of the two firms supply chains and the respective actors in each supply chain a number of synergies were detected. All these synergies has connected actions which needs to be taken into consideration going forward in order to analyze the possible benefits and the ease of implementation of the synergy. As described by Häkkinen (2014) there is a distinct difference between the achieved value or as described in chapter 4 the potentially increased volume and product mix flexibility and the connected action which is required to be performed in order to achieve the synergy. By analyzing the different proposals of actions that is needed in order to realize the present synergies in the merger there is a possibility to group synergies in terms of the type of action that is needed. We see that there are essentially three different types of actions within the proposals. These are to either add additional resources in the supply base, to introduce new management processes or to start a combinational or transformational structural change. A visualization of the grouping of actions is presented in fig. 8.1

![Figure 8.1: A schematic view of the grouping of required activities to ensure the presented synergies. The numbering correlates to the number of the synergy package which requires the action](image)

To be able to select synergies to pursue there is a need to assign a priority to the different types of actions which are required to achieve each of the synergies. By analyzing the ease of implementation of the certain action the ease of implementation for the synergy is also gained. The benefit of the synergy is of course still dependent on the value that the synergy creates for the combined entity of the two companies. As described in the break down of the purpose in chapter 4 synergies where ability to cope with increases in volume and product mix are sought. Therefore the following section will be broken down into analysis of each synergy’s value to the firms compared to the pre-merger state as well as each connecting actions ease of implementation for the firms.

The first action to review is the sharing of Axis EMS’ base to 2N. This action is described to give the synergy of increased volume flexibility through increased buyer power, capacity and contractual flexibility.

The second group of actions to review is the introduction of new management processes for risk and New Product Introductions, NPIs. These two actions are in contrast to the previous mentioned one of a nature of long-term indirect value which creates capabilities to sustain growth.
The third type of actions to review is the implementation of structural changes in the supply base. This includes both implementation of an ATO strategy which should give the connected synergy of increased product mix flexibility. But also the action of standardizing the product flow which should gain a higher responsiveness in the supply chain.

8.3.1 The benefits of introducing a new EMS

The buyer power of the EMS base has as previously been presented varied across the firms. Here a major gap between Axis and 2N was found. In order to close this gap it was therefore concluded that 2N had the possibility to leverage Axis brand name through new contracts and possibilities across the upstream supply chain opened up. From the perspective of volume growth this would contractually gain 2N an up to 30% increase in volume flexibility given that the same contracts were used. By adding one of Axis larger EMS’ to the EMS base of 2N, the larger EMS will bring added purchasing power since it has a stronger negotiation position than both Axis and 2N because of its size. This would on top of the contractual increase also grantee 2N the capacity needed for an increase in volume flexibility as well as the supplier flexibility that is sustained by the EMS’ as previously described. 2N has of now all EMS partners in close proximity to headquarters. Mason et al. (2002) also describes that the location can indeed increase the long-term collaboration between the contract manufacturer and buyer and serves a dimension needed to achieve supply chain flexibility. As 2N has headquarters in central Europe and Axis has 2 EMS’ located in a bordering country to 2N we don’t see distance as a barrier that would reduce the achieved value of this synergy.

In contrast to the present situation we see that the ability to handle volume shifts should be improved on a consistent level for 2N. This is assumed on the basis that the contractually agreements Axis has in regards to flexibility is transferred to 2N as they forge these contracts. As they are described as an extension of the Axis brand we don’t see any barriers that would hinder this long-term continuity in the relationship between 2N and Axis EMS’. As described before this also gives 2N a far larger ability to gain volume flexibility. As for Axis the situation would be unchanged. However, for the corporate group as whole we concluded that the synergy indeed provide one of the two sought types of synergies, namely an increased ability to consistently cope with volume increases in the supply chain.

8.3.2 The ease of implementing one of Axis EMS providers in 2Ns EMS base

As for both risk management and increasing volume flexibility the presented synergies can both partly be achieved on the basis that one of Axis EMS’ are introduced in the supply base of 2N. In regards to ease of implementation both companies has previously been phasing in and phasing out EMS providers. This means that the processes for this action is already in place for both organizations. Axis has of now a fairly standardized new product introduction process which is similar to the process of introducing a new EMS as well. For that reason we see that this action should be fairly similar to the normal action of introducing a new EMS in the supply base. From a benchmarking perspective this should therefore resemble the normal workload connected to an introduction of an EMS. As all processes already are in place for the action both resources, activities and actors are estimated to be fairly low for this action. The action will on 2N’s part instead need to be focused on the management of risk and development of this new relationship. There is as with all phase ins and phase outs of an EMS a risk of failure connected to it. As the EMS’ are central in the upstream supply chain and critical for demand certain attention is needed and a thorough contingency plan needs to be in place. There is therefore a certain implementation risk connected to the action which needs to be manged which increases the workload slightly for 2N.
8.3.3 The benefits of introducing new processes for risk management and NPIs in the supplier base

The transfer of know-how in risk management and NPI is something where Axis could truly contribute to the long-term growth of 2N. The risk management strategies within the supplier base of the two firms varies significantly. They also have an indirect effect on the two firms ability to handle growth both in regards to volume flexibility and product mix flexibility. By introducing a clear rule-based system to place production at the EMS it creates capabilities to withstand supply risk better. By partnering up with a larger EMS outside of the Czech republic 2N also provides long-term flexibility when the environmental risk is diversified. This would lower the effect of a production stop which in turn would affect the ability of the supply chain to provide both volume and product mix flexibility. By introducing new processes to introduce new products increases the ability to ramp-up new products in an efficient and secure manner. This should make swift demand changes in the product mix easier to handle especially when volumes go up. However, as described during the analysis to find synergies there is a trade-off between the cost of protection and standardization for exposure and freedom. However, as both companies does not compete on the market with cost this should not pose issues. Hence, to create the capabilities necessary to withstand a production stoppages better should be prioritized. Volume flexibility, the capabilities to withstand large volume fluctuations, also rise as the capacity within the supply chain increases when a larger EMS is introduced in the supply base of 2N.

In regards to the pre-merger state this should substantially indirectly give 2N an increased ability to cope with volume increases as well as abilities to raise flexibility in the product mix. For that reason we conclude that these actions gives the synergies sought during the integration of the supply chains of the companies.

8.3.4 The ease of implementing new processes

To implement new processes is something that we see as critical for 2N in terms of the risk management processes. As earlier described these processes has the underlying action of adding new resources in the supply chain. This because the analysis previously done points to a supply base with high constraints making the risk management processes harder to implement as the supply base does not have the scalability to do so. However, in terms of introducing new processes we see little effort required from Axis. This because the actions is dependent on knowledge sharing more than anything else for Axis. This will require a small amount of actors, resources and activities, as this is merely an information exchange and therefore should not carry a high workload for Axis. For 2N this means that new processes needs to be introduced. However, as these processes already exist at Axis the workload in developing these processes are lower. There are however, always a requirement on provided actors, activities and resources involved. For that reason this action carries a slightly higher workload for 2N.

8.3.5 The benefit of increasing product mix flexibility through an ATO strategy

The next synergy found is the achievement of product mix flexibility through increased usage of postponement at the EMS. This standardizing procedure is seen to be able to increase the flexibility for both companies. By postponing the level of value added closer to the customer both volume and product mix flexibility comes naturally. As described above a reduced product complexity enables the aggregation of demands which would reduce the volatility in demand. This in turn gives both firms a greater ability to forecast demand and demand spikes would be lowered. In terms of product mix flexibility postponing assembly of the product gives time to be able to in a larger extent adapt production to the final customer demand. This in turn raises the product mix flexibility for both companies.
In regards to the pre-merger state of both companies 2N has of now a more postponed production strategy according to the empirical findings. Axis on the other hand leans more in the opposite direction and is as of now more prone to order products from the EMS at a more finished level. By introducing this strategy both companies gains a standardized way of holding both inventory and placing orders. At the same time both the product flexibility and volume flexibility of both firms will consistently be held at a higher level. This leads to the conclusion that this synergy delivers a consistent value in regards to the synergies of increased ability to cope with increases in volume as well as product mix.

8.3.6 The ease of implementing an ATO strategy at the EMS

The spectrum of effect this action has to both companies also comes at a price. By introducing this strategy requires a number of actions that both companies needs to take. First to consider is the reallocation of stocks in the supply chain. This would require the sourcing managers at both firms responsible for the direct contact with the EMS to re-negotiate the terms of inventory policies. Instead of carrying a stock of finished goods the EMS would instead stock semi-finished products. This of course requires both a high number of actors, resources and activities in order to implement it. The basic material authorization that the EMS gets from Axis would still be in place which would ease this negotiation. However, this would in regards to implementation effort require a large amount of actors, activities and resources. For that reason we view the ease of implementation of this action as high in terms of effort needed by both companies, especially as the degree of cooperation for this action is high as well.

8.3.7 The benefit of the product flow integration

The next synergy is concerned with the integration of the product flows for the companies. The possibility to introduce new EMS’ in the supply base of 2N opens up the possibilities to further standardize the product flows of the companies. The benefit of this synergy is beneficial for both parties. The standardization of the product flow would create processes that are similar between the companies. This would in turn create less confusion, a shorter information flow and as a result a better ability for both 2N and Axis to react faster to demand shifts further down the supply chain. This stems from the reduction of nodes in the supply chain where a shorter more efficient flow would increase information exchange speed which increases the time available to react. Short-term this would lead to a higher visibility in the US flows as the short-term synergy is focused on this region. However, in the long-term the degree of integration is larger and the benefits of the standardization would increase. Releasing control of the final assembly to an outsourced partner is something Axis is used to. 2N on the other hand funnels all products in their supply chain through the hub in Prague. To have final assembly that close to headquarters is beneficial in the sense that for example R&D could in case of a New Product Introduction be able to control quality better. However, as products mature in the product portfolio this need to have total control decreases. By outsourcing final assembly and logistics in this part of the product flow, when a product is ramped up and ready for full scale production, would allow 2N to even more focus its resources on development. Which also is more of a core competence and at the same time avoid capacity issues that could arise at the factory in Prague if volumes grow rapidly.

Compared to the pre-merger state the product flow would be more standardized and handle more easily. From that perspective both firms stand to gain a consistent benefit of visibility and responsiveness which are prerequisites for volume flexibility which enables growth. Complexity in the supply chain as whole would also be reduced. However, depending on the degree of integration different results could be accomplished. As the downstream product flow of the US is the only flow integrated so far it could be argued that the benefit in regards to growth in the medium and short term is not considerably large. However, this marginal increase in the short-term could stem to large gains in the long-term. For that reason we conclude that this action to a great degree captures the synergies that is sought in the integration.
8.3.8 The ease of standardizing the product flow

In order to standardize the flow after the introduction of a new EMS there is a need to start phasing in products from one EMS to another. This rerouting requires that necessary machines and other equipment that is needed is present at the site where the outsourcing is aimed at. As described the EMS and CLC should already have the capabilities to carry this final assembly and should therefore not require a large effort in this regard. Existing transportation routes between the EMS and all Axis CLCs also already exist which would mean that these transportation alternatives could be leveraged as well. Rerouting the physical flow should therefore not require a substantial amount of effort from the companies. In the long-term there is however also a need to standardize individual processes within the flow to reach a consolidation level of integration. The total effort of the standardization of ordering flows and information flows is seen as high. However, as these activities are spread out over a longer time-span, the needed resources and actors are smaller and lowers the overall workload connected to the implementation of the action. In total we estimate that the action would carry a medium workload where both companies needs to supply the right competencies for this long term development of the integration to create the right value for the firms.
8.4 Recommendations

As described previously a number of synergies and connected actions has been discovered during the analysis of the empirical material. There is great potential for the two companies to unlock value when merging which has not previously been uncovered. In regards to growth we suggest that all synergies should be pursued in order to achieve the highest possible ability for the case companies to grow. However, the synergies demands resources from both companies in order to be realized. It is therefore suggested that the implementation of certain actions should be carried out in a sequential manner which allows for control and measurement that ensure full achievement of each synergy and also the success of each implementation.

In order to prioritize the actions needed to be carried out both the effort and risk of implementation were contemplated as well as the underlying requirements of each action. This to find a suggested approach in realizing these synergies.

The easiest action to implement relative the other actions presented is to introduce a new EMS for 2N from the supply base of Axis and use Axis contractual agreements. This was the action where most of the underlying activities to carry out the implementation as well as previous experience in similar projects were highest. In regards to benefit this action also unlocks two valuable synergy packages: increasing volume flexibility and reducing risk. This in turn makes sure that the supply chain of 2N has the ability to cope with volume increases which enables growth. For that reason it is suggested that this action is carried out before any other action.

With the EMS in place additional work on the processes within the companies can begin. Without the additional capacity and flexibility in place it is hard for 2N to mitigate risk as opportunities in the present supply base are limited. By sharing know-how and experience Axis has the possibility to both increase the level of risk management present at 2N as well as to improve the industrialization process. This action is as described above mostly connected to knowledge sharing which is deemed as relatively effortless. The constraint on present resources in the supply base however makes us suggest that this should be the second action that is taken in the integration of the two companies’ upstream supply chain.

The product flow and structure of the supply chains should be reviewed in a late stage. The same applies to the possibilities to introduce a new ATO strategy. These actions, as previously stated, carries major changes and both comes with a high requirement of effort and drive as well as a certain degree of risk. For that reason we would like the above actions to first be in place in order to assure that present resources in terms of capacity, flexibility, capability and ability to manage risk is already present in the supply chain to lower the implementation risk. It is suggested that the product flows are dealt with first in order to have an even more standardized flow when reviewing postponement opportunities.

The above reasoning is presented in fig. 8.2 below and constitutes the recommended approach that the companies should take in order to realize the value of the integration of the upstream supply chains of Axis and 2N.

![Figure 8.2: A schematic view of the grouping of required activities to ensure the presented synergies](image-url)
Chapter 9

Conclusions

This study’s main purpose was to find and evaluate present synergies in the upstream supply chain of Axis and 2N. This with a particular focus to enable growth for the corporate group as a whole. In order to do so a theoretical framework to help gather information and analyze both gaps and overlaps to find synergies was developed.

To ensure growth in the corporate group, synergies concerned with increased ability to cope with growth in volume as well as changes of demand within the product mix was concluded as the type of synergies that was sought when merging the two companies.

When analyzing the two companies it was concluded that the companies should indeed look to merge as there was a strategic fit between the companies. By further analyzing the upstream supply chain of both companies several synergies were found in accordance with the purpose of the study. These were found depending on the gaps and overlaps between the supply chains of the two firms. It was concluded that there were major overlaps in the supply chain structure of the companies which hindered efficiency in the product flow. Furthermore, it was concluded that there were major gaps in 2N’s performance relative Axis in regards to available capacity and capabilities within the supply base. In regards to flexibility, there were opportunities for both companies to get inspired by each other in several regards. Lastly, processes to handle both risk and introduction of new products in the supply chain could be improved at 2N. As a result of this 5 clear synergy packages has been found and evaluated during the study.

To leverage the existent gap in available capacity and volume flexibility between Axis and 2N it is suggested that an introduction of an Axis EMS in the supply base of 2N should increase the ability to handle increased volumes in the supply chain.

To decrease the existent gap in ability to manage risk it is proposed that 2N through knowledge sharing by Axis reworks the risk management processes at the company. This to gain tools to guarantee sustainable long-term growth opportunities.

The ad-hoc method of introducing new products in the supply base was concluded to hinder 2N’s ability to grow. By hiring a new person and learning from Axis these processes stands to be improved for 2N.

To standardize and straighten out the product flows of the companies were concluded to raise the ability to grow. For that reason it was suggested that the products are re-routed to achieve a faster flow which would increases the responsiveness of the supply chain.

Lastly, it was concluded that there were possibilities to raise the product mix flexibility of both companies by introducing an ATO strategy where postponement and new inventory policies achieves long-term abilities to grow.
The synergies were evaluated against the potential benefit and ease of implementation. By doing this it was concluded that the firms should pursue an introduction of a new EMS first, as this was the most logical action to begin with as well as the action that relative all other actions carried least effort. After this new processes for risk and innovation should be implemented followed by an integration of the product flows. Lastly, a new ATO strategy should be introduced as this carries the most required effort and implementation risks for the companies.

With this suggested approach it is believed that the companies will be able to achieve a long-term ability to grow, in a market that is constantly changing and increasingly volatile. By carefully taking action to improve, the corporate group of Axis will have the best possible ability to achieve their ambitious growth plans. This as well as achieve an excellent outcome during one of the most important aspects of a post-merger integration. The integration of the supply chain.
Chapter 10

Discussion

10.1 Outline

In this chapter a discussion of the thesis will be presented. Including lessons learned and things which could have been done better.

10.2 Suggestions for future work for Axis

The acquisition of 2N was made in 2016 and we have by presenting this thesis given Axis several recommendations on how a supply chain integration of 2N could be conducted. Some of the recommendations are already on-going or are planned to be executed. For instance, the introduction of an EMS from Axis supply base to 2N is currently on-going since the idea was brought up before us and is something we decided to build many of our recommendations around. By having recommendations that are presented with potential benefits as well as degrees of implementation difficulty we hope to have simplified upper managements decision making. The logical and theoretical approach used in this thesis should also prove that several of the identified synergy packages should be pursued in order to maximize growth. The initiated implementation of an EMS is in our view enough to start a series of actions in order to integrate 2N successfully. Axis should therefore take advantage of the momentum and assign a project leader who can use the recommended course of action, break down the synergy packages into smaller activities and start delegating responsibilities to 2N and Axis personnel.

10.3 Suggestions for further research and generalizability

During the study several gaps in the literature were found where further research definitely could bring additional value. The largest gap in the literature was found during our research of post-merger integration of supply chains. There is indeed a large body of literature that highlights its importance and possible issues that could arise. However, we missed generalized implementation processes or guidelines within the literature, more connected to the operationalization of a post-merger integration of supply chains. In this report we have tried to create a generalizable approach which indeed could be tested and cross-examined against other post-merger integrations of the supply chain. The study is not concerned with the planning or execution of the integration. To set the strategic focus is, however, important and to further develop the model proposed in this thesis is definitely something where further researchers could continue and add content to the large gaps in the literature as of now.
In relation to generalization the work-model proposed in this thesis is mainly used to analyze the upstream supply chain of a merger in a special sector and industry of the market, namely electronics manufacturing. The degree of outsourcing and other structural attributes common in this sector could indeed be less normal in other types of industry sectors. However, on a holistic level the work-model is formed on such a general level that we believe it could be changed to fit any type of sector or industry. We argue that every merging company should review the present strategies of both firms and their correlation to supply chain strategies. Furthermore, the resources, or in this regard the supply chain structure, also seems logical for every firm to review. Lastly, the approach in finding gaps and overlaps is applicable to every type of sector. There is, however, also here room for further research. A cross-industry case study where the work-model is either tried or cross-referenced against while looking for common actions to pursue could be carried out. It could be further broken down into firstly finding synergies secondly focusing on the operationalization of an integration program for the supply chain. This to find important similarities and differences between industries as well as common focal points which every post-merger integration of the supply chain go through.

The factors and objectives of the merger are here also of interest to discuss. A different objective of the merger should generate a completely different result and in further research a broader spectrum of strategic objectives could be handled. This could range from both different sectors as well as different objectives within each sector. In the same way, the door is also open to look at proper ways to handle divestitures. This has not been touched in the research as the main focus has always been on integration. However, the basic mechanics of a divestiture and a merger should pose for some interesting similarities. It also seems logical that if the supply chain carries importance during a merger it should also carry importance during a divestiture. Here common factors could eventually form complete material in order to close the present gaps in the literature regarding post-merger integration and connected subjects.
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Online Resources


Misc Resources

Appendix A

Interview material

A.1 Executive interview questions and notes - Axis

Name and title:
Per Ädelroth, Operations manager Axis
Christian Loftorp, Supply chain director Axis
Malin Hagg, Supply chain integration project manager Axis
Robert Lindroth, Operations development manager Axis

Familiarity with the integration of 2N:
All of the above are familiar with the integration and is part of the management team responsible to set the direction of the integration.

1. How compatible are the firms?
   a. Which are the key clients?
      i. Geography
      ii. Size
      iii. Industry

Axis largest market is the Americas with approximately 50% of sales and are focused on developed countries. Cameras is the main seller and stands for a majority of total business. Door stations is less than 10% of total sales. Focused on security, education, transportation and retail.

b. What are the client needs?
   i. What [Quality, Price]
   ii. When [Lead-times]
   iii. Where [Channels]
   iv. How [Supply chain, Push/Pull]

Axis targets high-end market and are one of the most expensive brands in the market. Does not compete by price, solutions are sold with significant service. The sales are mainly project based and primarily focused on large enterprise sales. The products are therefore specified in the project and Axis offers unique solutions to a small extent of the customers. However it is common that the products are bought on the-shelf as a majority of the sales goes through distributors. However the customer needs are different and we have segmented the supply chain after them.

The electronic market is however saturated in we are facing component shortages just as every other high technological company which is increasing our lead-times. We believe it is a trend but it is challenging our customers patience.
c. How does your supply chain fulfill these needs? Network, activities and key actors

   i. As-is

   ii. To-be [Future wishes]

We have a 2nd tier distribution model and do not dropship directly to end-customer. We want the distributors to hold inventory. Currently with long lead times but the aim is to have 10 days order lead time. Today we are having difficulties to ensure that. The delivery reliability is only 80% because of component shortages.

d. Who are your competitors?

   i. Differences [Competitive advantages]

   ii. Similarities

Axis is the leader of camera surveillance in the Americas. The biggest competitor is focused on cost however Axis focuses on the premium segment. The products are often similar but Axis focuses on quality and innovation. Low return rate, easy to work with and good brand. Axis outsources the majority of their supply chain while competitors owns their own supply chain. The current situation with component shortages has not resulted in loss of market shares for either Axis or their biggest competitors, seems like the smaller players are the ones which has lost the most. However the customers are not satisfied.

e. What are your competitive priorities? Rank the following (where 5 is the most important)

   i. Cost 1

   ii. Quality 5

   iii. Flexibility 3

   iv. Time 2

   v. Innovation 4

f. What is your growth plans? Please specify with numbers if possible.

   i. Products

   ii. Volumes

   iii. Channels

Axis expects 15% annual growth,

g. What is your biggest problems in regard to growth in the supply chain?

   i. Preparedness for future market changes

The component shortages on the electronic market, but there is nothing we can do about it. Big corporations as apple has the same problem with their electronic components. However we need to be even more scalable, since we have been growing faster than some of our suppliers, therefore it is important for us to keep track and phase out suppliers who will not be able to grow.
h. How do you perceive your counterpart (Axis or 2n)? Similar or different.
   i. Products
   ii. Customers
   iii. Supply chain
2N has a supply chain suitable for a small Czech company and are very good at what they do in a small scale and reminds us of how Axis used to do business before. However I do not know how they will handle growth and scalability with their current small local suppliers and EMS. Furthermore they have a different approach to making innovation available compared to us.

i. What do you expect from the integration?
   i. Positive
   ii. Negative
To accelerate growth together and not find cost synergies. The issue that might arise is the resource allocation question. We have to do what is best for Axis as a corporate group and keep what is good and improve what can be improved. For instance, a one percent growth for Axis is preferable compared to one percent at 2N since one percent of the total value is higher for Axis.

j. How can you benefit from the integration?

k. How can you contribute to the growth of both parties?
   i. Time
   ii. Resources
We are thinking of allocating one person who shall drive the process integration and work closer with them. However we need to make sure our employees do not get distracted from the integration but can give a couple of hours to help this new resource.
A.2 Executive interview questions and notes - 2N

Name and title:
Oldrich Stejkal, CEO 2N
Josef Besta, Sales director 2n

Familiarity with the integration of 2N:
All of the above are familiar with the integration and is part of the management team responsible to set the direction of the integration.

1. How compatible are the firms?
   a. Which are the key clients?
      i. Geography
      ii. Size
      iii. Industry

   2N’s biggest market is the EU with 72% of sales, North America stands for 23% and the Pacific stands for 5%. Door stations is their main seller and stands for 70% of total business. Focused on high-end residential market, education, transportation and elevators.

   b. What are the client needs?
      i. What [Quality, Price]
      ii. When [Lead-times]
      iii. Where [Channels]
      iv. How [Supply chain, Push/Pull]

   2N targets high-end and higher-end market and are one of the most expensive brands in the market. High focus on luxury design and does not compete by price, solutions are sold with significant service. The sales are mainly project based and primarily focused on new buildings and new installations. The products are therefore specified in the project and 2N offers unique solutions to a large extent of the customers. Therefore it is not common that the products are bought off-shelf and the customers are usually willing to wait for 2N products since they are superior and bought for projects. The electronic market is however saturated in we are facing component shortages just as every other high technological company which is increasing our lead-times to up to 3 months. We believe it is a trend but it is challenging our customers patience.
c. How does your supply chain fulfill these needs? Network, activities and key actors
   i. As-is
   ii. To-be [Future wishes]

We have a 2nd tier distribution model and dropship directly to end-customer. Currently with long lead times and not enough capacity to produce to have the right SKU-level on stock. Wishes to have 4-5 days lead time

d. Who are your competitors?
   i. Differences [Competitive advantages]
   ii. Similarities

2N is the leader in the IP-market, since they are leader of innovation as well customers are willing to wait for their products. We have been overly flexible and offered everything to everyone. Today we focus on bigger clients.

e. What are your competitive priorities? Rank the following (where 5 is the most important)
   i. Cost 1
   ii. Quality 5
   iii. Flexibility 3
   iv. Time 2
   v. Innovation 4

f. What is your growth plans? Please specify with numbers if possible.
   i. Products
   ii. Volumes
   iii. Channels

Axis expects 15% annual growth, 2N wishes to grow with 21% annually and it shall be driven by a 35% growth in door stations and by new innovations. Furthermore the US-integration with Axis is expected to increase 2N’s sales with 50%

g. What is your biggest problems in regard to growth in the supply chain?
   i. Preparedness for future market changes

We have made a lot of changes in the downstream supply chain with the new distribution model which needs to be improved. Secondly be able to produce enough goods, we are expecting the production to grow 30-40% annually to be able to drive the power of the new distribution model with Axis.

h. How do you perceive your counterpart (Axis or 2n)? Similar or different.
   i. Products
ii. Customers

iii. Supply chain

Axis has very similar door stations, but are focused on different markets with them. 2N makes a unit that can call many units, while Axis makes a door stations which many can call. Therefore we use different components and distributors but the end product is similar. The supply chain is very similar however Axis have the possibility to buy directly from component suppliers, in many cases we are not seen as important enough and instead must buy from the market/distributors. Which makes it difficult when it is shortages.

i. What do you expect from the integration?
   
   i. Positive
   
   ii. Negative

Increased sales for 2N and improved negotiation power towards suppliers.

j. How can you benefit from the integration?

k. How can you contribute to the growth of both parties?

   i. Time
   
   ii. Resources

We will be a significant part of Axis new business division and hope to increase and speed up development. Since many process has been built up in the other divisions it is important for us to focus on our business rather than build up new processes.
A.3 Operational interview questions and notes - Axis

Name and title:
Christian Andersson, Commodity manager
Nerzesa Dzinovic, Sourcing manager
Petra Billquist, Commodity manager EMS
Tommy Örjas, Commodity manager Electronics
Anders Drott, Industrial Lead
Henrik Ekström, Purchaser
Håkan Molin, Capacity Planner

Familiarity with the integration of 2N:
All of the above are familiar with the integration but their involvement till this point has been of a low degree.

Please explain the upstream supply chain network structure and process

- **Tiers**
  - Raw material
  - SKU etc

- **Ownership**
  - OEM
  - Distributors
  - EMS

- **Command and control**
  - Visibility
    - Routines

The network structure was drawn by the interviewee.

Axis has outsourced the supply chain and has the EMS doing the operational sourcing. 4 different EMS-providers and all of them has material authorization of 3 months, forecasts over 12 months. Order lead time of 10 working days. Lacks clear visibility over the EMS inventory.

CLC does final assembly. CLC keeps a 1,5 month demand in stock.

**Future wishes in the upstream supply chain?**

We wish to be more flexible so we can handle fluctuations.
Increase control over the supply chain. Increase scalability, does not want the supply chain to be the constraint to not grow, but rather a reason for the customers to select Axis.
How do you work with: (Any rules or directions in agreements?)

- Capability
- Capacity
- Flexibility
- Risk

Axis work with a 10-35-35 rule which is there to ensure minimize risk and dependency, capacity and capabilities. Which means that they want to have more than 10% of the suppliers business to considered significant but less than 35% to make sure the suppliers is not dependent on Axis. Furthermore the last 35 means that Axis does not want to spend more than 35% of Axis yearly spend on a single supplier. This to ensure that the Axis is not dependent on the supplier.

The capacity planner is responsible for the following of the rule. In addition to the rule, the capacity planner also works with allocation of products to the EMS. Where Axis want to divide products within a product group to several EMS-providers to make sure they have the capabilities over time and minimize the effect if an EMS fails.

Axis works with flexibility through their agreements, where we force the suppliers to have 30% overcapacity. Do not order 30% more but makes the supplier have a plan to gain the overcapacity and monitor. Furthermore the suppliers have 3 months material authorization.

What is your biggest problem in regards to growth in the supplier base?

The biggest problem right now is the component shortages on the electronic market. For these components we have noticed that our largest EMS’ have an advantage against the smaller ones. Since they are able to purchase the components directly from the component suppliers.

What kind of components do you source? Are they more critical than other commodities?

Axis is responsible to choose supplier but the operational sourcing is done by the EMS. We monitor the price level and make sure that the supplier is compliant to the ethic and environmental guidelines we have, however the EMS is responsible to negotiate the practicalities. For the most critical components that are Axis specific and not available freely on the market, we have a separate flow which we have inventory of in our CLC.

How are you prioritized when component shortages occur?

- Would that change if you were a smaller player

We are usually highly prioritized, since companies want to sell to us. We usually buy large volumes and a lot of suppliers therefore have forbearance as regards to our poor forecasts etc. At the same time we nourish our relationships with our suppliers and try to help them in all our means. For instance with locating bottlenecks. The EMS-providers which we have even more market power than we do. Which means that we usually get prioritized through them as well. The EMS-providers that always chose the lowest price and not build loyalty has had some difficulties to source components in the current situation.
a. How do you perceive your counterpart (Axis or 2n)? Similar or different.
   i. Products
   ii. Customers
   iii. Supply chain

The products are fairly similar the technological complexity is much higher in Axis products however 2N seems like they have a higher complexity in their design material. Regarding their supply chain we believe it is well suited for a company their size. However they do not have the same processes as we especially in regards to new product introductions where they do not have somebody designated for industrialization. Furthermore they have less volume, longer lead times and seemingly higher prices at suppliers.

b. What do you expect from the integration?
   i. Positive
   ii. Negative

That we can help them because we have done the same journey and expanded during the last 10 years. We did a lot of mistakes which they can learn from. They can use us as a benchmark and adviser in questions. No clear negative aspects except for the resource allocation question. Of course by using us they can get better prices and access to more capable global suppliers.

c. How can you benefit from the integration?

We can learn more about 2N’s ERP-system it looks well more developed than ours. They have control and visibility over their supply chain in a higher extent than we do.

d. How can you contribute to the growth of both parties?
   i. Time
   ii. Resources

Do not believe we should shove process on them, but rather be there for them when they need it.
A.4 Operational interview questions and notes - 2N

Name and title:
Jiri Krejci, Head of Purchasing Department
Marek Dubnicky, Head of Strategic Procurement

Familiarity with the integration of 2N:
All of the above are familiar with the integration but their involvement till this point has been of a low degree.

Please explain the upstream supply chain network structure and process

- Tiers ○ Raw material ○ SKU etc
- Ownership ○ OEM
  ○ Distributors
  ○ EMS
- Command and control
  ○ Visibility
    ▪ Routines

The network structure could not be drawn by the interviewee (telephone interview).

2N has outsourced the supply chain and has the EMS doing the operational sourcing for PCBA component. 3 different EMS-providers and all of them has material authorization of 3 months, forecasts over 18 months. Order lead time of 8-10 weeks. Has very good visibility over the EMS inventory.

2N does final assembly and testing in Prague, uses a similar model to Axis downstream.

Future wishes in the upstream supply chain?

How do you work with: (Any rules or directions in agreements?)

- Capability
- Capacity
- Flexibility
- Risk

No rules.

In regards to capability every EMS has different capabilities, so we have given them different product groups.

In regards to capacity we don’t see any direct problem, our EMS-providers are trying to expand, their facing difficulties but we do not see it as an issue, they might have 10% free capacity right now.

In regards to flexibility we believe we are very flexible, For instance we buy components on PCBAlevel. We also help the EMS when they need extra components in production peaks. We buy the components on the free market (Distributors). Since we have low volumes it is possible.
In regards to risk we do not have a real contingency plan, but I think we will be able to move our production from one EMS to another. But for instance if EMS5 fails we will not be able to transfer the production to EMS6 because they do not have enough capacity available or capability.

**What is your biggest problem in regards to growth in the supplier base?**

We are facing issues with the material for the desired design and finding suppliers which can deliver the entire component and other bottlenecks as production in the short run. We hope that production will not be a bottleneck in the future.

**What kind of components do you source? Are they more critical than other commodities?**

R&D is responsible to choose supplier but the operational sourcing is done by the EMS. We monitor the component and supplier. We have the right to change the supplier if we do not agree with the EMS. For the most critical components the EMS keeps stock.

**How are you prioritized when component shortages occur?**

- Would that change if you were a smaller player

We are usually down prioritized, since companies believe we have to small quantities. Furthermore we buy from distributors, we would rather want to buy directly from the component supplier/manufacturer.

**a. How do you perceive your counterpart (Axis or 2n)? Similar or different.**

i. Products
ii. Customers
iii. Supply chain

The products are fairly similar in production and we could probably also do our final assembly in axis CLC. The biggest difference is that we have our own testing units. They are unique but I believe we could probably use standardize testing as well in the future. We have a plan to standardize test so we can use other machines.

**What do you expect from the integration?**

iv. Positive
v. Negative

Opportunity to make cost savings
Opportunity to buy directly from component suppliers instead of distributors Learn from them.

No negative expectation besides that it usually takes many days for Axis to reply to us and help us. The other way around we always get everything done directly as is expected from us. For example
we are very proud of the system traceability and that every product is tested several times and we would like to keep it.

b. How can you benefit from the integration?

We can learn more about 2N’s ERP-system it looks well more developed than ours. They have control and visibility over their supply chain in a higher extend than we do.

c. How can you contribute to the growth of both parties?
   i. Time
   ii. Resources

We do not have a person dedicated for the integration but we are available and often in contact with Axis.