Capturing Supplier Innovation

Single Case Study of how Kongsberg Automotive can Facilitate Supplier Innovations

Master's Degree Project in Innovation and Entrepreneurship

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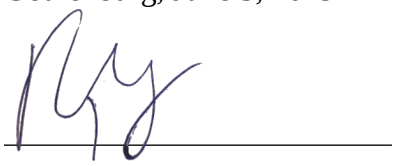

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Abstract

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Background & Purpose: In today´s globalised and highly competitive markets, incumbents face rapid changes in their respective market and it has become a necessity to adapt to remain competitive. One market especially faced with disruptive changes is the automotive industry, an industry that might witness more changes in the next decade compared to the last 20 years. One company that is in the middle of the automotive supply chain is Kongsberg Automotive, the company that this report is based on through a collaboration between the researcher and the organisation´s purchasing department. The organisation has expressed a desire to enhance their innovative capabilities to increase their competitiveness, with one of the goals being how to incorporate supplier innovation. The researcher and organisation decided to limit the scope to enhance the possibility to find valuable answers which resulted in the following research questions. *What is a supplier product innovation for KA-Group in the context of their 1-tier direct material suppliers? How can KA-Group facilitate early supplier involvement in new product development processes?* and the sub-question, *where in KA-Group´s product portfolio is early supplier involvement in new product development most applicable?*

Theory: The theoretical framework of the research has four main categories. Firstly, background with the aim to strengthen the choice of research, provide general information of the chosen research area and clearly depict the rationale of how the research questions were formed. Secondly, theory regarding supplier innovation is

described. Thirdly, theory regarding new product development and early supplier involvement is described. Lastly, the theory is summarised and linked to the research questions.

Method: The method chosen to collect data for the empirical findings was a qualitative research strategy with an inductive approach, using semi-structured interviews with respondents being from both purchasing and R&D within Kongsberg Automotive.

Results: A supplier product innovation stemming from a 1-tier direct material supplier can be, an innovation in one of the direct material segments, Electronics, Metal, Plastics & Textile and Raw Material, in the form of an incremental, radical or competence-enhancing innovation, that contributes to enhanced abilities to create new products or technologies, which addresses a need in the market, with the end result of increased profitability.

Kongsberg Automotive can facilitate early supplier involvement in new product development projects, by involving strategic or important suppliers that display innovative capabilities and shares needed expertise and know-how before the concept phase, which will result in operating benefits and diminishing the problems and errors that occur during the concept and development stages. Further, through the early supplier involvement model, it can be concluded that the organisation has the necessary knowledge of mentor suppliers to involve them strategically in the product categories in which technological change is not changing fast and supplier design expertise exists and is needed. Further, mentor suppliers can be involved early in all product categories except Powertrain & Chassis and the consumer-oriented market in Off Highway, based on their technological change in the market being fast, which might create lock-in effects with the supplier that results in the possibility of the product being rendered obsolete before or when it reaches the market.

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1. Introduction

The introduction chapter will first describe the background of the chosen field of research, next the problem discussion is described followed by the research purpose to depict what the research generally aims to achieve. The research questions are afterwards presented and lastly, the main delimitations of the research are discussed.

1.1. Background

In today´s globalised and highly competitive markets, incumbents face rapid changes in their respective market and it has become a necessity to adapt to remain competitive. One market especially faced with disruptive changes is the automotive industry, an industry that might witness more changes in the next decade compared to the last 20 years (EY 2016). The theorised disruptive changes stem from the "four megatrends" currently being developed and innovated, these are ride-sharing services, automated vehicles, digitalisation and electrification (Roland Berger 2017).

The innovative push in the automotive industry can also be clearly supported by statistics, according to Statista (2018) the industry is the third biggest spender in R&D globally with 16% of the total R&D spending in the world and PwC (2018), ranks 7 automotive and/or component manufacturers in the top 25 most innovative companies during 2018, a report that covered the 1000 most innovative companies in the world.

Innovations are usually in the eye of end consumers and media related to the organisations that supply the product or service, that is, the original equipment manufacturers [OEM]. For example, autonomous driving is linked to automotive manufacturers such as Tesla or Volvo Cars. However, one aspect that is often forgotten is the importance of the whole supply chain needing to follow the innovative push to realise the desired results. Involving the supply chain have specifically grown in importance in the automotive industry, which has undergone dramatic changes regarding the level of relationship and level of importance suppliers today have. Relationships have evolved from arm´s length trade to close strategic relationships (Isaksen and Kalsaas 2009) and automotive suppliers were forecasted in 2015 to create 82% of value-adding activities to the final product.

One company that is in the middle of the automotive supply chain is Kongsberg Automotive [KA-Group], the company that this report also will be based on through a collaboration between the researcher and the organisation´s purchasing department. KA-Group is an automotive parts

manufacturer with their main customer base being original equipment manufacturers [OEM] and Tier 1 suppliers, to which they supply three distinct product categories to, namely, Interior, Powertrain & Chassis and Speciality products. KA-Group has a global reach but also focuses on local support, which results in the organisation having a direct presence in 18 countries worldwide. KA-Group has stated that "You find KA-Groups products in one out of 5 passenger cars" (Kongsberg Automotive 2018a), which depicts their current global presence in the market.

KA-Group has expressed a desire to enhance their innovative capabilities to increase their competitiveness. This report will focus on one of the organisation's objectives, the purchasing department's goal of incorporating supplier innovations.

1.2. Problem Discussion

KA-Group´s objective to increase their understanding of how to incorporate supplier innovation mainly stems from a need to increase their competitive advantages. The organisation has succeeded with innovations in-house but acknowledges, that there is room for improvement. KA-Group´s objective can be seen as a highly relevant area to prioritise since innovations (Business Sweden 2015; Deloitte 2017a; Roland Berger 2017) and strategic partnerships (Deloitte 2017; Roland Berger 2017) are seemed to be two of the key differentiators for automotive suppliers if they want to succeed in the changing competitive landscape. Further, purchasing department within organisations are seen to have a key role in facilitating supplier innovation and involvement (Legenvre and Gualandris 2018; Handfield, Ragatz, Petersen & Monczka 1999; Bidault, Despres & Butler 1998), making the research scenario within a purchasing department highly relevant as well.

KA-Group has a clear goal to strive for but does not have the necessary knowledge to conceptualise how they will achieve it. KA-Group lacks the knowledge of what a supplier innovation actually is and in what product categories suppliers should be more involved.

1.3. Research Purpose

The general purpose of this research is through a single case study of KA-Group, investigate what a supplier innovation actually is in the context of the organisation and further detail how and where it can be facilitated within the organisation. The findings of this research will be rather specific to the collaboratory organisation, since the researcher did not seek to find generalised results but will still yield valuable insights to how an incumbent firm, in the middle

of the automotive supply chain, works with innovations in general and their perception of acquiring external innovative capabilities.

The researcher and organisation decided to limit the scope to enhance the possibility to find valuable answers to the research purpose, which is closely related to their future strategic agenda and resulted in the research questions depicted below.

1.3.1. Research Questions

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*
- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

1.4. Delimitations

As can be seen in the research questions some delimitations have been made. Regarding the first question, the decided scope was to solely analyse product innovations from suppliers within direct material purchases of KA-Group´s 1-tier suppliers. In the second question, the scope was narrowed down to early supplier involvement [ESI] within new product development processes [NPD].

These delimitations are specific and difficult to strengthen without proper background description. Thus, the researcher does not go into length in the introductory chapter why each of these was specifically decided. Instead, they are argued for in the background part of the theoretical framework where one key aspect of the background presentation, is to create a clear line of argument for why each delimitation was made.

2. Literature Review

The literature review chapter is divided into four main groups. Firstly, a background is formed to strengthen the specific research topic and further show how the research questions were constructed. Secondly, supplier innovation is described as a concept. Thirdly, new product development is described and linked to early supplier involvement. Lastly, linkages between theory and the research questions are shown.

2.1. Background

The theoretical framework will start with a background with the aim to strengthen the choice of research, provide general information of the chosen research area and clearly depict the rationale of how the research questions were formed. The background is divided into three different areas, the automotive industry, Kongsberg Automotive, conceptualising innovation and ends with a brief summarisation that connects to the research questions.

2.1.1. The Automotive Industry

It is important to start with a conceptualisation of the automotive industry, to explain why KA-Group´s objective, to increase their understanding of supplier innovations even is a relevant area to further investigate. The following description of the industry is a non-exhaustive and brief generalisation, that covers two main areas that will be depicted below, changes in the industry and trends in the industry.

2.1.1.1. Changes in the Automotive Industry

Changes in the industry can be linked to the rising economic globalisation as expressed by Isaksen and Kalsaas (2009), which stated that the economic globalisation has led to geographical extensions of production networks. In other words, globalisation has led firms to outsource and offshore the production and involving themselves in global production networks. Manufacturing outsourcing in combination with product knowledge shifting from carmakers to suppliers has led to a de-verticalization of the entire industry, which created the tiered supply structure known today and global mega-suppliers (Cabigiosu, Zirpoli & Camuffo 2013). The tiered supplier structure is in its essence where the supplier is in the supply chain in regard to the OEM, a tier-1 supplier is, for example, the supplier with direct contact to the OEM. These changes are also mentioned by other authors; Veloso and Fixson (2001) call it the rise of the supplier industry, which entails, that suppliers have changed from being small players into

being partners with the assemblers and thus having a more prominent role. Scannell, Vickery and Droge (2000) instead call it supplier consolidation.

The increased outsourcing to suppliers can clearly be seen through Statista´s report of automotive supplier market value worldwide (Statista n.d), which have increased from 290 billion euros in 1985 to 620 billion euros in 2015. Another Statista report (Statista 2018a) also shows the growing importance of suppliers creating value to finished products, it shows the percentage of value-adding activities that suppliers deliver to the final product. According to this report, the value-adding activities has grown from 56% in 1985 to 74% in 2005 and was forecasted to reach 82% in 2015.

The changes mentioned above, regarding suppliers being more involved and getting more value-adding tasks, has also changed the competition on the market. The buyer and seller relationship have shifted to being more focused on having a closer link with fewer suppliers (Bidault, Despres & Butler 1998), which can be further supported by the change of total suppliers in the market which will be shown next. Scannell, Vickery and Droge (2000) mention that the automotive industry in the U.S has undergone dramatic changes in the supplier base, going from 10,000 suppliers in 1983, to 450 suppliers in 1993 and was expected to further drop around the millennia. According to a newer and global report by Business Sweden (2015), the market has reached a mature level and had in 2015, between 200-300 multinational tier-1 suppliers.

To sum up the changes in the automotive industry, the economic globalisation has changed the market by OEM´s putting more emphasis on outsourcing and offshoring value-adding activities to their suppliers, which has resulted in a stronger supplier base and market in general, but also a more consolidated one based on the importance of stronger relationships to fully facilitate the benefits of outsourcing.

2.1.1.2. Trends in the Automotive Industry

The biggest trends within the automotive industry have been coined the four megatrends by consulting firms and include, ride-sharing services, automated vehicles, digitalisation and electrification (Roland Berger 2017). It is outside this report´s scope to go in depth about the different trend, but some forecasts about the size of these new trends will be shown on the next page and are based on a report from EY (2016).

- 90% of car innovations and new features are driven by electronics
- 70% of all vehicles sold by 2045 are expected to have autonomous capabilities
- 26 million global car-sharing memberships by 2020 (from 6.5 million in 2015)
- US$114b is the estimated global automotive R&D expense in 2020, up from US$80b in 2014

With these numbers, EY (2016) stated that the automotive industry will witness more changes in the next decade than compared to the last 20 years. If these forecasted numbers are accurate the automotive industry would indeed face an upcoming disruption and increased focus on innovations based on the increased R&D expenditures, since the industry already in 2018 had the third biggest R&D spending with 16% of the total R&D spending in the world (Statista 2018b).

The disruptive changes will force suppliers to adapt if they want to remain competitive in the market. Innovations (Business Sweden 2015; Deloitte 2017a; Roland Berger 2017) and strategic partnerships (Deloitte 2017; Roland Berger 2017) are seemed by renowned consultancy firms to be two of the key differentiators for automotive suppliers if they want to succeed in the changing competitive landscape.

With this, it is clear that supplier innovations are a highly relevant area to further investigate since it is seen to be two of the key differentiators. With the research topic being strengthened to be of enough importance to further investigate, the next part will be an explanation of the collaborative company in this report, KA-Group.

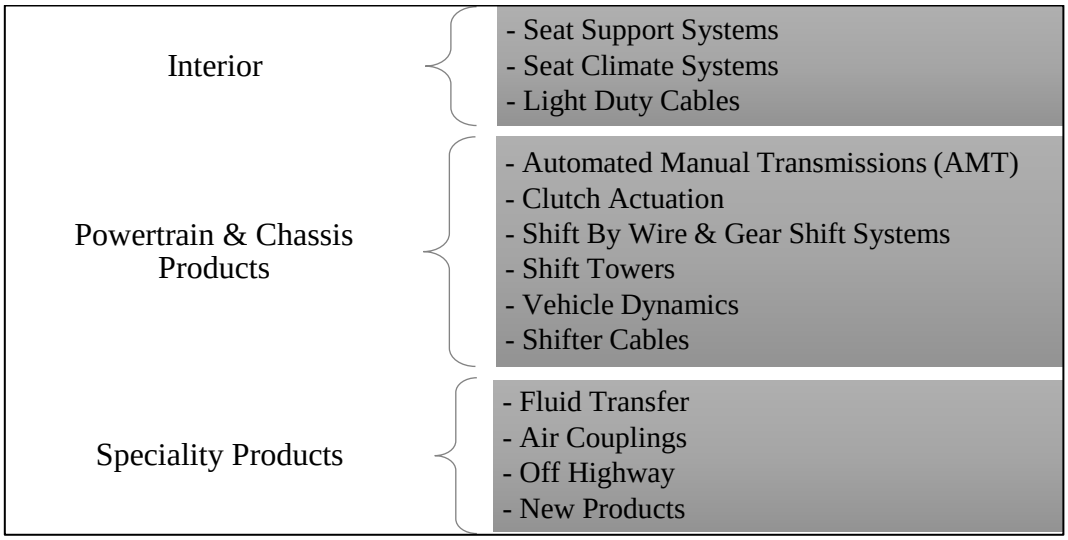
2.1.2. Kongsberg Automotive

This brief explanation of KA-Group will provide the reader with a basic understanding of the organisation and is divided into two main parts, a general explanation of the organisation as a whole and the purchasing department.

2.1.2.1. Organisation

KA-Group is an automotive parts manufacturer with its main customer base being original equipment manufacturers (OEM´s) and Tier 1 suppliers. KA-Group´s product portfolio can be divided into three main categories, Interior, Powertrain & Chassis products and Speciality products (Kongsberg Automotive 2018a). These product categories can be further divided into sub-categories which will be in Figure 1 below.

Figure 1: Kongsberg Automotive´s Product Portfolio



Own elaboration

Source: Kongsberg Automotive 2018a

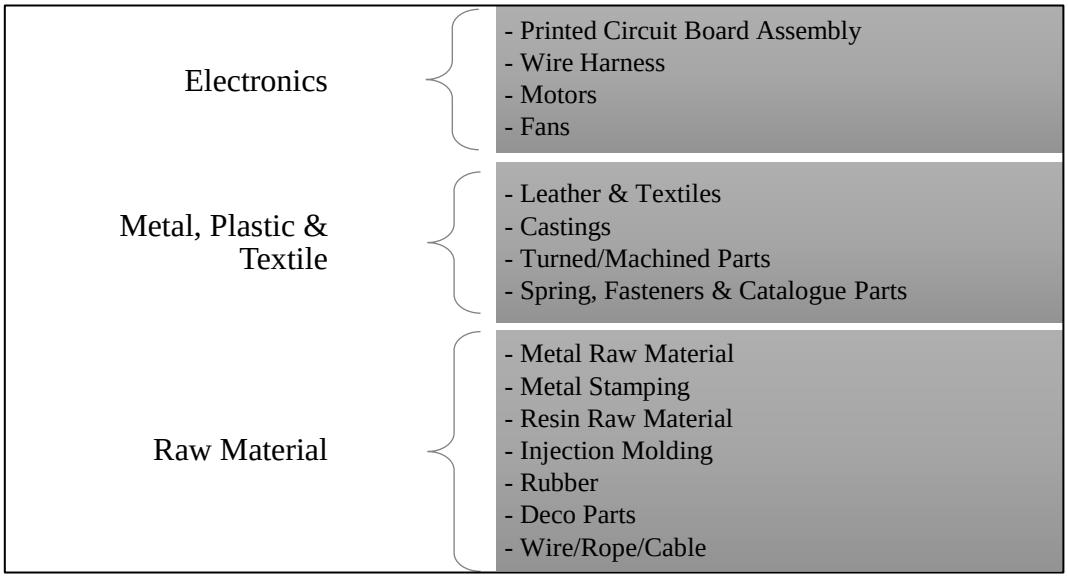
The main focus of the report will lie on the primary product categories, but the sub-categories are deemed important to depict based on the high probability that the respondents during the data collection will go into more depth than just covering the primary categories.

KA-Group stated that the organisation has a global reach but also focuses on local support, which results in the organisation having a direct presence in 18 countries worldwide. KA-Group has stated that "You find KA-Groups products in one out of 5 passenger cars" (Kongsberg Automotive 2018a), which depicts their current global presence in the market. With the global presence in the market, the organisation has chosen to adopt a "global strategy", that easily described is a strategy where KA-Group aims towards that all sections in the organisation needs to follow the same strategy principles.

2.1.2.2. Purchasing Department

KA-Group´s purchasing department has as the organisation in whole, a global presence with 23 locations over the world (Kongsberg Automotive 2018b). The departments purchasing activities can be divided into two main groups, direct material [DM] and indirect material [IDM], for this report the sole focus will be on suppliers within DM since IDM purchases, such as transportation and maintenance was not deemed to be a priority for the organisation. The main segments and sub-segments within DM are depicted in Figure 2 below.

Figure 2: Kongsberg Automotive´s Purchasing Segments within Direct Materials



Own elaboration

Kongsberg Automotive 2018c/d

As with the organisation´s product portfolio, the main focus will lie on the main categories depicted above and the sub-categories are deemed important based on the probability that the respondents during the data collection will go into more depth, than just covering the primary categories. Further, the researcher solely chose to analyse KA-Group´s 1-tier suppliers in the DM segments, based on these being the suppliers the purchasing departments has the primary communication with.

The purchasing departments expressed value proposition is, *"Turning cost into value for customers and KA-Group, everywhere and every day"* (Kongsberg Automotive 2018b), which means that the department has a strategic souring mindset where the main objectives a supplier need to meet are expressed as "QSTCM" (Quality, Service, Technical involvement, Cost and Management in terms of strategic alignment). In the scope of the purchasing department´s strategic alignment, this report will aim at finding answers regarding technical involvement, which covers product innovation and early supplier involvement. ESI according to KA-Group is for suppliers to be early involved in their projects to secure flawless launch and innovation is to secure future business growth and customer satisfaction (Kongsberg Automotive 2018b). Also, the purchasing department has introduced category management teams in DM, which is a cross-functional collaboration between different departments in the organisation and consists of, Purchasing, R&D, Sales, Quality and Category SQD. The overall objective of the cross-

functional categories is to improve strategies and engage suppliers in the organisation´s innovation processes (Kongsberg Automotive 2018e).

The purchasing department's technical involvement perspective and category management are also major components to their future strategic agenda. To implement the purchasing department's strategic aim to "turn cost into value," they have identified a wanted future state for the technical involvement perspective and category management. Regarding technical involvement, it is expressed as a key factor to proactively bring in supplier innovations and suppliers themselves to bring in innovations through extensive collaboration with suppliers, in this report the main focus will be on how KA-Group can bring in supplier innovations. To achieve the extensive collaboration needed the organisation has also set a goal to consolidate their supplier base to 550 in total from the current total of around 1150, where one of the main goals will be to solely strive for a top-class supplier base (Kongsberg Automotive 2019).

What can be concluded from the description of the organisation and purchasing department, is that they indeed have the same strategic objective that was deemed necessary to handle to stay competitive in the section above, namely, focusing on innovations and strategic partnerships/collaborations. Further KA-Group also presents a more detailed plan on how they want to achieve this, through ESI and bring in supplier innovation. However, before these objectives are further explained, it is necessary to first conceptualise what innovation actually is since it is a concept widely used but rarely described properly.

2.1.3. Conceptualising Innovation

Although innovation as a general concept is widely used by scholars and market actors, the broad scope and complexity of what an innovation actually is can create significant problems for the actor attempting to make use of innovations, which Gatignon, Tushman, Smith and Anderson (2003) depicts in their article, by showing the difficulties of assessing innovations in the academic perspective by the sheer volume of concepts and units of analysis, creating confusion and inconsistency in empirical analyses. Thus, it is needed to briefly conceptualise innovation as a concept and will be discussed below from a top-down perspective.

According to Hauser, Tellis and Griffin (2006), innovations can in the most generalised context be seen a process to create and bring new products and services to the market, where the main goal is to enhance profitability with these modified or new products. The authors also describe more detailed what the outcomes of successful innovations can achieve, these are not by any means a complete list of benefits innovations can yield but touches some of the more

overarching benefits of introducing innovations in the market. Firstly, the company can achieve market rewards for introducing new products to the market. Firm-level benefits can be shown by that on average, 32% of the firm's revenues and 31% of firms profit stems from products that have been commercialised within the last five years. Secondly, an incumbent firm can by commercialising innovations defend themselves against market entries, by changing their product positioning to maintain optimal profits.

Innovation in its essence can also be defined in four overarching categories according to Gatignon et al. (2003). Incremental, radical, competence-enhancing and competence-destroying innovations. Incremental innovations are improvements that are at a consistent rate with the technological change, Radical innovations are improvements that are above the technological change in the market, Competence-enhancing innovations build or reinforce competence, skills and know-how. Lastly, competence-destroying innovations are the opposite of competence-enhancing, obsolesces competence, skills and know-how.

With the overarching goal of innovations and categorisation defined, the concept can be compartmentalised into two main groups, process innovations and product innovations. Process innovations are "the ability to develop new processes using the latest technology in anticipation of or in response to, customer requirements" (Scannell, Vickery, & Droge 2000, p. 32). Process innovation is the implementation of new or improved techniques, methods, and procedures and the overall goals of the process improvement can be to reduce labour cost or improve the flexibility of manufacturing. (Wagner & Bode 2014; Leiponen & Helfat 2010). Product innovation is "the ability to develop new products and/or technologies in anticipation of, or in response to, customer requirements." (Scannell, Vickery, & Droge 2000, p. 32). Even though innovations can be divided into these two categories, Wagner and Bode (2014) state that it is important to still have an integrated view, otherwise negative consequences like lower manufacturability and slower development time might occur from the lack of combining process design and manufacturing technologies. Even if possible negative consequences are shown by Wagner and Bode (2014), this report will still solely emphasise on product innovation as stated in the introduction chapter, the decision mainly stems from the researcher´s necessity to delimit the scope of the research to be able to produce valuable insights to KA-group within the report´s short timeframe.

Innovations can be further divided by viewing how they are created internally and how the firm can collaborate externally to produce innovations. Hauser, Tellis and Griffin (2006) stated in

their research review that innovation is a broad topic that a variety of disciplines internally undertakes, such as marketing, operations management, product development. Although a wide array of departments for organisations internally are capable of producing innovations, the main focus of this report will be on the purchasing department of KA-group since it is the focal point for the researcher and is shown by previous research to be a source of innovation (von Haartman & Bengtsson 2015; Legenvre & Gualandris 2018). Regarding collaborations externally it is shown by Leiponen and Helfat (2010) that a wider source of knowledge and innovation is associated with a higher innovation success, especially in the scope of newly commercialised innovations in regard to the respective sales revenue. There are a wide array of external knowledge sources a company can seek to use and is likely to affect the outcome of innovations, such as other firms in the same industry, customers, suppliers and university research (Leiponen and Helfat 2010). As an example, Mansfield (1995) stated from his empirical analysis of seven major manufacturing industries that a substantial proportion of innovations in high-technology industries stems directly from recent academic research. Also, supplier innovations which are the external source this report will focus on, are by researchers seen an important source of knowledge to succeed with innovations, which will be described after the background summarisation.

2.1.4. Summary of the Background

To sum up innovation as a concept and the background information. Innovation is in its essence a process to bring new products and services to the market with the goal to enhance profitability, can be categorised into incremental, radical, competence-enhancing and competence-destroying innovations, can be divided into product innovation and process innovations and lastly, can be created solely internally by different departments, or by collaborating with external actors. Scholars have proven that purchasing as an internal actor and suppliers as an external actor both are proficient in creating successful innovations. As stated earlier, support has been given that KA-Group´s objective to increase their understanding of involving suppliers in innovation processes is a relevant field to further investigate, both in the scope what it can yield to the organisation by the new changes and new trends in the market, and by theory that wider source of knowledge (suppliers explicitly in this report) and innovation is associated with higher innovation success.

With KA-Group´s strategic plan towards 2025 (Kongsberg 2019), the width of the concept supplier innovation can be broken down into more precise research questions which were depicted in the introduction chapter and is the following.

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*
- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

These stem from KA-Group´s future state of the technical involvement in the QSTCM perspective, where KA-Group wants to proactively bring in supplier innovations and suppliers themselves to bring in innovations through extensive collaboration with suppliers, with ESI in focus. To make the research area more feasible to find answers within the short time frame of the report, the researcher further delimited the report to solely focus on how KA-Group can bring in suppliers' early product in the NPD process.

With the background explained and linked to the report´s research question´s the next stages will provide further information, giving the researcher the possibility to make overall directions of the research question´s from a theoretical perspective. Firstly, conceptualising supplier innovation is necessary to more clearly be able to state what a supplier product innovation essentially can be. Second, ESI in NPD processes will be described to assess where supplier involvement should be made and what is necessary from KA-Group´s perspective when incorporating supplier. Lastly, an overall summarisation will be made to clearly depict what theory states about the research questions.

2.2. Supplier Innovation

Using external knowledge as a potential source to generate innovations has according to Roy, Sivakumar and Wilkinson (2004) roots from the late 80s when scholars such as Hakansson (1987), challenged the then general acceptance that innovation within supply chains solely originated from the buyer. The notion that a substantial part of innovations are generated through the interaction between buying and selling firms within the supply chain, are today widely known (Roy, Sivakumar & Wilkinson 2004) and is a key factor for manufacturers to achieve the necessary improvements to remain competitive, especially when taking into consideration that purchased materials accounts on average for over 50% of organisations total cost of goods sold (Handfield et al. 1999). According to scholars, using suppliers to generate innovations has grown based on several factors, some of these are; Product and service

complexity continues to grow (Azadegan & Dooley 2010) and technological developments and customer demand change more rapidly (Handfield et al. 1999; Roy, Sivakumar & Wilkinson 2004), which has made it increasingly difficult for firms to gain competitive advantages on their own (Fossas-Olalla, Minguela-Rata, López-Sánchez & Fernández-Menéndez 2015). One last example of why supplier involvement has grown is that supplier's role within the supply chain has grown in importance, based on the focal firms' trend to outsource more and more production in the form of design, development and engineering activities to suppliers, a trend that have been especially noticed in the automotive industry (Wynstra, Von Corswant & Wetzels 2010) which was explained in the background regarding changes in the automotive industry.

In the widest scope of benefits of involving suppliers in the viewpoint of operations, Azadegan & Dooley (2010) stated that supplier innovativeness has positive associations to the improvement of all the five manufacturing performances (Cost, quality, product development, delivery and flexibility) for the manufacturer and does not necessarily entail that trade-offs need to happen. Trade-offs in operations management perspective are according to De Meyer & Ferdows (1990) a general theory explaining that a manufacturer cannot increase one of the performance objectives without the expense of another unless there is slack in the system. Supplier innovations are comparable with the general notion of innovations described earlier, that they can be distinguished into the two main groups of innovation, that is, process innovations and product innovation (Wagner & Bode 2014). With the earlier description to delimitate to only focus on product innovation and through discussion with KA-Group, the focal point of this research regarding supplier innovations will be through the context of NPD. Even though product development will be the key performance objective the researcher explores, it is important to note that the other objectives will also be taken in consideration, based on Azadegan & Dooley (2010) description that trade-off theory does not necessarily imply when incorporating suppliers in product development.

The purchasing department is seen to have a key role in facilitating supplier innovations by scholars, meaning to incorporate suppliers in innovation projects. Legenvre and Gualandris (2018) mention involving suppliers in innovation projects as one of the key purchasing capabilities for success, Handfield et al. (1999) stated that the role of purchasing will increase in importance and Bidault, Despres and Butler (1998) further described that purchasing has a key role in achieving ESI. With this, the next step will be to discuss how purchasing actually can facilitate ESI in NPD processes.

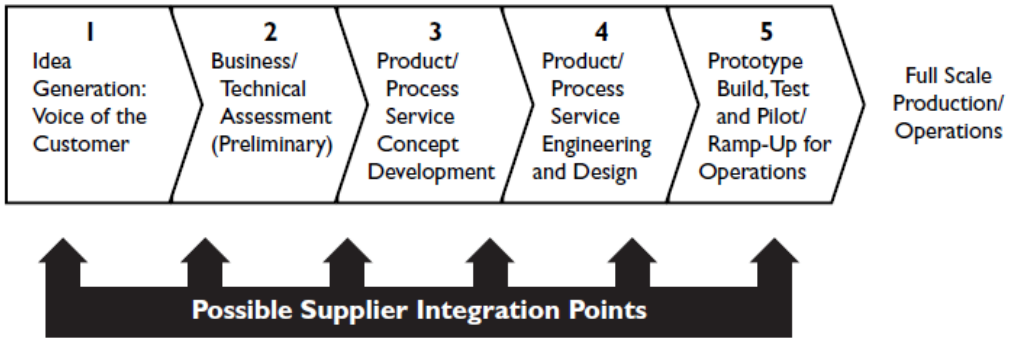
2.3. New Product Development

NPD is easily described as the process of creating new products, the NPD process can further be defined as a "series of interdependent and often overlapping stages during which a new product (or process or service) is brought from the idea stage to readiness for full-scale production or service delivery" (Handfield, Ragatz, Petersen & Monczka 1999, p. 62). These specific stages of NPD will be described below.

2.3.1. New Product Development Process

The stages mentioned by Handfield et al. (1999) are based on their own depiction of how the NPD process is built. Several scholars have over the years created similar NPD processes, for example by Hauser, Tellis and Griffin (2006) or the famous stage gate system by Cooper (1990), but to be able to reach viable findings in the report one model had to be chosen and the researcher deemed the chosen model to be the most applicable based on Handfield et al. (1999) simplified and detailed stages.

Figure 3: New Product Development Process



Handfield, Ragatz, Petersen & Monczka (1999).

As can be seen above in Figure 3, Handfield et al. (1999) divided the NPD process into five different stages and will be briefly explained in chronological order. (1) Idea Generation, consideration of the need for the product, potentially tapping customers input and technologies that might be necessary. (2) Business/Technical Assessment, creating a business assessment for the product as well as identifying technical solutions to the requirements of the customer. (3) Product Concept Development, the product concept essentially created and specific performance specifications are frozen. (4) Product Engineering and Design, the real development of the product are started, design specifications are conceived, and a prototype is created to test and verify results. (5). Ramp-Up for Operations, the product enters full-scale production.

As can be seen by Figure 3, all stages of the NPD process are deemed to be sufficient to involve suppliers according to Handfield et al. (1999). In general, the authors proclaimed positive results from involving suppliers in NPD, both from their own literature review and survey. From the survey, Handfield (1999) found strong indications to improvements in all categories tested, purchased material cost, purchased material quality, development time (time to market), development cost, functionality and product manufacturing cost. This to some extent goes in line with what was stated earlier, that improvements do not necessarily imply that trade-offs will happen (Azadegan & Dooley 2010).

Even though suppliers evidently can be incorporated at any step throughout the NPD process, KA-Group has a focus on involving suppliers early which will be the next part of the discussion.

2.3.2. Early Supplier Involvement

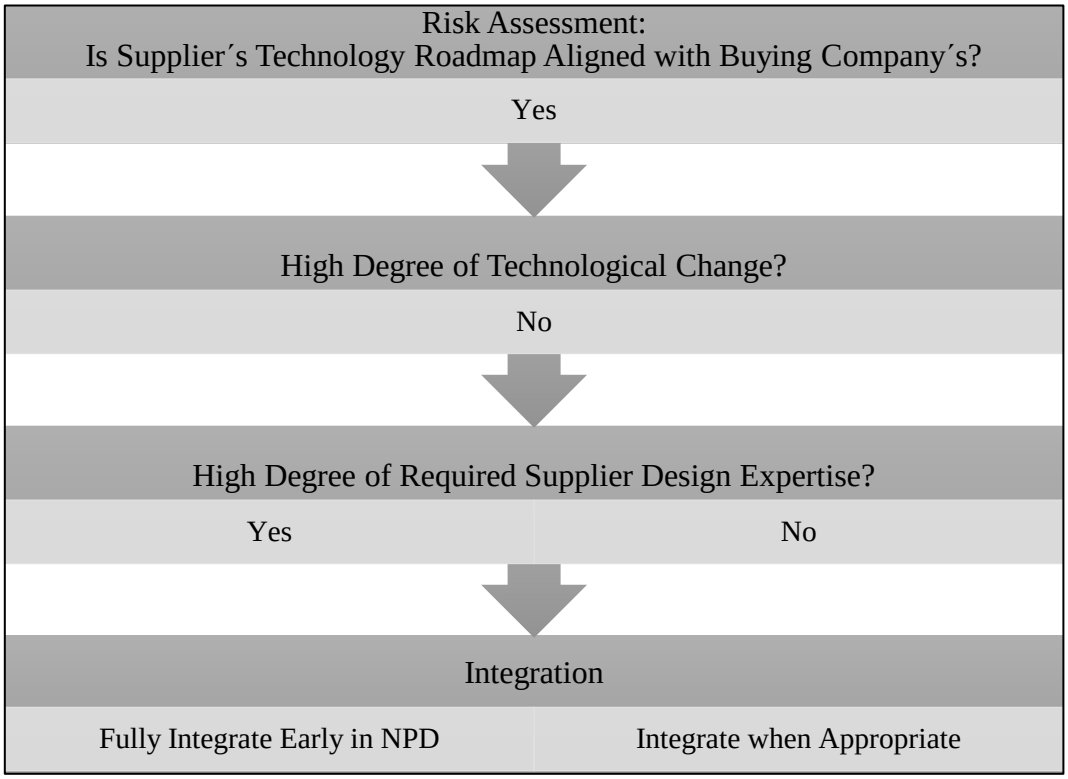
ESI can be described as "vertical cooperation where manufacturers involve suppliers at an early stage in the product development innovation process, generally at the level of concept and design" (Bidault, Despres & Butler 1998, p.719). Even though ESI is not a concept that has been directly linked to specific stages of NPD shown in Figure 3, the definition described provides a general direction, that the first four stages can be seen as involving the suppliers early. Furthermore, Petersen, Handfield and Ragatz (2005) tested in their study if the different stages of Handfield et al. (1999) NPD process affected the result of ESI and found no support for a positive correlation. Thus, this research will take all of the four stages as possible entry points to involve suppliers early. Even though a specific stage in the NPD process cannot be defined as the optimal entry point it is important to note the importance of taking the right path as early as possible. Handfield et al. (1999) state that although the concept stage and design stage of the NPD process (stage 3 and 4) contains a relatively small portion of the total NPD cost, they "lock in" as much of 80% of the total NPD cost. Meaning that when the NPD process has reached this stage, a majority of costs which is accumulated in idea generation and business assessment will be difficult to change. Handfield et al. (1999) further state that this makes it crucial for firms to have as much expertise as early as possible in the development process.

Further, it is also possible to explain what actually drives ESI, Bidault, Despres and Butler (1998) created an ESI adoption model where the authors tested three different categories and if these affected the adoption of ESI. The three categories tested were environmental pressures, social norms and industry norms, which can be seen as two external categories and organisational choices which is internal choices by the organisation. The authors found that all

categories affect the adoption of ESI to some extent, but the most interesting finding was that organisational choices were deemed the have the highest impact, making the authors conclude that “ESI adoption is more a question of strategic priorities than external forces, pressures or circumstances” (Bidault, Despres & Butler 1998, p. 731). With this, it can be concluded that ESI should be seen as a strategic choice by the organisation that can be actively pursued and therefore, the focus was set on organisational choices and not external situations.

Handfield et al. (1999, p.65) created a process model for reaching a consensus if and where a specific supplier should be involved in NPD projects, a modification to this model has been created and renamed which will be shown below. The modifications done is to simplify and show the most important steps in when ESI is applicable. Discussing steps from the original model, like identification of pool of supplier or if the supplier has an acceptable history and are qualified, is not deemed necessary to go in-depth about, mostly since actions to solely work with top class suppliers are already in KA-Group´s future strategy (Kongsberg Automotive 2019) and cross-functional collaborations are already in place at KA-Group, which is seen as one of the crucial steps to identify the pool of potential suppliers. With this, the simplified model will instead show the three key factors to take in consideration if the supplier should be involved early.

Figure 4: Early Supplier Involvement Model



Own Elaboration

Handfield, Ragatz, Petersen & Monczka (1999).

As can be seen in Figure 4 above, deciding if to involve suppliers early in NPD process can be seen as a three-step process and is as explained earlier, a simplified and modified model based of Handfield et al. (1999) original model.

(1) Risk Assessment regarding the technology roadmap is an assessment to ensure long-term and short-term alignments with the supplier, regarding objectives and technological plans. The term technology roadmap means "the performance, cost, and technology characteristics of future products each company plans to develop/introduce over some specified time horizon" (Handfield et al. 1999, p.73). This assessment of the alignment of the technology roadmap differs between companies and industries, but two key factors for the process is sharing information and incentives for suppliers to involve themselves in the process.

Sharing information, otherwise called knowledge sharing is at is sounds, a process of transferring knowledge from one actor to another. This report will not go in depth about the complex subject regarding knowledge management, but a distinction is important on what kind of knowledge that can be investigated in this report. Knowledge can according to Grant (1996) be divided into two main groups, tacit- and explicit knowledge. Tacit knowledge cannot be

codified and is difficult to transfer between actors, whereas explicit knowledge is codified and can be transferred through communication. With this, it is important to note that this research can only assess tacit knowledge since it is too complex to research the characteristics of tacit knowledge with the limited focus this report has on knowledge sharing in general.

Incentives for suppliers can be plentiful, however, one key aspect according to Wagner (2009) is to maintain collaborative relationships. Wagner (2009) exemplifies that suppliers spend resources and innovate with customers that actually treat them well. Further, the author state that one common cause for poor relationships is unfair sharing of the benefits from the joint innovation project, suppliers that instead participate in the value generated from the innovation, is generally more willing to collaborate in the future as well.

(2) Assessing the rate of technological change, if the technology roadmap is aligned with the supplier, the next step that is needed to assess is the rate of change in product technology. The rate of technological change can be a problem for companies where the life cycle of a product is very short. Even though supplier involvement is useful in dealing with rapid changes it can also be a double-edged sword according to Handfield et al. (1999). The main pitfall described by the authors is that the company can be locked into a specific design or technology, which might result in the product already being obsolete when it is released. With this argument, the authors state that if the rate of technological change is high the company should instead involve suppliers later in already established NPD projects, which is not included in the modified model in Figure 4 since it is not the focus of the report. If the degree of technological change is low however, ESI is more applicable and thus goes to the last step in the ESI-model.

(3) The degree of supplier design expertise, with the two other stages, cleared the last step is more of an assessment of where and when to involve the supplier rather than an exclusion criterion. If the supplier possesses design expertise and has experts that can provide key insights that are a necessity to create the new product, they should be involved early in the NPD process. If the supplier does not possess the design expertise needed, it is less critical to involve them early and can thus be involved when it is appropriate. Some of the key features of design expertise defined by Cross (2004) is, using processes to structure and formulate the problem, quickly identifying the problems at hand, being solution focused and finding the problems and possible solutions quickly.

With a more detailed view of where suppliers can be involved early in NPD processes and what criteria that need to be fulfilled for ESI to achieve high results, it is now possible to link the research questions to the theoretical framework, which will be the next step.

2.4. Linking Theory to the Research Questions

With the theoretical framework being fully discussed, it is now necessary to link the theory to the research questions, to clearly depict what can be assessed now at what is needed to be collected from the primary data collection.

2.4.1. Linkage to Research Question 1

Linking the earlier descriptions of innovation and supplier innovation it is possible to conclude a very generalised answer to what a supplier product innovation is in the context of KA-Group. A supplier product innovation is an innovation in the form of incremental, radical or competence-enhancing from one of the purchasing segments (Electronics, Metal, Plastic & Textile and Raw Material) that should enhance the product development of a product that aligns in one of the three categories in their product portfolio (Interior, Powertrain & Chassis Products and Specialty Products). With the enhancement in product development meaning a possible improvement in, purchased material cost, purchased material quality, development time (time to market), development cost, functionality and product manufacturing cost.

As can be clearly depicted this is quite a descriptive question since the research does not go in depth to analyse specific suppliers, thus making it infeasible to conclude a more detailed answer. However, the interesting part is to through primary data collection, compare the theoretical findings to KA-Group´s own perception of what a supplier product innovation actually is and their general attitudes towards incorporating suppliers more closely, which if misaligned, can have impacts to what they can expect from a supplier in a product development perspective. But also, interesting to actually contextualise more directly what respondents within KA-Group believe a supplier product innovation could be in their specific fields.

2.4.2. Linkage to Research Question 2

What can be derived from the theory is that adopting ESI should be seen as a strategic choice by the organisation (Bidault, Despres & Butler 1998) and can be applied in any of the four first stages of Handfield et al. (1999) NPD process model shown in Figure 3, from idea generation to design development. Furthermore, Petersen et al. (2005) found no significance of ESI having stronger effects in any specific stage, thus all of the four stages ESI can be adopted into, should

be deemed as possible entry points for KA-Group´s suppliers, even though Handfield et al. (1999) stresses the importance of evolving as early as possible based on lock-in effects. With this, primary data collection will be needed to be collected, to find where KA-Group believes they need supplier involvement the most in the NPD process and how to see how applicable the Handfield et al. (1999) model is in the context of KA-Group.

The second step to conceptualise is how KA-Group can facilitate ESI in NPD processes, which will be analysed through the modified ESI-model depicted in Figure 4, regarding when to integrate suppliers. The simplified model shows that the supplier's technology roadmap needs to be aligned with KA-Group, the product being developed should not be in a product category of rapid technical change and for the supplier to be involved early, it should have high design expertise. What needs to be collected from primary data is more knowledge about the specific purchasing segments and product categories, to conceptualise if KA-Group currently has the necessary knowledge to decide which suppliers should be involved and where ESI is applicable, thus also in which product categories ESI is applicable.

3. Methodology

The methodology chapter has the following structure. First, the research strategy is discussed to show the orientation the researcher will conduct the research through. Second, the research design describes the structure of how the collection and analysis of data will be done. Third, the research method depicts the ways data was collected. Forth, the data analysis discusses the way the researcher decided to analyse the data and lastly, research quality criteria are discussed in order to validate the research findings, thus strengthen its contribution to knowledge.

3.1. Research Strategy

A research strategy is according to Bryman and Bell (2015) the orientation the researcher decides to conduct his research through. Research strategy can be divided into two distinct strategies, qualitative and quantitative, although it also exists a mixed method. Before a decision over what strategy is most appropriate in this research, a discussion is needed regarding the relationship between theory and research to distinguish if a deductive or inductive approach should be used.

Deductive and inductive approach are the two different ways to look at the relationship between theory and research. The deductive approach is according to Bryman and Bell (2015) a theory testing approach, where the researcher attempts to deduce a hypothesis that is created through existing theory. Inductive approach, on the other hand, is more of an exploratory approach, where theory instead is an outcome of the research. Since the research questions are quite broad and explanatory in nature, mostly regarding the complexity to understand how KA-Group can facilitate ESI in NPD processes but also finding what a supplier product innovation is for KA-Group, makes the inductive approach the most logical approach to answer the research questions.

With a choice made over what relationship between theory and research are most applicable, it is possible to decide the research strategy. Bryman and Bell (2015) state that the research strategies presented earlier can be described in three distinct ways, even if scholars nowadays are starting to discuss if it is appropriate to do such distinct separations. (1) Quantitative research usually involves a deductive approach, emphasises in the quantification, collection and analysis of data to test theories (hypothesises). (2) Qualitative research usually involves an inductive approach, emphasises on words rather than quantification in the collection and

analysis of data to generate theories. (3) Mixed strategy research involves a combination of quantitative and qualitative research.

With the choice of using an inductive approach, a qualitative research strategy was a natural choice, since an inductive approach and qualitative strategy often goes hand in hand. However, the choice of using a qualitative strategy also stems from Bryman and Bell´s (2015) description of the general contrasts between the qualitative and quantitative approach. These contrasts cannot be seen as hard facts over the differences between the strategies but should instead be seen as guidelines that together can show what strategy is more applicable. Below the main contrasts making a qualitative study more attractive will be presented.

(1) Theory and concepts tested in research vs Theory and concepts emergent from data. The research is a collaboratory study between the organisation KA-Group and the researcher, where the research based on the research questions are exploratory in nature with a need to create theory based and concepts on data collection to be able to answer the research questions properly.

(2) Number vs Words. With the research being exploratory words are seen to be more applicable than numbers to properly be able to analyse the research.

(3) Point of view of researcher vs Point of view of participants. Based on the necessity to understand the organisation´s viewpoint it was deemed most fitting to analyse through the participant's point of view.

(4) Structured vs Unstructured. A qualitative approach will provide the researcher with a greater possibility to be more unstructured, which gives a possibility to get actors meaning and generate concepts that emerge from the data.

(5) Generalisation vs Contextual understanding. Since it is a single case study the emphasis should be on getting a contextual understanding of the organisation and problem, rather than trying to generalise it.

(6) Hard, reliable data vs Rich, deep data. The need for contextual understanding also facilitated the need for collecting rich and deep data to fully be able to understand and find answers to the research.

Even though the contrasts above argues in favour of qualitative research it exists criticism of qualitative research. Bryman and Bell (2015) depict four different kinds of criticisms, which is

needed to be addressed to further strengthen the choice of qualitative research strategy. (1) Too subjective, refers to the viewpoint that qualitative results often are unsystematic in their depiction of what is significant and the close relationship the researcher acquires with the people studied. With the researcher having knowledge of personal bias is a root cause of problems in qualitative studies, it was kept in mind throughout the study to minimise the potential effect. (2) Difficult to replicate, difficulties of truly replicating qualitative research based on the general unstructured procedures that are often used. This problem will further be discussed in the quality of the research section. (3) Problems of generalisation, the problem of qualitative research often has difficulties in generalising the answers found. Will also be discussed later, but the essence is that the research focus is on getting a contextual understanding of the organisation and problem, rather than trying to generalise it. (4) Lack of transparency, referrers to the problem to the qualitative researcher lack of explaining why and how the researcher did things in a particular way, with the biggest problem being lack of explaining in the data analysis section. This research will through clear explanations describe each step of the research process, making so the reader understands the choices made in each step and thus minimising lack of transparency as an issue.

3.2. Research Design

After conceptualising the report´s research strategy, it is possible to decide the appropriate research design, which according to Bryman and Bell (2015) is the term describing the structure of how the collection and analysis of data will be done. The authors further describe that there are five main design categories that can be used; Experimental design, Cross-sectional design, Longitudinal design, Case study design and Comparative design.

The experimental design usually suits quantitative studies and is essentially a research design that rules out alternative explanations, can be seen as a cause and effect analysis where the researcher manipulates variables of interest and then compare a treatment group and a control group (Bryman & Bell 2015). Without going too much in depth, it is quite clear that this research design would not be suitable to answer the chosen research questions since the researcher does not see a potential way to structure the experiment and what variables that would be manipulated to give data regarding KA-Group´s problem.

The cross-sectional design also usually suits quantitative studies and is a design aimed at collecting wide data, from multiple cases, at a single point of time to analyse connections between different variables (Bryman & Bell 2015). This design is also evident to be a clear

mismatch with the proposed research since it is a study regarding a single case (the organisation) that needs deep and rich data to create contributing knowledge.

The longitudinal design aims at collecting data to map changes that occur over time, where data are collected on a sample on at least two occasions (Bryman & Bell 2015). This design is not suitable based on that the research is aimed at finding and describing the organisational problems that have been depicted, not see how the problems change over time. A longitudinal design might be a good choice as the next step research for KA-Group, overlooking how the defined problem in this research changes over time. Also, viewing it in a more general perspective, longitudinal designs are usually an infeasible design choice in a master thesis, based on the limited timeframe.

Comparative design, or multiple case study in qualitative research, aims towards generating theoretical insights through the comparison of two or more cases (Bryman & Bell 2015). This could have been a possible approach since the primary data, which will be discussed later, involves respondents from two different departments within KA-Group. Thus, the researcher could have made the research into a multiple case study by mainly researching about differences between the department, however, the researcher felt that this scope would not yield the most significant results and chose a single case study instead, which will be described next.

The case study design is about a detailed and intensive analysis of a single case and is today a widely used design in business research (Bryman & Bell 2015). The choice of research design becomes rather apparent based on that the research is through a collaboration where the most important findings are through conceptualising the organisation as a single case instead of separating the organisation into multiple cases based on different departments. KA-Group will be the single-case the researcher will base his report on, seeking to answer the research questions through an intensive analysis of the problem and organisation.

The single-case study is a representative case study, defined by Bryman and Bell (2015) as a case study type, seeking to explore a case the exemplifies an everyday situation of an organisation. This case type fits the research most appropriately because the problems of understanding supplier innovations can be put in a more general context, namely the problems for organisations to understand and value innovations and suppliers as a strategic partner, which should be seen as common pitfall that many organisations have fallen into over the decades. Bryman and Bell (2015) also mention four other case types, that in some way do not fit the scope of the research. (1) A critical case is based on the researcher having a clear hypothesis to

investigate, which this research does not have. (2) The unique case is a case being unusual in its own right and therefore interesting to study, the chosen case is interesting by itself but cannot be seen as unusual, based on the general problem of organisations to grasp different aspects of innovation. (3) The revelatory case is based on the researchers' possibility to analyse a phenomenon that has previously been inaccessible by researchers, this is simply not coherent with the chosen case because supplier innovation is a concept that has been widely analysed. (4) The longitudinal case is similar to longitudinal research design because they are both based on analysing how a situation changes over time, thus this case type is also not applicable by the same argument made over longitudinal research designs.

One argument against case studies is that the results usually cannot be generalised. However, since the research is not aiming towards generalised results but rather, in-depth information about the sole case, making it an ideographic approach, meaning that the study does not seek to generalise results to others, should make the argument invalid in the scenario. Also, Bryman and Bell (2015) argue that it is the particularisation compared to generalisation, that is one of the main strengths with case studies.

3.3. Research Method

The research methods that were used to collect data is through both primary and secondary data collection and will be presented below.

3.3.1. Secondary Data

Secondary data were collected to create the theoretical framework (literature review) of the research. A literature review is according to Bryman and Bell (2015) crucial part of the research since it provides the researcher with the basis to justify the research question and also aids in constructing the research's design. The authors further describe that a literature review helps the researcher to show how the data is collected and how to analyse the data in a more structured way. The literature review consists of two main sections, a review of scientific articles and organisational documents from KA-Group. Literature review of scientific articles was used to find fitting information about supplier innovation, ESI and NPD in general. Seeking to find what supplier innovations actually are and how they can be useful in the context of involving suppliers early in NPD processes according to theory. Organisational documents are documents from an organisation and are described by Bryman and Bell (2015) as material that can provide valuable background information to the researcher, especially in a case study where it can be

used to do a description of the company. The organisational documents were mostly used to describe KA-Group in general, both the organisation in whole and the purchasing department.

Bryman and Bell (2015) distinguish two main ways to conduct a literature review of scientific articles, systematic review and narrative review. A systematic review is a literature review with explicit procedures aiming to minimise biases through exhaustive reviews of scientific articles. This usually entails the review to be seen as a strong evidence-based approach that is generally transparent and can possibly be replicable. Even though this approach seems to be a good approach to create a high degree of research quality, it is not seemed by the researcher to be the ideal approach in this particular research. This choice is based on some of the limitations discussed by Bryman and Bell (2015). Firstly, based on the exhaustive review criteria, results in the approach being seen as hard to be fully implemented by students, mostly by their limited time and resources. Secondly, the decision over inclusion and exclusion criteria of articles can be problematic, especially in a qualitative approach. Thirdly, an inductive approach, that this research is based on, can be problematic in a systematic review, since in a systematic review it is necessary to decide the main theoretical terms prior of the data collection, which does not fit well with an inductive research which needs the flexibility to change boundaries of their subject if unanticipated results from the data are collected.

With the systematic review being rejected, the narrative review was the approach this research applied. A narrative review instead aims at finding important interpretations of the literature it covers, through an initial impression of the topic the researcher wants to explore. The narrative approach is deemed more applicable based on, firstly, as mentioned above, the research topic requires a more flexible approach, where the researcher has the ability to modify boundaries based on what is found. Secondly, the approach requires less strict inclusion and exclusion criteria which yields a wider scope, which suits this research based on the need to be exploratory.

3.3.2. Primary Data

Primary data were collected to get a richer understanding of KA-Group and were based on the main findings from the secondary data. Connected to the first research question with a general definition of what a supplier innovation is through the theoretical scope, it was deemed necessary to analyse it through a comparison to KA-Groups own perception. Connected to the second research question with a theoretical explanation of where to implement ESI in NPD processes and a model for ESI integration, it was deemed necessary to get answers to where

ESI actually is applicable within the organisation, researching both product categories and purchasing segments, and analysing if KA-Group has the information needed in the integration model to fully understand which suppliers should be involved early.

Before a discussion regarding what method has been chosen to collect data, a discussion is needed over how the researcher sampled his respondents.

3.3.2.1. Sampling

Sampling is according to Bryman and Bell (2015) the segmentation of units that are selected to be a part of the research. It exists two distinct categories of sampling, probability sampling and purposive sampling. Probability sampling is a method for sampling the population on a random basis to usually increase the possibility for the researcher to find conclusions that can be generalised. However, since this research does not seek to find results that can be generalised, and probability sampling is usually used in quantitative studies, it was not be applied in this research. Instead, a form of purposive sampling was applied. Purposive sampling is a form of non-probability sampling where the researcher aims to collect a sample in a strategic way to fit the research question in a proper way. Although a purposive sampling method has been chosen it is still a question of what kind of sampling method that is most applicable. Bryman and Bell (2015) distinguish three different varieties of purposive sampling, theoretical sampling, generic purposive sampling and snowball (convenience) sampling, where generic purposive sampling was the chosen approach.

Generic purposive sampling resembles the theoretical sampling approach to some extent but is not connected to grounded theory and thus does not have the same iterative sampling style. This sampling method fits the research since it is described by Bryman and Bell (2015) to be useful when the researcher wants to gain insights to a wide range of roles within an organisation, which fits this research since it was important to get an understanding from different roles and departments at KA-Group to fully conceptualise the organisational problems presented. With the sampling, the approach discussed the next part will be to present the chosen respondents.

3.3.2.2. Respondents

From the literature review the researcher concluded that the most relevant respondents would be people from the purchasing and R&D departments, Table 1 and Table 2 will depict the chosen respondents from both departments. Further, more detailed information about the respondents can be found in Appendix 1.

Table 1: Respondents from Purchasing

Manager Within	**Code Name**
Interior	Respondent A
Powertrain & Chassis Products	Respondent B
Speciality Products	Respondent C
Direct Material Manager	Respondent D
Electronics	Respondent E
Metal, Plastics & Textile	Respondent F
Raw Material	Respondent G

Table 2: Respondents from R&D

Manager Within	**Code Name**
Interior	Respondent H
Powertrain & Chassis Products	Respondent I
Off Highway	Respondent J
Fluids	Respondent K
Couplings	Respondent L

As can be seen above in Table 1 and Table 2, the choice was made to show the respondents as two different groups to make it easier to fully understand, since some of the respondents in a generalised context "work" in the same category. Further, an explanation of the chosen respondents will be described below.

Regarding Table 1 of respondents within purchasing, respondents A-C are the managers of each respective product segment depicted in Figure 1, respondent D is the manager of the DM segments depicted in Table 2 and respondents E-F. are team leaders in each of the DM segments.

Regarding Table 2 of respondents within R&D, respondents H-I were deemed to have a good overall perspective of how NPD processes work in their specific product category, respondents J-L were instead deemed to have an overall perspective of the NPD process within their sub-product categories in Speciality Products, those were chosen since that product category are

seen to be more dispersed and there is no manager with an overall perspective of the entire category.

3.3.2.3. Choice of Qualitative Data Collection Method

Next important step is to decide the proper way to collect data from the sample group, Bryman and Bell (2015) describe three different methods. (1) Ethnography and participant observation, research method where the researcher immerses himself in some kind of social context over a longer period of time, aiming at understanding and describing the social context through the observation of behaviour. (2) Interviewing, a research method where the researcher gathers data through some kind of interviewing method. (3) Focus groups, research method where the researcher conducts interviews in a group setting, with multiple respondents at the same time, compared to ordinary interviews the researcher here also aims at studying discussions that arise between the respondents in the group.

The only research method that was deemed to be viable in this research was ordinary interviews, based on the difficulties the other would present. Ethnography and participant observation simply does not suit the chosen research questions and also is a time-consuming approach, the time required for a proper participant observation was simply infeasible in the context of a student thesis. Focus groups did not fit the research well based on KA-Groups global strategy, which means that the respondents in the research were spread out in the world, making a focus group highly unlikely to work.

With interviews chosen as the research method, the next step is deciding what kind of interviews that the researcher believes are most appropriate. There are two main choices of interviews in qualitative research according to Bryman and Bell (2015), unstructured and semi-unstructured interviews. Unstructured interviews are like the name depicts, almost completely unstructured in the sense that the interviewer only has brief notes on what is important to discuss, this approach is a good fit when the researcher wants to understand the participant's worldviews of a social setting or of people sharing attributes. Semi-unstructured interviews instead are more specific, with the researcher usually having an interview guide with the most important topics to cover, but except the predetermined questions in the guide, the interview is flexible. Semi-unstructured fits well if the researcher from the start have a quite clear focus on what he wants to focus his research on. Based on the research having a clear focus on what will be investigated from the start, a semi-unstructured interview approach was applied.

3.3.2.4. Interview Structure

With semi-unstructured interviews, the choice was made to use interview guides to make it easier to stay on topic and is depicted in Appendix 2. Two main interview guides were used, one for R&D and one for purchasing. As can be seen in Appendix 2, the interview guides were structured in predetermined categories which enabled an organised way to collect and codify the data, the codification of data will be further discussed in data analysis method. The interview guides were sent to the respondents beforehand, so they could have a chance to get familiar with the topics the researcher wanted to ask about.

The interviews were held face to face when feasible but since KA-Group is a global organisation, skype was needed for some of the respondents based on the distance. The interviews were started with an overall introduction before going into the interview questions. The aim of the introduction was to make the respondents comfortable, understand the reason of the research and also avoid overstepping ethical principles, such as invasion of privacy, deception and lack of informed consent (Bryman & Bell 2015). To not overstep the respondents' invasion of privacy, they are all anonymous and been given coded names as can be depicted in Appendix 1. It was also important to clearly state that recording and transcription would be used if they gave their consent and that their answers would only be used for the research purpose.

The choice was made to do partial transcriptions of the interviews, the choice of disregarding full transcriptions mainly stems from it being very time-consuming, taking five to six hours transcribing every hour of speech (Bryman & Bell 2015).

Lastly, regarding language during the interview. The interviews were held in both Swedish and English based on the respondents' national scope, which resulted in the transcriptions being in both English and Swedish to stay as close to the original as possible but was translated into English in the empirical findings. Language is especially important based on two main factors. Firstly, usage of correct and not too complicated language is important to make the interviewees fully understand the questions and therefore decrease the risk of interpreting the questions wrong (Bryman & Bell 2015). Secondly, since some interviews are held in Swedish it is important that the translation in the empirical chapter is done as correct as possible, which is seen as a problem in qualitative studies according to Xian (2008) that stated that translating the data can have linguistic, cultural and methodological problems.

3.4. Data Analysis Method

A proper data analysis method is important based on how rapid data can be collected and become a challenge to manage and thus derive conclusions from (Bryman & Bell 2015). There are three specific ways to analyse collected data according to Bryman and Bell (2015). (1) Analytic induction is in a simplified explanation, an approach where the researchers try to find a universal explanation of phenomena by collecting data until there does not exist any inconsistencies with the proposed hypothetical explanation. (2) Grounded theory is described as theory generated from data, data that have been systematically been gathered and analysed through the research processes in an iterative manner, meaning that data collection and data analysis occurs at the same time, data is collected through theoretical sampling which is then analysed, if theoretical saturation has not occurred, the procedure repeats itself until theoretical saturation has occurred. (3) Thematic analysis is a qualitative method where the researcher extracts key themes from the collected data, themes do not have a distinct definition but can, in general, be seen as a category identified through the data that provides the researcher with the basis for analysing and decide if it can make a theoretical contribution.

Analytic induction analysis can quickly be disregarded on the simple basis that the researcher did not think it would be possible to state a hypothetical explanation of the research questions. Grounded theory, on the other hand, would have been an analysis method that could have suited the research well because it is a good approach when it is important to understand complex topics and the research starts broadly and then narrows down. But the researcher decided to discard grounded theory based on the iterative and strict processes it needs to follow, it is a very time-consuming and complex method. Thus, the researcher has chosen to analyse the research through a thematic analysis, which basically follows the same codification of data as grounded theory (Bryman & Bell 2015) but does not have the same iterative and extensive processes.

Since the predetermined categories in the interview guide were rather separated from the start and the researcher categorised the questions to easily be linked to what was needed to be investigated to supplement the findings in the literature review, it resulted in a quite simple thematic analysis. The answers from the interviews where codified which then could be used to create three distinct themes; Perception of product innovation and supplier product innovation, New product development processes and perception of supplier involvement, and knowledge about suppliers.

Coding is usually seen as an important first step in the data analysis stage, but there are some concerns that Bryman and Bell (2015) describes. The main problem that can occur when using a thematic analysis is the codification of answers, with most criticism laying on the loss of data, either through losing the context of data or the fragmentation of data. With the clear categories used in the interview guide, proper transcription that was done immediately after an interview and a relatively small sample size make the researcher assume that these issues should not interfere with the data analysis.

3.5. Research Quality Criteria

Proving the research quality is important in order to validate the research findings thus strengthen its contribution to knowledge. Usually, when assessing the quality of research three measurements are used, Reliability, replication and validity (Bryman & Bell 2015).

Reliability is a term describing how stable measurement of a concept is and is usually a quality criterion most used in quantitative research. Reliability measurements, especially external reliability, which measures how well a study can be replicated, is complicated in qualitative studies since it is impossible to "freeze" time and the social setting that was studied at that particular time, thus it can be seemed to almost be impossible to truly replicate a fully qualitative research. Internal reliability is to what extent the group of researchers agree on how they have interpreted the data, since the researcher is doing the research by himself it is especially important that he seeks guidance from external parties, such as thesis supervisor or supervisor at KA-Group, to conclude that the interpretation of data is correct.

Replication is closely related to reliability in the sense that it is a measurement describing to what a degree a study can be reproduced by others. Replication is not described by Bryman and Bell (2015) as a criterion that is used in qualitative studies and thus it will not be further discussed.

Validity is the overall concern of the research integrity regarding the conclusions that are created through the research. There are several validity measurements, Measurement validity, Internal validity, External validity and Ecological validity, but usually, only internal and external validity is discussed from a qualitative perspective. External validity concerns to which degree findings can be generalised, as discussed earlier, this research is not putting emphasis on finding generalised based on it being a single case study. Internal validity is about if there is a good match between the researcher´s observations and the theoretical ideas that have been

developed. Proving internal validity is usually one of the strengths of case studies since they often provide detailed data.

In general, what can be clearly depicted above is that qualitative studies usually have difficulties in proving these criteria, since they were originally created to measure quantitative research. These criteria are especially difficult to prove in case studies, where Bryman and Bell (2015) even describes that often it is up to the researcher to do an assessment of how well the criteria fits the research, meaning the importance of them to the general quality discussion of the research. With these difficulties, qualitative researchers have created two alternative categories to assess the quality of research, trustworthiness and authenticity. The former of the two was applied to this research and includes credibility and confirmability.

Credibility, ensuring that research is carried out in good practice Bryman and Bell (2015). Good practice was upheld by doing the report in a proper way, meaning no plagiarism and informing the respondents in a proper way what the research is intended to. Confirmability, ensuring that the researcher has acted in good faith and tried to eliminate or clarify biases. This is especially important in a single case study in collaboration with an organisation to try to be as objective as possible, otherwise, there can exist doubt over that the findings are skewed in favour of the organisation.

4. Empirical Findings

The empirical findings chapter is divided into two main parts, one containing the findings from the respondents in Kongsberg Automotive´s purchasing department and the other in the R&D department, this structure was deemed by the researcher to be the most coherent way to depict the respondent's answers. Each of the main parts also contains four main categories, the three first being the main themes depicted in the methodology chapter and the last being a simplified summarisation of the findings.

4.1. Purchasing

4.1.1. Perception of Product Innovation and Supplier Product Innovation

4.1.1.1. Perception of Product Innovation

Respondents within the purchasing department (Respondents A-G) described the concept product innovation generally in similar ways, the respondents aligned regarding that they see a product innovation being something new on the market. The respondents further answered that a product innovation could both be development on existing products or completely new product on the market. Development of existing products was described by Respondent C (Manager of the product category Specialty Products) as something that simplifies and improves the products they have today. Respondent A (Manager of the product category Interior) stated that it is doing things in a different way, the functionality of the product can be the same but changes in how to achieve the function is the key, finding new ways to achieve the same functionality should result in KA-Group´s product being cheaper, lighter and more optimised. Respondent A continued with that in their business, the function is given by the customers which are standard since KA-Group is not a company that develops new functionalities every year and selling them to customers.

Even though both ways were mentioned, the majority of the respondents put a strong emphasis on the importance of being innovative enough to bring completely new products to the market. Innovation generating new products was described as important because it gives KA-Group the opportunity to create unique products in the market, that sets them apart from their competitors which then can strengthen their competitive advantage.

"A competitive advantage is driven by the economy, reaching a final goal and becoming stronger in the market" – Respondent F

4.1.1.2. Perception of Supplier Product Innovation

Respondents within purchasing were rather aligned regarding the potential effects of product innovations from suppliers, it was seen to be a driver to improve the same organisational objectives as described above. However, what a supplier product innovation actually can be differed among the respondents.

Respondent B (Manager of the product category Powertrain & Chassis) stated that KA-Group buys components from their suppliers because they are necessary to the customer, innovation from a supplier could thus be on the components the suppliers create that make KA-Group create their own products in a different way. Respondent A had a similar line of thought by the main innovations being improvements to the components they buy from suppliers and further explained, that KA-Group is buying parts according to specified drawings that are given to the suppliers, which means that KA-Group is doing most of the development work.

Respondent F (Manager of the DM segment Metals, Plastic & Textile) stated that a product innovation does not just need to come directly from the supplier but can also be something that KA-Group push, using the supplier as some form of a developer, that shares the work and resources. Respondent G (Manager of the DM segment Raw Materials) followed this line of thought stating that a supplier has to some extent be involved in realising the product KA-Group create and also that the push can come in either direction. Respondent D (Manager for the DM segments) stated that it can be a collaboration with suppliers regarding solutions that they come up with, that there is a new technology to build on an existing solution. Respondent E (Manager of the DM segment Electronics) also said that a supplier product innovation indeed could be in the form of new technology that comes to KA-Group which enables them to develop new products, but he further described that it is not where the big difference happens, it is not where differentiation to the competition occurs.

"Supplier innovation opens up the opportunity for us to work in new ways, working directly with the supplier and have an understanding of where you want to go together, creating a future strategy together" Respondent – E

4.1.2. New Product Development Processes and Perception of Supplier Involvement

4.1.2.1. Internal New Product Development

The respondent's knowledge about the internal NPD processes in KA-Group (called New Product Introduction within the organisation) varied some. The managers for each product category (Respondent A-C) and the category DM manager (Respondent D) stated that they had

a good understanding of how the processes work within their categories and are involved at an early stage. The other respondents (Respondents E-G) within purchasing that all are working directly with DM had more limited knowledge, their knowledge mostly coming from working on previous projects. Respondent F further stated that their knowledge could definitely be improved, and the category buyers do not directly work with these processes, they have supported but it has primarily been the project buyers who have been involved.

4.1.2.1.1. Perception of Internal New Product Development Processes

Next question surrounded the respondent's involvement and perception of the organisations NPD processes. Respondent B said that they within the product category Powertrain & Chassis have meetings where the head of engineering discusses new technical innovations or new ideas, and the purchasing department should also be involved, discussing improvement opportunities from the supplier pool. Respondent C also mentioned this early involvement which is called a start-up meeting. In this start-up meeting, every department should be involved to decide on a long-term plan, according to KA-Group´s NPD process, the meeting should always take place but is not the case in every project. This is one important challenge to solve according to Respondent C because if purchasing is included in an early phase, the purchaser has time to source the right supplier they are looking for and can then even include the suppliers early. If this meeting does not happen and purchasing instead first gets involved in the NPD project at the design phase to source a supplier, it is too short of a time-frame to be successful. This may also result in R&D developing a design concept that none of the suppliers can handle based on the lack of information from the beginning.

The importance of early involvement is also expressed by other respondents. Respondent E stated that he knows that the most important aspects of a project need to do be done long before the design phase, it is important to front load resources. The purchasing department must be involved earlier and be more involved in the NPD in order to find and utilise the right suppliers which are also expressed by respondent F. Respondent E explained if they instead can participate in the idea generation, they can start scanning and see which suppliers fit in well much earlier. Respondent D also stated that they are not involved enough and said that the early phases of NPD are already completed before purchasing gets involved. The best thing according to her would be if they have an idea about what should be bought, not everything but, with some of the complex components KA-Group has problems with. Instead, it may be that R&D itself has a proposal that may not be the best. Respondent G also described the importance of early

involvement but felt that one issue could be that the NPD processes are not followed fully, for example by rushing the early stages which makes it difficult to even involve purchasing.

4.1.2.1.2. Communication with R&D

One of the main causes of the problems in NPD depicted above, is thought by respondent D to be caused by the R&D´s lack of communication and their inclination to do it themselves, but she also thought purchasing has not sufficiently pitched the importance of involving purchasing and thus it is not certain that people think that the suppliers can give much value-added in their own processes.

However, KA-Group has taken measures to decrease the lack of communication internally by the creation of the category management teams. Respondent D said that it has helped, cross-functional communication which is the key since all functions have the opportunity to get information from others and also express their own ideas and knowledge. Respondent E and G also described the category management teams positively, Respondent E thought cross-functional cooperation is a key to continuing to develop and disseminate information more effectively, especially when they are such a globally dispersed company, which also Respondent G discussed by stating that the cross-functional collaboration can make it easier to share information about their suppliers, the category management teams have been active for around 2-3 year and some have worked better than others, mostly depending on the individuals commitment. Respondent G further emphasised on the increased co-operation internally through cross-functional collaboration which is extremely important, that can also result in R&D being more involved with communication to suppliers.

4.1.2.2. Perception of Involving Suppliers

4.1.2.2.1. Effect of Involving Suppliers

The majority of the respondents saw clear benefits of involving suppliers, mostly noticeable in obtaining expertise, involving suppliers early and emphasising on functionality.

Respondent B described that they could theoretically develop everything in-house and would thus own all the knowledge and intellectual property rights. The reason KA-Group need to have suppliers as an external source of knowledge is because suppliers are the experts in what they are doing and with their own development work they can provide KA-Group with good technical solutions and knowledge in areas they lack enough know-how. Respondent D followed the same line of thought and said that KA-Group is good at what they are doing but they cannot do everything, KA-Group should highlight and make use of the suppliers´ expertise

and really become their extended arm. Respondent E stated in other words that KA-Group is the expert in the system they create and not the subsystem of suppliers, KA-Group does not need to have that expertise because that is the whole reason of using suppliers. He continued with that if the suppliers give feedback it should be listened to. If the feedback is disregarded it is a high chance of their product ending up with poorer quality or more expensive, if that happens it is KA-Group´s fault and not on anyone else.

Respondent C also focused on expertise but discussed it more directly on the effects involving suppliers early could yield, bringing in innovative suppliers early can help them define what KA-Group is looking for but is something they are prioritising far too little and could not pinpoint to specific factors based on the complexity of involving suppliers. What KA-Group gets from taking in suppliers early is the expertise and knowledge to optimise the product, quality, sustainability, price and so forth. The more time and effort that is put in early in a project and involve suppliers, the lesser the costs will be at the end of the development. Respondent F also discussed this aspect by pointing out the potential saving of time by involving suppliers, by doing right from the start. Respondent C further described that not only in KA-Group but in general, companies emphasises too little in the beginning of a project which later on in the project will create problems or a realisation that the product could have been improved even more, which will be difficult and expensive to change later on in a project, especially when the concept is defined. Respondent G said that within raw material early involvement is very important because it needs to be decided very early on in the product development, it will be very difficult and expensive to change raw material at a later stage because it can have major effects on the nature of the product.

Respondent E discussed the potential effects of having a mindset of thinking more about the functionality when quoting supplier, the mindset of using function specifications was a big part of his team being awarded the KA-Group´s internal innovation award 2019. According to him, the innovation award was not really based on the product that was developed, the product was actually quite simple and not new. What was new were that they have a partner supplier who makes this product based on functions instead of an exact specification. They went from a specific specification to a specification focusing on the functionality instead. He further described that the focus on functionality is something he tries to do with all of his main suppliers, that is when it is possible to open up the dialogue. Respondent F also discussed the benefits of focusing on functionality. He said that KA-Group has many built-to-print suppliers, they draw up a finished drawing and ask the supplier to create that component exactly like the

specification are requiring. The supplier is an expert of what they are doing and if KA-Group let the supplier come more with their own ideas through using functionality focus it could have a great effect of obtaining their innovative capabilities.

Regarding involving supplier in their specific category within KA-Group Respondent E´s involvement of suppliers was previously discussed, but some of the other respondents also gave further insights. Regarding Respondent B´s own field he stated that supplier involvement is important since they create products in a very cost driven and changing market by the development of electrification, which makes them very dependent on improving their product portfolio step by step. Respondent F stated that he saw it being quite beneficial in his field, they had recently worked with a supplier to produce new material and this supplier received the internal innovation award in 2018. Respondent G said that he thought it could be especially beneficial in Electronics where KA-Group is not optimal, in the form of cost optimisation compared to competitors based on their development being too complex and slow which makes it expensive. Regarding Respondent G´s own field he also stated that they can make big cost savings by involving suppliers. Respondent C discussed in his field of Speciality Products that the sub-category Off-Highway is a special case in KA-Group based in their "high mix low volume", which was described as a high degree of customer-specific products but in a low volume compared to the other product categories within KA-Group. Respondent C described them having the expertise in-house but in order to get the most out of innovation, they still need to integrate suppliers early in the NPD processes.

Respondent A also described that they have done some innovative work with suppliers within Interior but should be seen as an exception. Other than that, it can be noted that Respondent A´s answers differentiated compared to the others. Respondent A thought it was a difficult question to answer based on the difference in their different business areas. Also, there are only a few areas where it would make sense that a supplier really is giving them a competitive advantage in the form of innovative products in his field of Interior. In its essence most of the parts are created in-house, there is not much room for a supplier to come in and be innovative. But if KA-Group lacks the know-how it was seemed to be obvious that suppliers should be more involved but as soon as it is getting interesting and the value proposition is high, they try to do it on their own which was seen as an unfortunate tendency. The lack of innovativeness from suppliers was explained by that they do not have that much innovation-driven supplier components within Interior. KA-Group is doing the R&D and the design work by themselves own and the suppliers mostly does build-to-print components. He thought KA-Group should

do more specifications regarding functionality than complete build-to-print because they are limiting themselves by doing the design in-house. The problem according to Respondent A is that when a specific project for a customer is won, it is already defined how it should look like, the requirements are set which limits the environment for innovation. When the customers are in to play the design is already done to like 80% and when innovation should come into play they are earlier in the overall steps, not when already winning a project with customers. Furthermore, Respondent A described that finding new innovative solutions to the functions in the product they sell is not a priority, which is based on resource issues and a priority to instead improve the current products in the portfolio.

4.1.2.2.2. Difficulties of Involving Suppliers

The main problems of involving suppliers seemed by the respondents to be KA-Groups perception of in-house development, slow processes to take advantage of ideas and too short quotation time.

Respondent D thought the low degree of involving suppliers caused by both sides. She continued to explain that she thought KA-Group has not been ready internally, KA-Group wants to develop as much as possible in-house. Respondent E follows the same line with that they are not mature enough in that regard to work with suppliers at such a deep level. KA-Group has a strong perception of being so sufficient in-house that they can find the optimal solution to all problems instead of working with suppliers. Respondent A explained that KA-Groups tendency to try to produce in-house is making it hard to bring in someone that has a great idea and is even making suppliers very cautious and very hesitated to open the book for us. The feedback Respondent A get from both now and from previous work is that KA-Group has a poor reputation in the market in regard to innovation and using suppliers, he thought that is driving the suppliers to keep KA-Group more at arm´s length and is seen as a buyer that just requests build-to-print and have good know-how in R&D development internally.

Respondent F saw a problem of involving suppliers based on their short quotation times, which makes it very difficult to involve suppliers.

Regarding slow processes, Respondent D explained that the few times they have had suppliers who have brought up new ideas they do not have good processes to take care of them internally. In order to start a change-work, KA-Group has processes that are too complex and too long that depletes all energy of the project. This is also mentioned by Respondent E which described that why some suppliers are slower than others in adopting the functionality specifications was

mostly based on them. KA-Group may have asked these suppliers to come up with suggestions for improvement that they have made, but they do nothing with them.

"When these proposals are not taken seriously, why should the suppliers be quick and come up with new proposals then?" – Respondent E

4.1.3. Knowledge About Suppliers

4.1.3.1. Level of Contact with Suppliers

In general, the respondents' level of contact with the supplier varied dependent on what kind of supplier, key suppliers were identified as the suppliers that the respondents within purchasing put most emphasis on.

Respondent D stated that the level of communication varies between suppliers, they do not currently cover their top 100 suppliers which in aggregated sum is 70% of purchasing´s total spend, but further explained that it is with these suppliers she saw the biggest possibility to deepen their relationship with. Respondent D also mentioned their current supplier segmentation project that is important for them to get a clearer understanding of their suppliers' capabilities, important today with their big supplier base but also for the future consolidation of the supplier pool. In the segmentation, they define if a supplier is strategic, important or mostly transactional. The segmentation of these three categories can be seen as a pyramid and is depicted on the next page.

When segmenting suppliers three main factors are in consideration, critical components, innovative capabilities and spend. The suppliers can be conceptualised in a pyramid based on the size of each segment. It is a small peak with around 10-12 suppliers who are strategically important for KA, strategic suppliers are the ones KA-Group especially needs work very closely with.

Being seen as a strategic supplier comes down to their business impact, it can be a supplier who may not be the largest in spend but if something happens to that supplier KA-Group will have significant problems since there is no other supplier in the market that can make the same component to their requirements. The critical component factor is the main deciding factor if the supplier needs to be seen as strategic, but innovative capabilities is also a deciding factor. Important suppliers are also necessary to have communication with but do not involve as much interaction. Lastly, the transactional suppliers which are the biggest supplier segment are not

focused much on deeper interactions, they are for the most part built-to-print suppliers, which KA-Group needs based on their own products being for the most part built-to-print.

Figure 5: Kongsberg Automotive´s Supplier Segmentation Structure

Own elaboration

Regarding the respondents that are managers for KA-Groups product categories their main direct communication with supplier depended on the current projects taking place, mostly being involved with the key suppliers and when problems with suppliers occurred. Regarding their teams Respondent A stated he tries to get them to interact a lot with suppliers. They need to know what is going on the supply side. There is now value add to have buyers only doing desktop studies.

Respondents managing each main DM segment stated that their teams have good communication with key suppliers and their top 100 suppliers. Respondent G further discussed that he thought the communication was especially good with injection moulding suppliers within Raw Material suppliers since higher management is more involved based on their previous knowledge in that area. Otherwise, management is mostly involved when problems occur.

4.1.3.2. Technology Roadmap

The knowledge about their supplier's technology roadmap, meaning knowledge about their short and long-term plans regarding future product development plans and strategy was aligned with the majority of the respondents. Mostly in regard to that, they lack knowledge but sees it as an important factor going forward.

Several of the respondents answered that they, in general, are lacking this information due to KA-Group´s supplier pool is quite large, the exceptions are some of the key suppliers they are

working closely with. Respondent E stated that it is something that they try to check every time they have a supplier meeting, to see what the suppliers really want. Many of the suppliers are much larger than KA-Group is, they are world leaders in their fields. With that, it is extremely important for KA-Group to find out if the suppliers want to grow with them and to facilitate that KA-Group needs to explain their own future plans to assess how strategically involved the parties should be.

"It's about daring to share that information" – Respondent E

Understanding the supplier's technology roadmap is also something that is a key factor in the organisation's segmentation project but will firstly be efficient when KA-Group starts to consolidate their supplier pool. As Respondent C and D explained the purchasing department does not have the resources to deepen their relationships with suppliers with the current supplier pool, which makes it difficult to efficiently acknowledge the supplier's future strategic plans. Respondent D further stated that it is also important that they need to set up processes to handle this correctly. Lastly, Respondent A said that he thought the knowledge about supplier's technology roadmap exists in some situations but is not brought in systematically and is instead by the individual buyer. The category management team should, in theory, discuss areas such as this but it is not optimised.

4.1.3.2.1. Information Sharing

What could be noted from the respondent´s answers were that it was quite a mix between the perception of KA-Group being sufficient with information sharing or being an area that needs improvement.

Some of the respondents stated that they think in general that the information sharing is good, most discussed in the line of KA-Groups own information sharing. Respondent B said it feels that there is a lot of information sharing, on all levels. Respondent D and F thought KA-Group is quite good at sharing information when they meet with the suppliers but was, of course, dependent on the level of relationship. Respondent G said it is happening partly but definitely needs to be more, they are trying to be open. Within his DM segment of Raw Material, they try to inform the suppliers about what is going on, which projects that are happening etc. He further explained that information sharing most often happens in the earlier stages, when projects or serial production already is running, it will be less of such information. Respondent E believed their current level of information sharing is not good and could definitely be improved. It is only with a few suppliers that they have a higher degree of information sharing with. The ones

they have it with have been created by KA-Group having problems internally and then reached out to the supplier for help.

Regarding what kind of information that is shared or not, Respondent C answered that he is unsure on exactly how transparent they are towards the supplier, he further described that it is not in all cases that they show the supplier the final product, they can show the specific component KA-Group want the supplier to create and can share more information about the specific component if they are having problems, to give the supplier a better picture of what the component will be included in. One factor to this is that a lot of information can be sensitive based on their development projects. Respondent B also followed this line of argument with the sensitivity of the information that results in KA-Group being less specific with some basic information.

Information sharing from the suppliers' side also seemed to differentiate depending on the relationship. Respondent F thought suppliers usually share information but is depending on if the information is sensitive or at a fairly early stage, which might result in KA-Group not receiving a full disclosure. According to him, the most important aspect is to ask the right questions because otherwise, it will not be possible to know if the suppliers actually want to share or not. This is why it is especially important to educate purchasers in seeking to receive more information. Respondent G thought the main reason for suppliers being unwilling to share is based on KA-Group has historically been poor at taking advantage of the information given by suppliers which counteract their willingness to share information in the future. This is something that the whole automotive industry is affected by, that the validation of changes is too slow and complex. Respondent E explained in the same line of argument that he thought information sharing from suppliers is lacking because they do not invite and talk. KA-Group does not want to acknowledge that they are not experts in everything and need help in certain areas. He ends his argument by saying that it is not about just taking information but also to gain trust and working together.

"When we then have established the trust of the supplier they are not just a supplier, but an extended arm" – Respondent E

Respondent C and D both discussed that they have experienced the best level of information sharing with their mentor suppliers. Where both parties actively pursue the goal of establishing tighter connections, sharing information about technology, innovation and future goals. Respondent D said that the primary contact with the mentor suppliers is through the corporate

management team, which makes each round of new mentor suppliers (cycle every two years) limited to 10-12 suppliers based on that they cannot allocate sufficient time if they would take in more.

4.1.3.2.2. Incentives

Regarding incentives, the respondents were also here a bit differentiated if the incentives are strong enough to involve suppliers strategically.

Respondent B stated that suppliers do indeed have the incentives, their main incentive is to sell their products. Most of these suppliers are earning their money by series production and KA-Group is able to sell high quantities to automotive customers. Respondent C described that he believes they have the incentive saying that at the end of the day it is about interest and the possibilities available. Respondent F thought the main incentives are that they can take part in growing with them if it is going well for KA-Group, primarily the financial incentives of being able to sell a relatively high volume to us. Respondent D thought generally that they have some good incentives, most prominent being how the mentor program has given good results. The mentor program gives the supplier a potential growth by developing together with KA-Group.

"The closer relationship creates behaviour and trust to share information and being more open towards each other" – Respondent D

Respondent E thought it depended on which segment, in certain categories in Powertrain & Chassis they are very good at this because they share more information with the supplier, which makes it is much easier to cooperate with suppliers because they also want to be part of their future plans. In others, especially in Speciality Products, where they are much less likely to share information, it becomes more difficult. Respondent G also stated that it depends on different situations, but in general, the incentives are rather weak which might make the deal unclear and risky for the supplier. He continued by stating that it can be perceived risky for the supplier based on that they do not always have it clear if their development work on a component will secure them the sales, he has experienced situations where KA-Group paid suppliers to develop a component to their requirements and afterwards have given the sales to another supplier based on them being able to drop down in price, which is a fair trade but might make some suppliers less interested.

Respondent A, on the other hand, thought KA-Group does not have enough incentives, one part of it being his perception of KA-Group in the market that was previously discussed. He also

stated again that if the supplier has capabilities that are really interesting they should instead acquire the suppliers, to still have the intellectual property rights and transfer the know-how in-house. Respondent B follows this argument to some extent by the desire to have the development and know-how in-house. He prefers to have significant ownership in the final design. The more of the design, the more of the product they own, the better it is for them. It is better because it makes them independent of the supplier, getting the full return. Respondent B finishes the statement with that KA-Group should have the know-how in-house but in reality, they, of course, do not have all the know-how and they thus need know-how from suppliers.

Respondent B further stated that it happens that the incentives are not enough, where suppliers cancelled contracts because they feel they have spent too much time with the project and do not see the payback being at the same level. Respondent F thought the main issue is not the incentives to the supplier but rather their mindset within the organisation that has been that it should be very cheap. Automotive is extremely competitive, but if they want to reach somewhere, KA-Group has to become a market leader by having products that are very good compared to competitors. The price is, of course, an important factor, but one has to drop the cost mindset to some extent and instead develop with the suppliers.

4.1.3.3. Technological Change

The perception of technological change varied some in the different categories and will be discussed individually, starting with the product categories.

Respondent A stated that in the product life cycle in Interior basically is like the lifetime of a car which is 6-7 years. The original concept of what they are producing today is based on a concept from 20-25 years ago. The main change is components that have become lighter, cheaper, more optimised. Respondent B explained that they within Powertrain & Chassis actually are facing significant changes, mostly due to the electrification trend that affects the product in his portfolio. As an example, they launched at the beginning of 2018 a transmission module which is a completely new product for KA, it has a complexity that KA-Group has not had before. Even though he sees significant changes occurring in the market he believes it will not affect the products life-cycle in general. Respondent C answered that it was rather slow in general in Speciality Products.

Respondent E stated that automotive electronics at the level they are doing are not really innovative. It is quite standard products that they are working with, safety and quality is the main focus. Respondent D also mentioned Electronics and believed this was the DM segment

that was changing the fastest out of the three, it is also where she felt KA-Group lacked the most know-how in general. Respondent F said that within Metals, Plastic & Textiles it is quite slow, not very changeable. Generally, there are very small changes that are usually unfortunately driven by the cost aspect and the market is moving at the same rate, not especially technology driven in general. Respondent G thought Raw Materials moved slow, it is a slow market that does not exactly come up with new materials every year that can be used in production.

4.1.3.4. Design Expertise

The majority of the respondents saw design expertise as something that their suppliers had.

Regarding the product categories, Respondent A stated that in some of the area's suppliers had the expertise that KA-Group lacked. Respondent B felt that suppliers definitely have design expertise, in many cases, suppliers have most of the expertise and they lack it in-house. Respondent C described that suppliers have it, but KA-Group does not need access to it in all cases. If they are looking for a build-to-print supplier, expertise is not the focus since KA-Group has the expertise in-house. But when suppliers are working on more complex components and they do not have the proper expertise, then it is a necessity to access the supplier's expertise.

Respondent D said that within the DM segments, the few they work closely with have this, it is more a question of how to access it. Respondent F said that a lot of the components from the supplier in his category are based on clear specifications. But he still thought that suppliers, in general, have a high capacity, especially their key suppliers anyway. Respondent G felt it was doubtful because Raw Material is a rather simple product, the raw material supplier is by definition quite far from the final product, but he still emphasised that some supplier definitely might have it.

"They definitely have it, but the question is whether we let them use it?" – Respondent E

4.1.4. Summary of Purchasing

Below Table 3 and Table 4 has been made to show a simplified summarisation of the empirical findings from the purchasing department. The key phrases used are not in all cases words the respondents exactly used, but are simplified phrases used to show the respondents similarities and differences more clearly. Lastly, since the interviews were held in a semi-structured form, some of the topics covered in the table were not answered by every respondent.

Table 3: Summary of Empirical Findings from Product Category Managers in Purchasing

		Interior (Respondent A)	**Powertrain & Chassis (Respondent B)**	**Speciality Products (Respondent C)**
Perception of Product Innovation and Supplier Product Innovation	Product Innovation	• Competitive Advantage • Functionality • Unique Products	• Functionality	• Competitive Advantage
	Supplier Product Innovation	• Improvement of Components • Same Benefits as Above	• Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above
NPD Processes and Perception of Supplier Involvement	Knowlegde of NPD processes	• Good Knowledge	• Good Knowledge	• Good Knowledge
	Perception of NPD processes	-	• Early Involvement Needed	• Early Involvement Needed • Processes Not Followed Fully
	Communication With R&D	-	-	• Needs to be Improved • Cross-Functional Communication
	Perception of Involving Suppliers	• Expertise to some Extent • Functionality	• Expertise	• Early Involvement • Expertise
	Involving Suppliers in Their Field	• Doubtful	• Yes	• Yes
	Problems to Involve Suppliers	• Focus on In-House Development • Reputation	-	-
Knowledge About Suppliers	Level of Contact with Suppliers	• Key Suppliers • Problem Suppliers	• Key Suppliers • Problem Suppliers	• Key Suppliers • Problem Suppliers
	Technology Roadmap	• Not a Priority	• Some Key Suppliers	• Mentor Suppliers • Important Factor in the Segmentation • Some Key Suppliers
	Information Sharing	• Yes	• Yes	• To Some Extent
	Incentives	• Long-Term Contracts	• High Volume Potential • Securing Sales	• Yes
	Technological Change	• Slow	• Fast	• Slow
	Suppliers Having Design Expertise	• Some Areas	• Yes	• Some Areas

Table 4: Summary of Empirical Findings from Direct Material Managers in Purchasing

		DM Categories (Respondent D)	**Electronics (Respondent E)**	**Metal, Plastic & Textile (Respondent F)**	**Raw Material (Respondent G)**
Perception of Product Innovation and Supplier Product Innovation	Product Innovation	• Competitive Advantage • Unique Products	• Competitive Advantage	• Competitive Advantage • Revenue	• Unique Product
	Supplier Product Innovation	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above
NPD Processes and Perception of Supplier Involvement	Knowlegde of NPD processes	• Good Knowledge	• Limited Knowledge	• Limited Knowledge	• Limited Knowledge
	Perception of NPD processes	• Early Involvement Needed	• Early Involvement Needed	• Early Involvement Needed	• Early Involvement Needed • Processes Not Followed Fully
	Communication With R&D	• Needs to be Improved • Cross-Functional Communication	• Needs to be Improved • Cross-Functional Communication	-	• Needs to be Improved • Cross-Functional Communication
	Perception of Involving Suppliers	• Expertise	• Expertise • Functionality	• Early Involvement • Expertise • Functionality	• Early Involvement • Expertise
	Involving Suppliers in Their Field	• Yes	• Yes	• Yes	• Yes
	Problems to Involve Suppliers	• Focus on In-House Development • Slow Processes	• Focus on In-House Development • Slow Processes	• Short Quotation Time	-
Knowledge About Suppliers	Level of Contact with Suppliers	• Key Suppliers	• Key Suppliers	• Key Suppliers	• Key Suppliers
	Technology Roadmap	• Mentor Suppliers • Important Factor in the Segmentation • Some Key Suppliers	• Some Key Suppliers • Important Factor in the Segmentation	• Some Key Suppliers	• Some Key Suppliers • Important Factor in the Segmentation
	Information Sharing	• To Some Extent	• Yes	• To Some Extent	• To Some Extent
	Incentives	• Mentor Program	• To Some Extent	• High Volume Potential • Potential to Develop • Securing Sales	• To Some Extent
	Technological Change	• Electronics Moving Fastest of DM Categories	• Slow	• Slow	• Slow
	Suppliers Having Design Expertise	• Some Areas	• Yes	• Yes	• Some Areas

4.2. R&D

4.2.1. Perception of Product Innovation and Supplier Product Innovation

4.2.1.1. Perception of Product Innovation

Respondents within R&D (Respondents H-L) described product innovation in somewhat similar ways, most stated that a product innovation could be in the form of both incremental and radical innovations.

Respondent J (R&D manager for the product sub-category Off Highway within Speciality Products) and Respondent L (R&D manager for the product sub-category Air Couplings within Speciality Products) answered in a similar fashion, that product innovation could be in the form of both completely new product or an improvement upon an existing method or function, this, in turn, can be in the form of new feature, function or a way of doing things.

Respondent K (R&D manager for the product sub-category Fluid Transfer within Speciality Products) said that product innovation as a concept basically is what he have been doing his entire career, which is managing product life-cycles through changes/improvements to the products. Respondent K further explained that an important part regarding product innovations is to have an incoming stream of ideas to evolve your current product or create brand new products. Incorporating this perspective should give the companies enhanced possibilities to remain competitive in the market, through a technology or cost perspective. Respondent I (R&D manager in the product category Powertrain & Chassis) also mentioned the importance of getting new ideas but also emphasised on the importance of making money from it as well.

Respondent H stated (R&D innovation manager in the product category Interior) that understanding what a product innovation is actually was something they worked with some years ago to define, based on the term generally being used quite loosely within organisations.

"Unique solutions that addresses a need that turns into money" – Respondent H

Respondent H further described that this is what he thought an innovation is but is not always the way they run projects, a variety of the projects are just incremental development projects, he thought of those as more of a development project rather than an innovation project. In the development projects, they are not looking for a unique solution, they are only tuning an existing solution to a function, but those projects are still done in the innovation group based on them being the most capable.

4.2.1.2. Perception of Supplier Product Innovation

The respondents within R&D were aligned over what a supplier product innovation could yield, it was seen to be a driver to improve the same organisational objectives as they described regarding product innovation, addressing needs, finding new solutions and increase revenue were the main key aspects.

All of the respondents within R&D also stated that they saw the potential of the suppliers generating innovations on their own components but also aiding in KA-Groups development work. Respondent K said that supplier inputs are very important since in his field of Fluid Transfer in Speciality Products, rely highly on supplier product innovations. He continued by stating that suppliers unlock their potential, particularly in the case of material development. It is important for Respondent K that his key suppliers have their own innovation and invest in R&D to keep moving the market forward, especially when some products are challenging in the market.

4.2.2. New Product Development Processes and Perception of Supplier Involvement

4.2.2.1. Internal New Product Development

Compared to the respondents within purchasing, it was not focused to learn about the respondents within R&D´s knowledge regarding KA-Groups internal NPD processes, since it was established before the interviews that they work closely with NPD projects. Instead, the researcher asked questions regarding if their NPD processes were aligned with the one used in the theoretical framework, their perception of how good the NPD processes are and the level of communication with Purchasing.

All of the respondents thought the NPD process the researcher chose for his theoretical framework was in general a close resemblance to their processes. Respondent J and Respondent L stated that the vocabulary is different, but the steps are in general the same. Respondent J further described that the NPD process is standardised across all NPD areas within KA-Group, but is also a flexible process, not every step applies to every product and described that a one size fits all approach tends to comprehend every possible step. Respondent I explained that they use a more detailed stage gate process. A lot of focus is on having knowledge before they start the design of a product since otherwise a lot of problems might occur in the later stages of the development. Respondent K, on the other hand, said that they do not put much emphasis on the early stages, which were caused by a rather small budget compared to other departments within KA-Group, the faster turnaround time from customer enquiry to delivery and the market being

very fast. Respondent K further explained that the idea generation stage is especially a very quick step because it is mostly driven by the customer coming to them with rather clear specifications or preferred solutions. They do not have a lot of “blue sky” thinking and most of their work revolves around how they can optimise the customer's requirement in the scope of cost and performance.

Even though Respondent H processes differ from the other R&D managers because of his role as innovation manager, which means that his team works more towards the pre-development before the actual NPD process takes place, thought the NPD process used by the researcher was quite a close match to the first stages. He further explained that their pre-development phase correlates to the idea generation and business assessment stages and that his innovation group focusing on pre-development are specific to Interior.

4.2.2.1.1. Perception of Internal New Product Development Processes

What can be noted from the respondent’s answers is that they emphasised on the value of focusing more on the earlier stages of NPD. Important to note is that the answers depicted below might appear to show the respondent´s having a negative attitude towards the NPD processes at KA-Group, this is because the researcher leaned his questions more towards what can be improved rather than seeking to find everything that is positive, to more nuanced be able later on to see where suppliers could be involved.

Respondent K feels that they do not give the engineers sufficient time to materialise the correct level of maturity before they want to earn from it. The accelerated development phase based on causes mentioned earlier makes the department work in smaller steps and work at 5 projects at the same time. Which results in them realising the product to the market where they are at the current moment instead of delaying until they have made further progress, which might not yield the same results as focusing on one project over a longer time. Respondent I follows the same line of argument by discussing that they need to emphasise more on the early phases to make sure that they close the knowledge gaps. Very often they find problems in the late phase which means that they have not understood the beginning phases good enough. They also want to use as little money as possible in the beginning, especially when a defined customer does not exist to the product they are designing or are not certain that the concept is something valuable in the market. Later in the project when some customers show interest, start putting in resources but then a lot of the design decisions have already been taken in the earlier phases. According to their process, they should front load, put in resources early because, in the end, it is actually

often cheaper. But in reality, it is difficult to achieve. Some of the main things why this is not actualised is that resources are limited, and free resources might not be available. The other is that KA-Group does not want to risk spending that money on projects that are uncertain if it will go to production.

Respondent J stated that he thought the process is adequate. The process allows flexibility amongst various products and in most areas, it works fine. In agriculture and construction, the customers have a long product cycle time and their process matches their process rather well but with some of their products which are closer to consumer-oriented products, their process is to slow. In those cases, they tailor the process more heavily for them to be able to react fast enough to their market, that is just the design processes. Further Respondent J said that there is always room for improvement on their skills because of limited resources. Respondent J continued by stating that he thought his department definitely have areas where they need to fill some knowledge gaps, especially in market forecasting and concept development. The processes could be a bit more flexible in some steps, based on the process being a bit long sometimes. The negative effects of it being slow are that they spend too much resources and time just filling the process documentation. Lastly, he also mentioned as Respondent K that they have rushed processes making it hard to involve suppliers in new product development projects.

Respondent L thought it was necessary to start putting more emphasis on pre-development, development of products that they do not have in their portfolio today and does not exist on the market. More of a research project where they are testing ideas and do not have an existing customer to that specific product concept, looking into the future rather than focusing on new generations to their existing products. Pre-development is exactly what Respondent H is doing in Interior and stated that it has been very beneficial to have it prioritised. It allows them to gather more information and ideas to use when they are doing the core concept of the design, which drops the number of changes needed to be done in later stages and address possibilities as fast as possible. However, Respondent H also thought they had marginal resources to sufficiently do the pre-development. Further, he also explained that he felt that they are lacking the knowledge the most in their concept definition phase. It would be in both the concept and the design phase they need to increase their knowledge the most which he thought could be achieved by focusing more on the earlier phases.

4.2.2.1.2. Communication with Purchasing

Respondent H have communication with the purchasing team, but they try to have the most communication through the innovation buyer, which is a purchaser being directly linked to his innovation team at Interior. That is the main point of contact because they do not want to overwhelm the purchasing department with uncoordinated requests based on the early project stage they are at. Respondent I stated that they have a lot of communication with purchasing but regarding the early phases of the NPD, it is not that much communication. Normally they have a drawing that is released, and the purchasing can then ask the suppliers for a quote, in the early phases they do not have that. Respondent I further explained that it would definitely be good to have more communication in the earlier phases about potential suppliers that would be willing to be a part of the project, those that do not have problems with the uncertainties in the beginning. According to Respondent J, they first start communicating with suppliers and purchasing when they have a concept that is ready for cost estimates, maybe not official quotes but they need a baseline to make sure that their sales price will be profitable. He further explained that there is not much of strategic communication with purchasing, they mostly want technical feedback from suppliers regarding the manufacturability of their concepts. Respondent K stated that most communication with purchasing is to the project buyers that are involved, with the commodity buyer it is less contact and tends to only be when there is an opportunity to reduce cost or when they seek advice for a problem they have difficulties solving with the existing supplier pool. Respondent K also described that the purchasing department can be an extra push when suppliers are reluctant to join, and they can bring a bit more bargaining chips to the table. But it could be better, he thought the commodity buyers could be more proactive in helping their suppliers becoming more innovative and push that it is a key part of their relationship with them.

4.2.2.2. Perception of Involving Suppliers

4.2.2.2.1. Effect of Involving Suppliers

All of the respondents mentioned clear benefits of involving suppliers, mostly noticeable in obtaining expertise, involving suppliers early and the importance of critical components.

Respondent H stated that in pre-development they are actively involving suppliers because in most cases, KA-Group in not experts on every component and they like to have qualified suppliers that can add benefits to the design as early as possible. He continued by discussing that it is certainly not the entire supplier base that has these beneficial capabilities. Many of the components they want are build-to-print, around 60-70% of purchased components to a new

product is built-to-print which does not require much strategic involvement, but regarding the key components in their product, it is very important to have more strategic suppliers involved. Suppliers should according to Respondent H be involved as early as possible, it is important to early realise if the design is feasible and can be produced at an effective cost later in the project, he also mentioned that they can avoid quite a lot of mistakes by early supplier involvement when they help KA-Group put with the feasibility of a concept. The concepts they are creating in the pre-development stage are mostly based on already set requirements from the customer, he thought it is unfortunate that they rather rare create products without customer requirements already set because it makes it a challenge to actually be innovative. This is one of the main causes they mostly work on incremental improvements on already existing ideas which was seen to not be a real innovation project according to his definition of innovation previously described.

Respondent I thought supplier involvement definitely is beneficial and are actively working some key suppliers. He further explained that supplier involvement is important because some components KA-Group buys from suppliers are critical to the functionality of the product, which makes it important to communicate with these suppliers early get on the right track with the product.

Respondent J sees the value of involving suppliers but have not seen a lot of supplier innovation except in the electronics area, they mostly see some level off continuous improvement and they do value the design feedback. From a pure innovation standpoint, he has not experienced much coming from their suppliers. He further explained that he values the suppliers' input because it can be a great help to reduce cost based on their expertise on the components. Regarding the departments own project around 70% is built-to-print with rather clear requirements from the customer, the rest is where they can be more innovative and try to see where the market is going towards and predict that need.

Respondent L also followed Respondents J´s thought that he does not see product innovation being particularly strong from their suppliers. Their suppliers are normally small companies that do not invest much in innovation. The supplier network for Couplings are very limited because of their extended vertical reach, they mostly buy basic materials or other parts. The high degree of verticalization means that they produce nearly everything in-house. However, he still thought it is always important to get innovations from suppliers, especially if they have the expertise and technology that they lack.

Respondent K said that they are involving key suppliers which they feel there is a partnership that could be beneficial. Could be based on a mutual benefit for both companies or a longer-term strategy that could be achieved. They involve raw material suppliers or finished component suppliers in the development phase to optimise cost and shorten lead times. He also thought involvement is beneficial based on the possibility to acquire a deeper depth of knowledge in their market based on the suppliers extended network and their expertise in components which might help KA-Group to solve some internal problems. He further stated that the key suppliers should be involved as early as possible.

"The earlier your suppliers support you, the better chance you will have of not having a design in the end that nobody can afford" – Respondent K

4.2.2.2.2. Difficulties of Involving Suppliers

Some of the respondents also expressed difficulties in involving suppliers more, both in general and in their specific field.

Respondent I thought a significant problem to involve supplier more is intellectual property rights and other legal aspects, he further described that there needs to be a deeper relationship and mutual trust on both sides to break the barrier, which he thought KA-Group is struggling a bit with. Also, he mentioned that companies that might have developed something unique can be hesitant to share such information, mostly smaller companies that are afraid KA-Group might exploit their technology.

Respondent J described that the biggest problem in his field is based on their suppliers within Off Highway are not big enough to do a lot of their own R&D. Most of these are just build to print suppliers, bigger automotive suppliers have the expertise that could aid his field, but they are not interested based on the low volume that is produced at Off Highway. He further discussed that it is quite easy to involve suppliers when they are doing modifications to existing products because they already have a supplier that understands the parts more or less. The hard part is completely new product designs, there are no existing suppliers that can help sufficiently with the concept design. It is also difficult to involve the right suppliers in new product development based on the process being rushed by customers tight deadlines.

Respondent L did not see the suppliers trying to push for innovations. In general, he thought that suppliers in more conventional markets are more passive and are waiting for organisations such as KA-Group to tell them what they need and do not produce particularly big innovations,

compared to the electronic suppliers that move quickly, based on high investments and development.

4.2.3. Knowledge About Suppliers

4.2.3.1. Level of Contact with Suppliers

In general, the respondent's communication with suppliers were mostly focused on a few key suppliers and suppliers contributing with components that are critical to the functionality of their product.

Respondent H involvement is quite little, but his team in generally has active participation with a few suppliers that have items that produce components that are quite new to them. Respondent I answered that they have tight communication some key suppliers, almost daily contact with the suppliers regarding the electric motor since it is a critical component in the product he is involved with. The motors are not an off the shelf product, it is something that is new and motor size that KA-Group need does not exist, the motor needed to be developed specially to fulfil their needs. Communication mostly stems from complexity and technical challenges. For more standardised parts that KA-Group can buy off a drawing (build-to-print) they, of course, do not need to have as much contact with them.

"When we do not know exactly what we need and cannot easily put it down in a drawing it is important with close connection to those suppliers" – Respondent I

Respondent J also explained that the main communication is with a few key suppliers, which they frequently can ask for technical feedback. The technical reviews are important during NPD because they need suggestions on how to make the parts easier for them to manufacture. The engineers will do it because they have a relationship with suppliers before purchasing gets involved which can be an area for improvement. He further stated that he thought it is important to do the communication to suppliers more formalised, so the purchasing does not worry that they are going behind their backs.

Respondent K answered that contact with suppliers varies. Where the supplier is selected for the most cost-effective offer and can meet the specifications of the drawing, they are usually not interested in R&D or any form of development. Which results in very limited involvement from my team. During the NPD process, they talk to key suppliers a little more to meet the requirements from the customer. In those cases, they have some communication with the suppliers engineering department, but also the commercial side due to the need for cost

estimates. Communication is especially important with material suppliers because they are interested in the new materials that are coming along. In its essence, they touch all levels of communication depending on what supplier it is. He further stated that most of the communication is engineer to engineer. Basically, the only thing they clarify is that there are no barriers on the purchasing side. In other words, if they choose a supplier and start some development work with them it obviously through a purchasing agreement with them where they are already a supplier or are becoming one, where it is important that they are cleared by the purchasing department.

Respondent L had personally limited direct contact with suppliers stated that his team have meetings with suppliers regarding projects frequently. They have in general good contact with suppliers, especially with some key suppliers they work together with suppliers in. He also stated that he thought purchasing are helping with finding and developing new suppliers.

4.2.3.2. Technology Roadmap

Technology roadmap was not a main question to the respondents at R&D except incentives, but through the semi-structured interview form some of the respondents gave information that can be linked, most information was given about incentives to involve suppliers more strategically.

Respondent H stated that they normally do not share their future development plans with suppliers but still tries to give them an idea on things that might be interesting in the future. He further explained that the suppliers also follows that direction with not sharing much information except for the mentor suppliers, which the engineers from both sides discuss future activities, growth and how they can work together. Respondent L, on the other hand, said that they are actively using technology roadmap, to assess what kind of know-how they have and need to bring. If they do not have the know-how it is necessary to search for suppliers that have it. If they do not have the know how it is basically two alternatives, they acquire the know-how or go to a supplier.

4.2.3.2.1. Information Sharing

Respondent H stated that technology roadmap and information sharing goes hand in hand, was not something that was pushed actively but had an example of when they had good communication with a supplier, this supplier could create a component with new properties that was quite interesting for them. That came from a discussion with the supplier about some of the needs that KA-Group had that perhaps they could address in the future, the idea was brought

up through open contact, so they were comfortable to come to KA-Group in this case, they felt the trust to be able to share that information.

4.2.3.2.2. Incentives

Respondent H stated that he felt supplier generally have the incentives, projects can challenge the limits of their capabilities and can grow from that. Also, they are usually offering quite a high-volume potential. He further stated that once they have potential suppliers identified it is usually rather successful to get them involved.

Respondent K described that in Fluid Transfer it is mostly a business volume increase and the suppliers are able to secure sales, which also Respondent L described as the main incentives. Respondent K further explained that without that security suppliers would not be interested in developing a component based on the risk that they can just exploit the supplier by taking their design to the market and seeking lowest cost alternatives.

"It is a fine line between having them help you develop a product where you still have all of the knowledge and IP and when they become a developing partner where some of that knowledge is in both companies" – Respondent K

Respondent J said that incentives to get suppliers to become strategic suppliers are quite hard to achieve based on their low volume production, based on that volume usually is the main incentive for suppliers to involve themselves. With KA-Group´s supplier base mostly consisting of automotive suppliers that usually are selling at much higher volumes that they are asking for, there are basically no incentives according to him. The suppliers that are interested in off-highway are usually small suppliers regarding the volumes and are too small to be proper strategic suppliers based on their low investment in development and R&D. This situation puts Off Highway category in a gap, the bigger suppliers are not interested in the volumes and the smaller suppliers do not meet their requirements.

But according to Respondent H, it can also be a challenge, both in getting to purchase to push the right suppliers and the incentives themselves. He further explained that if the suppliers feel the incentives are not enough it is usually based on that they feel that there is going to be too much time investment for their return. They also have some difficulties if they are working on a project that is quite advanced and will not be in production within 3 years. Because then they are asking the suppliers to participate early before they will have any chance of income in the form of component sales. In some of these cases they have agreed to pay them a contract fee,

so they are not spending all their risk om the project without any monetary return. If suppliers have some specialised technology or knowledge they have in some cases agreed to buy that portion of the development upfront, so suppliers do not have a too high degree of risking sunk cost.

Respondent I and L stated that one solution could be to do as many of their competitors are doing, creating joint ventures or partnering with supplies. Respondent I further said that he thought it is a good way of kind of having equal partners going into development together. KA-Group has typically not done that but could be a path for the more complicated products or components.

4.2.3.3. Technological Change

With the product category Powertrain & Chassis as an exception, the rest of the respondents thought the degree of technological change was rather moderate or slow in general.

Respondent L said that he is rather new to his current position within Air Coupling, but what he could say was that their product launched in 2009 and they are still launching new generations to that original product. In general, the life cycle of their products is quite long. The life cycle of a product family might be 10-15 years, but they are increasing their portfolio and are proactively working with innovations with a five-year overview, which means that they have products in the pipeline with a five-year horizon and are frequently launching new products. Compared to competitors they are also developing their products faster which has led them to gain on the market, which has been noted from the competitors that have started to react. Respondent H said that the technological change in his field is Slow to moderate at the moment, they are mostly really developing products upon things that have been developed already. They have not previously had a tremendous amount of success using completely new technologies. In the market overall, the degree of change is the same by stating that the automotive industry is not always ready to be the first users of new technologies.

Respondent J said that the lifecycle and degree of technological change vary depending on what market or product that they are selling. In his product category Off Highway, they sell parts to outdoor power equipment like to a lawnmower that might have a life-cycle of one season, those manufacturers might change the component KA-Group sells next year to someone with a better price or specifications to the product. At the other end of their business, they have agriculture and construction equipment and those products might run 25 years, KA-Group produced the product for 5-10 years and then are required to maintain service parts for 15 years. He continued

by explaining that there is a continuous change in the market and in some areas, they see changes come quite rapidly and in other areas, they see that it is rather slow. Respondent K said that they have two main product life cycles within Fluid Transfer, the product itself is very short because it is known technology and just new versions of the same product. The material life cycle, however, is much longer, 3-4 years. Lastly, he stated that they are very dependent on innovations of materials which they mostly can only exploit.

Respondent I said that the big picture is that it is changing a lot, mostly based on the push for electrification. It will be a dramatic change in what technology is needed which in the end will result in a totally different product. They try to draw on some of the knowledge they have in-house.

4.2.3.4. Design Expertise

All of the respondents had a positive attitude towards external design expertise, with some even stating it to be a necessity.

Respondent H, I and J valued design expertise highly. Respondent H explained that it is valuable mostly because they do not need to duplicate supplier's technology and knowledge, instead they are then are able to work with suppliers and duplicating knowledge is an expensive task with learning curves etc. To benefit from this, KA-Group needs to identify their gaps of knowledge to understand where they should implement suppliers. Respondent J explained that it is what they are looking for when they are doing their concept review.

"Suppliers are not designing the parts for us, they are doing a design review on our parts to tell us where we might have done things difficult, we depend on our suppliers to give us their inputs" – Respondent J

Both Respondent K and L felt that if a supplier has a high degree of design expertise the supplier could move up to the next level of relationship. Respondent K stated that instead of calling them suppliers KA-Group could start to think of them as a development partner, start to build a relationship based on trust and success in the past. Respondent K also mentioned that he has been working with preferred development partners in the past and those projects have been far more successful. It is complicated because it is a lot of aspects to consider, Intellectual property rights, benefits and much more. He further described currently have purchasing contracts with suppliers that develop for their own reasons, but they are not a true development partner for KA-Group.

"In other words, they are not loyal, they are not giving us the first sight of their development. We are not a preferred development partner for them" – Respondent K

4.2.4. Summary of R&D

As with the respondents in purchasing, Table 5 and Table 6 has been made to show a simplified summarisation of the empirical findings from the purchasing department. The key phrases used are not in all cases words the respondents exactly used, but are simplified phrases used to show the respondents similarities and differences more clearly. Lastly, since the interviews were held in a semi-structured form, some of the topics covered in the tables were not answered by every respondent.

Table 5: Summary of Empirical Findings from Managers in Interior and Powertrain & Chassis Products in R&D

		Interior (Respondent H)	**Powertrain & Chassis (Respondent I)**
Perception of Product Innovation and Supplier Product Innovation	Product Innovation	• Addresses a Need • Revenue • Unique Product	• New Solutions • Revenue
	Supplier Product Innovation	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above
NPD Processes and Perception of Supplier Involvement	NPD processes	• Generally The Same in The Two First Stages	• Generally Aligned With The Theoretical NPD Process
	Perception of NPD processes	• Focus More on Early NDP Stages • Marginal Resources	• Focus More on Early NDP Stages • Marginal Resources
	Communication With Purchasing	• Mostly with Innovation Buyer	• Beneficial With More Contact in Early NDP • Good Communication • Low Contact in Early NPD
	Perception of Involving Suppliers	• Critical Components • Early Involvement • Expertise	• Critical Components • Early Involvement
	Involving Suppliers in Their Field	• Yes	• Yes
	Problems to Involve Suppliers	-	• Exploitation of Technology • Intellectual Property Rights
Knowledge About Suppliers	Level of Contact with Suppliers	• New Components	• Critical Components
	Technology Roadmap	• Mentor Suppliers an Exception • Usually Do Not Share That Level of Information	-
	Information Sharing	• To Some Extent	-
	Incentives	• Contract Fee • High Volume Potential • Securing Sales • Potential to Develop	• Joint Venture or Partnership (Potential Incentives)
	Technological Change	• Slow to Moderate	• Fast
	Importance of Design Expertise	• Highly	• Highly

Table 6: Summary of Empirical Findings from Managers in Speciality Products in R&D

		Speciality Products - Off Road (Respondent J)	**Speciality Products - Fluid Transfer (Respondent K)**	**Speciality Products - Air Couplings (Respondent L)**
Perception of Product Innovation and Supplier Product Innovation	Product Innovation	• New Solutions	• Managing Product Life-Cycles • New Solutions • Competetive Advantage	• New Solutions
	Supplier Product Innovation	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above	• Developer • Improvement of Components • Same Benefits as Above
NPD Processes and Perception of Supplier Involvement	NPD processes	• Generally Aligned With The Theoretical NPD Process	• Generally Aligned With The Theoretical NPD Process	• Generally Aligned With The Theoretical NPD Process
	Perception of NPD processes	• Focus More on Early NDP Stages • Time Restriction	• Focus More on Early NDP Stages • Time Restriction	• Focus More on Early NDP Stages • Slow Processes
	Communication With Purchasing	• Cost Estimates	• Cost Estimates • Could be Improved	• Important to Collaborate
	Perception of Involving Suppliers	• Low Innovative Capabilities • Expertise • Reduce Cost	• Early Involvement • Expertise • Lead Times • Market Knowlegde • Reduce Cost	• Low Innovative Capabilities • Expertise
	Involving Suppliers in Their Field	• Yes	• Yes	• Yes
	Problems to Involve Suppliers	• Limited Supplier Pool • Time Restriction	-	• Reactive Suppliers
Knowledge About Suppliers	Level of Contact with Suppliers	• Key Suppliers	• Critical Components • Key Suppliers •Material Suppliers	• Key Suppliers
	Technology Roadmap	-	-	• Actively Using
	Information Sharing	-	-	-
	Incentives	• Few Incentives	• High Volume Potential • Securing Sales	• High Volume Potential • Joint Venture or Partnership (Potential Incentives) • Securing Sales
	Technological Change	• Slow and Fast	• Moderate	• Slow
	Importance of Design Expertise	• Highly	• Highly	• Highly

5. Analysis

The analysis chapter is divided into three main parts. Firstly, covering the theoretical and empirical discussion regarding research question one. Secondly, two parts covering the theoretical and empirical discussion regarding research question 2 and the sub-question.

5.1. Supplier Product Innovation

The first part of the analysis will discuss the material generated to answer research question 1, regarding what a supplier product innovation can be for KA-Group. First two parts will discuss the theoretical framework and empirical findings regarding product innovation and supplier product innovation. The third part, will link the analysis to the research question and attempt to make a conclusion.

What is also important to note before conceptualising and trying to link research question 1 and research question 2 to the findings, is that the researcher has chosen to conclude his answers based on what the majority of the respondents answered. Without the choice of answering the research questions based on the majority, the answers would end up being stated as inconclusive based on differences between the departments, but also in differences within each department.

5.1.1. Product Innovation

According to theory collected, it can be stated that a wider source of knowledge (Leiponen & Helfat 2010) can increase the degree of success in innovations, especially by the purchasing department (von Haartman & Bengtsson 2015; Legenvre & Gualandris 2018) by acquiring external knowledge from suppliers (Roy, Sivakumar & Wilkinson 2004). Supplier innovation should in its essence have the same characteristics and yield the same expectation of result as the general concept innovation, except it is created through the interaction with suppliers. Thus, a supplier innovation should follow the same definition described by Hauser, Tellis and Griffin (2006), a process to create and bring new products and services to the market, where the main goal is to enhance profitability. With the researcher´s limitation to solely focus on product innovation, the distinction of a supplier innovation can be further detailed by the definition of product innovations. Supplier product innovation should result in achieving the goal above, introducing new products and enhance profitability, through "the ability to develop new products and/or technologies in anticipation of, or in response to, customer requirements" (Scannell, Vickery, & Droge 2000, p. 32), that has the possibility to affect all the five manufacturing performances, cost, quality, product development, delivery and flexibility,

without trade-off theory necessarily will come in effect (Azadegan & Dooley 2010). However, what Scannell, Vickery and Droge´s (2000) definition lacks is the aspect of the main goal of creating an innovation as expressed by Hauser, Tellis and Griffin (2006), which is to enhance profitability. With this, the researcher attempts to consolidate these two definitions into one that covers the main topics of both.

"The ability to develop new products and/or technologies in anticipation of, or in response to, customer requirements with the main goal to enhance profitability"

Linking the theory above with the respondents´ answers some interesting findings were revealed. The key phrases when describing product innovation by respondents within purchasing were competitive advantage, functionality, unique products and revenue. Whereas the respondents in R&D, answered new solutions, competitive advantage, revenue. What can be concluded from this is that all of the respondents touched upon one or more of the keywords in the definition of product innovation created by the researcher. Competitive advantage should be seen as a quite loose term since it can be argued to include all of the key phrases, profitability by standing out in the market and gain market share or revenue, but also creating new products and meeting customer requirements by creating a product that can is needed and makes their position on the market stronger. With this, the researcher makes an assumption that solely by naming competitive advantage does not make the respondent fully aware of what a product innovation is. Further, the keyword revenue has, of course, a strong correlation to profitability and the differences between them cannot be discussed based on the researcher not asking specifically what the respondents´ meant by revenue. Lastly, functionality, unique product and unique solution are all related to creating a new product.

The point of comparing the respondent's keywords to the definition was to show that all in some way describe what a product innovation is, but none of the respondents except Respondent H touched all of the areas. Respondent H´s R&D department within Interior created a definition of innovation based on the term being used loosely within organisation, having the same line of argument as the researcher since the attempt to define what an innovation is was based on Gatignon et al. (2003) description, that a lack of understanding of the innovation can create significant problems to the actor trying to make use of innovation. The definition by Respondent H touches all of the keywords discussed.

"Unique solutions that addresses a need that turns into money"

5.1.2. Supplier Product Innovation

Regarding supplier product innovation, all of the respondents answered that they saw the same benefits being achieved as in ordinary product innovations. Thus, in this research at least, the decision to see supplier product innovations to yield the same benefits as product innovations hold and the researcher's own definition above can be applied to supplier product innovations as well. Moreover, the respondents also answered what kind of innovation they thought could be achieved by incorporating suppliers and in what way, which will be categorised accordingly to Gatignon et al. (2003) four categories what an innovation can be in the form of. All of the respondents saw a possibility to gain incremental innovations, for example, the development of a new generation of existing products at KA-Group or developments of the components the suppliers create. However, incremental innovations were not seen to be the top priority of what KA-Group can gain on supplier involvement, from the majority of respondents the focus was and achieving radical innovations and gaining capabilities and know-how, which can be translated into competence-enhancing innovations. Radical innovations were seemed to be important for KA-Group to be able to get unique products that set them apart from the competition. Competence-enhancing innovations were the one aspect differing most between the respondents, accessing know-how was seen to be important by all of the respondents but some differed in the way they thought it could be gained. Some respondents saw supplier innovation in two ways, either being involved in KA-Group´s own development work and be seen as a co-developer or development of components that then could be adapted into the organisation's product development. While some only saw supplier innovations as an improvement to their own components. This difference will be more thoroughly discussed later on.

5.1.3. Linkage to Research Question 1

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*

A general conclusion can be described by linking the discussed material above with the first research question, but first, it is important to iterate what a DM supplier is. A DM supplier contributes finished components and/or materials in one of the main categories depicted in Figure 2 which is, Electronics, Metal, Plastics & Textile and Raw Material (Kongsberg Automotive 2018c).

Based on the empirical findings and theory, it is possible to state a preliminary conclusion based on the material discussed to this point. A supplier product innovation from a 1-tier DM supplier, is an innovation in one of the DM segments in the form of an incremental, radical or competence-enhancing, that contributes to enhanced abilities to create new products or technologies, which addresses a need in the market, with the end result of increased profitability.

Since the researcher got varying answers of what the respondent´s perceived as a product innovation and having a general managerial overview, not going into detail in every purchasing category and product category, a more precise answer cannot be concluded. But what can be further stated is what KA-Group can do, to further get a more precise answer regarding what a supplier innovation is. KA-Group needs to as an organisation in whole, conceptualise a common definition to what a supplier innovation is and what kind of innovation they are seeking. Even though all of the respondents to some extent touched upon the key areas, the differences still show that the respondents are not fully aligned to what a product innovation can yield. This could be solved by, for example, adopting and using the definition stated by Respondent H throughout the entire organisation. Further, it is also necessary for KA-Group to find alignment in what kind of innovation they seek from their suppliers, because the three potential categories of innovation listed in the conclusion, require different sets of activities and commitment. For example, if KA-Group seeks to gain competence-enhancing innovations by acquiring technology and know-how from supplier, it will probably be necessary to create a stronger relationship and see the supplier as a co-developer, compared to if KA-Group sees the supplier mostly as a component developer of the supplier's own components.

5.2. New Product Development

The second part of the analysis will discuss the material generated to answer the first part of the second research, which is finding where suppliers should be involved, and the potential benefits KA-Group will yield. This will be analysed by firstly, determining how applicable the theoretical NPD model is in KA-Group´s context and the respondent's perception of the internal NPD processes. Secondly, analyse what benefits supplier integration might yield, where suppliers should be involved in the process and the current problems to involve suppliers. Lastly, the researcher will link the discussed material and make a conclusion.

5.2.1. Internal New Product Development Processes

NPD is in its essence the process of creating products and the NPD process can be seen as "series of interdependent and often overlapping stages during which a new product (or process or service) is brought from the idea stage to readiness for full-scale production or service delivery" (Handfield et al. 1999, p. 62). The researcher chose Handfield et al. (1999) NPD process model (Figure 3) based on the assumption that it was deemed to be simple enough to come up with clear conclusions and general enough to be applicable to KA-Group´s own NPD processes. As stated in the theoretical framework the researcher needed to collect primary data to sufficiently state if the chosen model is applicable to KA-Group and where suppliers should be involved.

Firstly, regarding the applicability of the NPD model to draw generalised conclusions upon, it can be stated that the respondent´s within R&D thought the model compared to their own was a close resemblance. Respondent I-L explained that the differences were mostly based on vocabulary, some phases being more detailed or some stages being less focused on at the current moment. Respondent H, which is involved with pre-development, thus having a different process model, still saw the two first stages of the theoretical model (idea generation and business/technical assessment) as a close resemblance to their model. With this, it is possible to conclude that the chosen theoretical model is in general of enough resemblance to KA-Group´s processes to validate generalised conclusions drawn upon comparing the model to the respondent's answers.

The respondent's knowledge, involvement and perception of the internal NPD processes differed depending on what department and role they had. All of the respondents within R&D were very involved and had good knowledge of the process, which was one of the researchers' requisite for them being seen as a viable respondent. The respondents within purchasing that were most involved and had most understanding of the internal NPD processes were the managers of the product categories and the manager for the DM segments (Respondents A-D), whereas the managers for each DM segment, were less involved and felt that they lacked knowledge, mostly based on their work tasks usually not involves being active in current projects.

Regarding the respondent's perception of the internal processes, which was a question the researcher angled more towards finding out what can be improved rather than the positive aspects, some key findings can be noted, more focus or involvement in the early stages, resource

issues, issues with the processes. The key finding regarding putting more emphasis on the earlier stages was mentioned by both purchasing and R&D.

From purchasing´s side, the majority of the respondents thought they were not involved early enough in the process, usually first getting into the project around the design phase (stage 3-4), which makes it difficult for them to utilise and source the right suppliers for the project. If they would be involved earlier, Respondent E stated that they would have more time to scan the market increasing their possibility to source the most appropriate supplier, which might result in the concept not being applicable since R&D created a concept that no supplier can handle. Related to the need to be more involved early is the thought from some of the respondents at purchasing, that the processes are not followed fully. Respondent B and C explained that there is a formal start-up meeting that should take place when new projects are ready to be launched, but this is not frequently followed which results in the lack of early involvement described.

R&D also lifted the need to focus on the early stages more, but in the sense that they lack the time and resources to efficiently do these first phases sufficiently. The lack of resources and time in the beginning phases are explained to be a problem based on that they are not able to acquire or gather the necessary knowledge, resulting in that many problems occur during the concept and design phase of the project, which was described as significantly costlier compared to finding these earlier. Further, Respondent K explained that the lack of focus in the beginning phases makes it more difficult to involve suppliers. Focusing on the earlier stages and front-load resources should however happen according to Respondent I, but in reality, it was explained as difficult to achieve, mostly based on uncertainty if the project will reach production and that they try to limit resources until a clear customer to the proposed product has been identified. The only respondent that deviates from the rest is Respondent H based on that they are already focusing on the first stages by solely working with pre-development, which was described as very beneficial since it allows them to gather more information and ideas to use when they are doing the core concept of the design, which lowers the number of changes needed to be done in later stages and address possibilities as fast as possible.

An interesting finding related to the current problems depicted above was the two departments different viewpoint of communication with each other. Both sides saw the communication to be an area that can be improved but purchasing described it as a necessity and R&D more towards an extra benefit. Some of the respondents at purchasing described it as one of the main causes for the problem with early involvement, whereas the respondents at R&D described the

communication more neutral, with most of the communication surrounding when the concept is finished, and they want a quote (price and feasibility statement) from the suppliers. However, the lack of communication is an area that seems to improve based on the respondents from purchasing, by the implementation of category management teams, which is a cross-functional collaboration, which was described as a key to continue to develop and disseminate information more effectively, especially when they are a globally dispersed company.

5.2.2. Involving Suppliers

Involving suppliers in NPD projects is seen by Handfield et al. (1999) to be a possibility in all of the stages that can be depicted in Figure 3. Moreover, the authors found indications for supplier integration benefiting purchased material cost, purchased material quality, development time (time to market), development cost, functionality and product manufacturing cost. Which also to some extent aligns with the five manufacturing performances described by Azdegan and Dooley 2010). Further, Handfield et al. (1999) stated that it is crucial for firms to have as much expertise as early as possible in the development process.

However, in this report the focus has not been on every supplier integration point, but has instead focused on ESI, which is a "vertical cooperation where manufacturers involve suppliers at an early stage in the product development innovation process, generally at the level of concept and design" (Bidault, Despres & Butler 1998, p.719). With the definition described above, it was concluded by the researcher that the ESI could occur in any four first steps, from idea generation to product engineering and design, but could not specify further since Petersen, Handfield and Ragatz (2005) found no statistical significance that any of the stages had a stronger effect. Lastly, it was concluded based on Bidault, Despres and Butler (1998) that ESI is mostly a strategic choice by the organisation, thus the report did not focus on a scope outside the organisation.

5.2.2.1. Benefits of Involving Suppliers

Benefits of involving suppliers in NPD was mentioned by the majority of respondents, that also saw it as beneficial in their own specific field within KA-Group. The respondents in purchasing mentioned the main benefits being gaining expertise, both in general and through early integration, and functionality.

Expertise, in general, was seen to be important based on that KA-Group do not have the know-how in every field and getting the feedback from suppliers could enhance their products. The respondent within R&D also saw clear benefits in gaining the expertise from suppliers.

Expertise is especially seen as important for critical or new components affecting the functionality of the product.

Gaining expertise was also put in more direct context by stating that suppliers need to be involved early, being able to optimise the product, quality, sustainability, price and so forth according to Respondent C. Furthermore, it was stated that putting more emphasis in the earlier stages, both internally and with involvement of suppliers, could in general, shorten the development time and save costs by doing it right the first time. Respondents within R&D saw early involvement as important, even as early as possible, to realise if the concept and design are feasible, which results in lower costs. It was also mentioned that early involvement can be beneficial to gather more market knowledge based on the supplier's extended network.

Lastly, functionality was also seen as a way to increase innovativeness, mentioned by respondents within purchasing, going from a detailed specification to a specification focusing on the functionality of the component instead, which can provide the supplier more room to use their expertise and innovative capabilities. Focusing on functionality was also seen to be a good way to increase the innovativeness of the built-to-print suppliers as well, that usually are only designing components from clear specifications presented by KA-Group.

Comparing the empirical findings with theory, it is evident that the respondents see the same benefits with involving suppliers as Handfield et al. (1999) found statistical significance for. Thus, the researcher can state that KA-Group in general, both purchasing and R&D, have a correct perception of what involvement of suppliers might yield.

5.2.2.2. Problems Involving Suppliers

What can be concluded from the empirical findings is that the perception of what the main problems of involving suppliers, differ between the departments. Purchasing sees it more as an organisational mindset and internal processes, whereas R&D mostly saw it as a problem with the current supplier pool.

Several of the respondents mentioned that one of the significant problems to involve suppliers have been the organisational mindset of producing as much as possible in-house, believing that they have the necessary expertise within the organisation. This is further explained by Respondent A, that this mindset has resulted in a reputation in the market, being an organisation with strong know-how and development but their focus on in-house development makes suppliers having an arm´s-length relationship. Further problems were internal processes, both

having to short quotation times to involve supplier and to slow processes when handling suggestions from suppliers, which can result in the suggestion not being taken in consideration and the suppliers lose incentives to mention more ideas.

From the R&D perspective, most of the problems mentioned were on the suppliers, either not having enough investment in R&D or not being innovative in general. But Respondent I also mentioned the problem might surround the relationship between the parties, without building up a deeper relationship and trust, it will result in complex legal aspects such as Intellectual property rights.

5.2.3. Linkage to Research Question 2

- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*

With the material above it is possible to conclude the first part of research questions 2, as described in the theoretical framework, to find where suppliers should be involved.

Easily described, suppliers should be involved early in KA-Group´s NPD process, contributing with needed expertise and know-how on critical components to aid KA-Group´s development. Even though critical components were seemed by R&D as most important to involve, suppliers with less critical components, the built-to-print suppliers, should also be able to be involved if KA-Group uses the mindset of functionality specification instead of detailed specifications, giving the suppliers the possibility to use their expertise. The emphasis on gaining expertise might also imply that KA-Group is mostly seeking to achieve competence-enhancing innovation compared to incremental and radical innovations.

Early integration is especially important since it can diminish the faults and errors that were mentioned to often occur in the concept and design phase. Diminishing the problems occurring in these phases can have a significant effect on KA-Group´s development. Reducing cost, time and improve the functionality of the products, which all relate to the findings Handfield et al. (1999) described of what supplier involvement might yield and some of the manufacturing performance objectives mentioned by Azadegan and Dooley (2010). Why it is especially important to diminish the problems in the concept and design phase is according to Handfield et al. (1999), even though these stages by themselves amount to a rather small portion of the total cost in an NPD project, lock in as much as 80% of the total cost. With the statement previously, that the theoretical NPD model is applicable to make conclusions to KA-Group, the researcher can state that supplier involvement should occur before the concept and design phase

(stage 3-4) in Figure 3 to yield the benefits described above. However, the researcher cannot further specify if the idea generation phase, business/technical assessment stage or a pre-development phase before the NPD itself is the most beneficial stage, based on the different needs from the product categories. Nevertheless, the researcher can imply that KA-Group should look more into the usage of pre-development since it was described by Respondent H, to be highly beneficial for their development in the product category Interior.

For KA-Group to enable early supplier involvement there are some concerns that should be addressed. Firstly, KA-Group needs to emphasise more on the earlier stages of the NPD process internally. Purchasing in the form of not being involved early and R&D with the lack of focus and resources on the earlier phases.

Purchasing´s lack of involvement early makes it difficult for them to source and involve the ideal suppliers for the current project. Also, by not being involved much in the projects as some of the respondents answered, resulted in them having limited knowledge of the NPD process. The limited knowledge might also result in the purchaser having difficulties of assessing what capabilities the supplier should have to be seen as a sufficient supplier to involve. For example, by not knowing the importance of the business/technical assessment stage, the purchaser responsible for the sourcing might not fully understand that the supplier's knowledge of the market can yield significant benefits the development project. Based on empirical findings from the interviews, the researcher can mention two aspects on how to improve this. Firstly, putting more emphasis on having the start-up meetings at the beginning of projects, to make certain that the departments involved are integrated early. Secondly, category management teams, although already established, should be even more emphasised. Emphasising on cross-functional communication makes the organisation as a whole more transparent towards each other, sharing knowledge and insights. Seeing the category management teams as a cornerstone of the internal communication might result in the communication problems addressed by the respondents in purchasing to be diminished, which was seen to be one of the main causes for the problems with the internal NPD processes. On R&D´s side, it is also important to emphasise more on the earlier stages, front-loading as formally stated in their processes and in general have a focus on putting more resources and time in the beginning. This is necessary based on the simple explanation that it will be difficult to yield benefits from involving suppliers early if the internal process itself does not emphasise on those stages. This problem might be hard to overcome based on the organisation´s line of thinking that they do not want to risk resources on a project that might not reach production or does not have a defined customer. The researcher

cannot state if this is a true organisational problem but can imply that the organisation needs to address it, if they want to succeed in involving suppliers more strategically and early.

Secondly, KA-Group needs to change its mindset described by the respondents, the mindset of having the necessary expertise and know-how in-house regarding development, or if they do not have it they should acquire it from suppliers and do it on their own. This mindset will make it difficult to make the necessary changes above and it might make the suppliers less inclined to be strategically aligned with KA-Group, based on the mentioned reputation making the suppliers keep KA-Group at arm´s length.

5.3. Knowledge About Suppliers

The second part of the analysis concluded that early supplier involvement can be beneficial for KA-Group and most applicable in pre-development or the NPD phases before concept and design. The third and last part of the analysis, will compare the empirical findings to the theory regarding the respondent's knowledge about suppliers, which will be through the ESI model depicted in Figure 4 that is based on Handfield et al. (1999) original ESI model. This will result in the researcher being able to find answers to the second part of research question 2, if KA-Group has the necessary knowledge to decide which suppliers should be involved and where ESI is applicable. Also, with the application of the ESI model the researcher will attempt to answer the sub-question about where in KA-Group´s product portfolio ESI is most applicable. The next section will have the following structure, the level of contact with suppliers, ESI model with a summarising table (Table 7) and lastly, linking the analysis to the research question.

5.3.1. Level of Contact with Suppliers

Even though the level of contact with suppliers is not one of the three steps to conceptualise if and where a supplier should be integrated based on the ESI model, it was deemed important by the researcher to comprehend and describe KA-Group´s supplier base in a generalised way, to more precisely be able to conclude the suppliers with the most potential to be involved more strategically.

In general, the respondents from both purchasing and R&D stated that most of the contact they personally, or their team has with suppliers, surrounded suppliers with more importance, both in regard to the amount of spend and what kind of component the supplier contributed. These suppliers were named throughout the empirical findings as top 100 suppliers or key suppliers that contributed with, critical components or significant spend. Based on this, the researcher

chooses to name all these suppliers under the term “key suppliers” to make the description of the suppliers easier to comprehend.

The purchasing department expressed that they recently started working on a segmentation project of the supplier base, a project dedicated to increase their understanding of suppliers´ capabilities and is seen to be an important tool in the planned consolidation of KA-Group´s supplier pool. The segmentation resulted in a pyramid-shaped structure seen in Figure 5, with strategic suppliers, important suppliers and transactional suppliers. The suppliers are segmented into these categories based mainly on three key characteristics, critical components, innovative capabilities and spend, which together is seen as the supplier’s business impact. It was found in the empirical chapter that both strategic and important supplier has to some degree more innovative capabilities, whereas the transactional supplier was solely seen as a built-to-print supplier with low capabilities. With this, the researcher makes the assumption that transactional suppliers do not have the innovative capabilities to be involved early and yield significant benefits to KA-Group, thus the supplier segments that will be in focus is strategic and important suppliers.

5.3.2. Early Supplier Involvement Model

5.3.2.1. Technology Roadmap

Technology roadmap can be seen as “the performance, cost, and technology characteristics of future products each company plans to develop/introduce over some specified time horizon” (Handfield et al. 1999, p.73), where the importance lies in finding and involving suppliers that have a technology roadmap that aligns with the organisation’s future strategic plans. This question was mostly focused on the respondents within purchasing since they have the main communication with suppliers.

From the empirical findings, it can be stated that purchasing, in general, felt that they lacked knowledge about supplier’s technology roadmap, mostly based on their large supplier base. But according to Respondent A he believed that the knowledge exists in some areas, but it is acquired from the individuals pushing for it and not brought in systematically, which can be correlated to Respondent L´s answer that they within Air Couplings, actively use technology roadmap to assess what kind of know-how they have in-house and what know-how they need to bring in. However, one base of suppliers that KA-Group had more knowledge about were some key suppliers, but mostly they mentor suppliers, which can be described as a closer relationship where both parties actively pursue the goal of establishing tighter connections,

sharing information about technology, innovation and future goals. Moreover, it was also clear that increasing the knowledge about suppliers´ technology roadmap was seen to be important to KA-Group, based on the insight to understand if and how suppliers can grow with them. Also, it is a key factor in the segmentation project but would first be feasible to do after the consolidation, based on insufficient resources to do it with the current size of suppliers.

It is clear that acquiring knowledge to assess if the supplier's future strategy and product development align with KA-Group´s future plans is a key factor going towards. However, what is not known is if KA-Group has more obstacles than insufficient resources to acquire the necessary knowledge. Two of the key factors in enabling sharing of technology roadmap between companies is according to Handfield et al. (1999) information sharing and incentives for suppliers to involve themselves. These two factors will be discussed next.

Information sharing in this report solely focused on explicit knowledge, explained by Grant (1996) to be information that is codified and can be transferred through communication. It was deemed to be the only information the researcher could find results upon if it is shared or not, based on the complexity of defining tacit knowledge, especially through qualitative questions without going more into depth based on it not being a main priority in the report. It is important to note is that the level of information sharing the respondents discussed surrounded the key suppliers and not the whole supplier base. What can be concluded from the empirical findings is that the respondent's perception of information sharing differs quite significantly. Some stated that the information sharing is at a good level, some at a sufficient level and some that it was not good at all based on the low number of suppliers they share information with. With this discrepancy it is difficult for the researcher to conclude if the information sharing to suppliers is at a sufficient level or not, but what can be stated is that from the answers is that the information sharing mostly seems to be at a more descriptive level with most of the suppliers, either side not keen on sharing too much sensitive information, except with the mentor suppliers where both sides invest more in each other.

Incentives to involve suppliers can be in many forms, some of which were mentioned by the respondents to be business volume increase, securing sales, contract fee in development and the mentor program. The key factor in giving the suppliers the right incentive is according to Wagner (2009) to basically maintain the collaborative partnerships, treating the supplier which spends resources and innovates with the buyer well. As with the level of information sharing, the respondents´ answers differed significantly, both by departments and product categories,

making it challenging for the researcher here as well to conclude, if the incentives currently applied are enough to make suppliers to involve themselves more strategically with KA-Group, except for the mentor suppliers which here was explained as the incentive itself for suppliers. What can be stated however, based on Wagner´s (2009) explanation that one of the common causes for poorer relationships between the supplier and buyer in regarding development project, is if unfair sharing of the benefits from the joint innovation project exists, with supplier participating in the value generated from the innovation is more willing to collaborate in the future. The researcher can pinpoint that KA-Group should look into their current incentives, assessing if the most prominent incentives, being business volume increase and securing sales truly is enough to the suppliers to involve themselves or if KA-Group needs to change their perspective of keeping the entire intellectual property rights, by creating joint-ventures or official partnerships as competitors to KA-Group does according to Respondent I.

To summarise, except for mentor suppliers, KA-Group lacks the knowledge about supplier's technology roadmap to assess the potential of suppliers being involved in NPD early. It is one of the key factors in the segmentation of suppliers, but to assess if the knowledge could be acquired simply by making it a strategic choice or if the organisational change is needed, an assessment was done of the key aspects facilitating the knowledge needed, which was information sharing and incentives. Since the empirical findings showed discrepancies of the respondents´ beliefs and not having data covering the supplier's own perception, the researcher needs to imply that the result is inconclusive. However, for KA-Group to properly gain knowledge about suppliers' technological roadmap in the future, they need to define if these two factors are sufficient level. Otherwise, it will probably be challenging to make suppliers share that level of information.

5.3.2.2. Technological Change

Next step in the ESI model is to assess the rate of technological change, where intuitively one might think that higher rate of technological change should make it even more important to make use of external knowledge and needed expertise, when it is actually the other way around according to Handfield et al. (1999). The authors describe the rate of technological change as a double-edged sword, supplier involvement can be beneficial when facing rapid changes but can also be a pitfall, in the form of a lock-in effect in a specific design or technology, rendering the product in worst case, obsolete at release based on competitors moving the market forward. If the rate of change is fast, Handfield et al. (1999) instead suggest that the supplier is involved at later stages in the NPD project. With this, the researcher will depict the rate of technological

change in each category, both DM segments and product categories, to further assess where suppliers should be involved early. However, what is important to note is that these findings cannot be seen to validate the rate of change based on the results stemming from a few respondents and the complexity to assess a whole market. The results shown should instead be seen as a general indication of where suppliers might be involved rather than be seen as facts.

Firstly, regarding the DM segments, it can be stated that all of the respondents related to the DM segments saw their areas moving slowly, with electronics being seen to change fastest even though the components are rather standardised. With this, it can be stated that all segments of suppliers within DM, can, in general, be involved early in NPD.

Secondly, regarding the product categories, some differences in technological change can be found. Both respondents within Interior saw the change be quite slow, the product life cycle is the same as cars (6-7 years) and most of the development is incremental changes to the products, making them lighter, cheaper and more optimised. In Powertrain & Chassis, however, the respondents stated that they see significant changes in the future, based on the push for electrification which will result in completely new products. In Speciality Products, the rate of change was rather mixed but generally indicated a moderate change. In Off Highway the rate of change depended on the market, Respondent J explained that the outdoor power equipment market (consumer-oriented market) was deemed to change fast and the agriculture and construction equipment market moved slowly with mostly incremental development. In Fluid Transfer, Respondent K described the market as moving moderately fast, with a short product lifetime but longer regarding the material they are using. Lastly, Respondent L within Air Couplings saw the market as slow, with KA-Group even being faster than competitors on the market yielding competitive advantages.

What can be concluded from the description of the technological change in each product category, is that all except Powertrain & Chassis and the consumer-oriented side in Off-Road, have a slow or moderate technological change and thus should be seen as more risk-free to involve suppliers early. Regarding the markets moving faster, the researcher cannot conclude that these categories are not fully applicable to benefit from early supplier involvement but should be seen as a higher risk based on the potential lock-in effect. However, with the choice of following the ESI model the researcher chooses to see these categories as less beneficial to involve suppliers early in this report, thus stating that suppliers instead should be integrated when appropriate if they fulfil the last section of the ESI model, which will be discussed next.

5.3.2.3. Degree of Design Expertise

Degree of design expertise is the last step in the ESI model and should according to Handfield et al. (1999), not be seen as a delimiting factor to include or not include suppliers in NPD projects, but rather be seen as guidance to involve suppliers early or later. If suppliers hold a high degree of design expertise they have the necessary knowledge and expertise to aid an NPD project and should thus be involved early. If the supplier does not possess it, they still have useful knowledge and expertise but are seen as less important making it more appropriate to involve them when appropriate.

What can be concluded of KA-Group´s supplier design expertise is that all areas of both product categories and DM segments stated that Design expertise exists to some extent, some suppliers have it but not KA-Group´s whole supplier base. Further, it can also be concluded that a clear majority of the respondent´s valued the expertise highly, some even stating that the organisation should create deeper relationships with suppliers that have it.

5.3.2.4. Conceptualising the Early Supplier Involvement Model

With each of the steps in the simplified ESI model based on Handfield et al. (1999) full model discussed from theoretical and empirical findings, it is possible for the researcher to conceptualise where suppliers could be integrated early in KA-Group, which will be shown in Table 7 below.

Table 7: Conceptualisation of Early Supplier Involvement in Kongsberg Automotive

	Interior	**Powertrain & Chassis**	**Speciality Products**		
			Off Highway	**Fluid Transfer**	**Air Couplings**
Is Supplier´s Technology Roadmap Aligned with Buying Company´s?	• Mentor Supplier´s, Otherwise No	• Mentor Supplier´s, Otherwise No	• Mentor Supplier´s, Otherwise No	• Mentor Supplier´s, Otherwise No	• Mentor Supplier´s, Otherwise No
High Degree of Technological Change?	• Slow	• Fast	• Fast • Slow	• Moderate	• Slow
High Degree of Required Supplier Design Expertise?	• Highly Valued • Some Areas	• Highly Valued • Yes	• Highly Valued • Some Areas	• Highly Valued • Some Areas	• Highly Valued • Some Areas
Integration	• Fully Integrate Early in NPD	• Integrate when Appropiate	• Integrate when Appropiate • Fully Integrate Early in NPD	• Fully Integrate Early in NPD	• Fully Integrate Early in NPD

5.3.3. Linkage to Research Question 2

- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

With the analysis of the ESI model described, it is possible for the researcher to answer the second part of research question 2, regarding if KA-Group currently has the necessary knowledge to decide which suppliers should be involved and where ESI is applicable.

It can be concluded that based on the segmentation project to understand suppliers' capabilities and aid the future consolidation of the supplier base, solely strategic or important DM suppliers in are deemed to have the innovative capabilities making it beneficial to include them early in NPD projects. Furthermore, even though both strategic and important suppliers are deemed to have the capabilities in general, KA-Group has currently only the required knowledge about their mentor suppliers regarding their technology roadmap. Even though it is a key factor in the segmentation project, KA-Group also needs to assess if they have the proper level of information sharing and incentives towards the suppliers, to understand if pushing for knowledge in this area solely can be achieved by being strategically focused or if organisational change is needed. Further, it can be stated that the organisation does have knowledge about the other two steps in the model. The technological change was deemed to be slow or moderate in all DM segments and all product categories except Powertrain & Chassis and the consumer-oriented market in Off Highway. Meaning that the markets moving faster in this report, are deemed to not being optimal to involve suppliers early based on the lock-in effect of technology or materials. Lastly, design expertise was deemed by most to exist to some extent in the supplier pool and all of the respondents within R&D saw it as highly valuable.

With this, the researcher can conclude that KA-Group can involve both strategic and important suppliers early but needs to focus more on acquiring knowledge if the supplier's technology roadmap is aligned with theirs to facilitate ESI. Currently, they only have sufficient knowledge of their mentor suppliers to assess if they should be involved. One solution to this could have been to increase the size of suppliers that are invited to each mentor supplier rotation but based on the suppliers being handled by managers the resources available are limited, increasing the number of mentor suppliers would probably create problems. The issues that would be created is that if the managers get more suppliers to communicate with, it will result in them not being

able to keep the high level of communication needed to build strong relationships, resulting in the program as a whole has a risk of being compromised and not yield the same results. The ideal option seems to be acquiring the knowledge during the segmentation project, but one problem the researcher noticed is that gaining knowledge about supplier's technology roadmap is decided to happen after the segmentation. The choice of acquiring the knowledge after the segmentation might be counteractive since acquiring this knowledge should seem to be an important step in assessing their innovative capabilities, which is one of the key factors in the segmentation project. Even though the underlying reason for this is limited resources and might be difficult for the organisation to achieve, the researcher can imply that to do the segmentation and understanding suppliers' capabilities most sufficiently, the technology roadmap assessment should be involved during the segmentation and not afterwards.

Regarding the sub-question, the researcher concludes that currently, only mentor suppliers can be involved early in NPD and is most applicable in the product categories with slow technological change, which is, Interior, Off Highway excluding the consumer-oriented market, Fluid Transfer and Air Couplings. The researcher cannot state that Powertrain & Chassis and the consumer-oriented side of Off Highway is not applicable for ESI in general but based on the theory provided regarding the lock-in effect the researcher deems them to be more precarious.

6. Conclusion

The conclusion chapter aims at summarising and depicting the main findings of the report and will have the following structure. First, describing the background to the research questions. Second, the two research questions will be presented and described. Third, the implications of the research will be discussed and lastly, potential areas for future research will be mentioned.

6.1 Background to the Research Questions

The purpose of this research was, through a single-case study of Kongsberg Automotive, investigate what a supplier product innovation is in the organisation's context and how the organisation can facilitate it through early supplier involvement in new product development projects, to enhance their innovative capabilities. The research questions will again be presented below, and the researcher will summarise the conclusions.

6.2. Research Question 1

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*

Based on the researchers own conceptualised definition of what a supplier product innovation is, the conclusion can be made on what it is in the context of Kongsberg Automotive.

"The ability to develop new products and/or technologies in anticipation of, or in response to, customer requirements with the main goal to enhance profitability"

By using the definition above it can be concluded that a supplier product innovation stemming from a 1-tier direct material supplier can be, an innovation in one of the direct material segments, Electronics, Metal, Plastics & Textile and Raw Material, in the form of an incremental, radical or competence-enhancing innovation, that contributes to enhanced abilities to create new products or technologies, which addresses a need in the market, with the end result of increased profitability.

The varying answers from the empirical findings and the researcher choice to not go into depth in each product category, made it not possible to conclude a more precise answer. Although, what can be further implied based on the empirical findings is that Kongsberg Automotive, probably will yield the most benefit from strategic or important suppliers given their innovative capabilities, in the form of radical or competence-enhancing innovations, yielding the competitive advantage or increased know-how in-house that was seemed to be of most importance. Moreover, it can be stated built-to-print suppliers, that usually are only designing

components from clear specifications presented by Kongsberg Automotive, also might be able to use their innovative capabilities if the organisation focus on using functionality specifications instead of specific requirements, which have been successful in the area within purchasing that have previously implemented it.

What Kongsberg Automotive can do to further their understanding of product innovations and supplier product innovations, is to as an organisation in whole, conceptualise a common definition to what a supplier innovation is and what kind of innovation they are seeking, based on that most of the respondents at Kongsberg Automotive touched upon the key characteristics but did not mention them all. One definition that could be adopted is the one mentioned by the Respondent within the Speciality Product category Off Highway, the definition touches upon all of the key characteristics of a supplier product innovation, which is the ability to develop new products, addressing a need in the market and profitability.

"Unique solutions that addresses a need that turns into money"

6.3. Research Question 2

- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

The second research question has throughout the report been divided into two parts for the researcher to more clearly show what was needed to be investigated to reach a conclusion. First part surrounds Kongsberg Automotive´s own perception of supplier involvement and if positive, conclude where suppliers should be integrated into the new product development process. The second part surrounds if the organisations have the necessary knowledge based on the simplified early supplier involvement model created by the researcher, to actually integrate suppliers more strategically and if, in what product categories early supplier involvement will be most beneficial.

Regarding the first part, it can be concluded that the theoretical new product development model chosen by the researcher was of enough resemblance to Kongsberg Automotive´s model that it was deemed possible to draw general conclusions. In its essence, suppliers should be involved early for Kongsberg Automotive to benefit most of the acquired expertise and know-how from the suppliers, which might yield reduced costs, shorter development time and improved functionality of the products. The researcher is not able to define a specific phase the suppliers

should be involved but can emphasise on the importance of involving suppliers before the concept phase, to diminish the problems occurring at the concept and design phase. It is important to minimise errors and problems at those stages because even though these stages by themselves amount to a rather small portion of the total cost in an NPD project, lock in as much as 80% of the total cost.

Regarding the second part, it can be defined, that according to the level of contact with suppliers and early supplier involvement model, only mentor suppliers can currently be involved early in Kongsberg Automotive´s new product development projects. The level of contact with suppliers varied based on the company´s large supplier base, but what could be noted is that the organisation had the most contact with their key suppliers or mentor suppliers, with the last one being suppliers in which both parties seek to form a closer relationship, where both parties actively pursue the goal of establishing tighter connections, sharing information about technology, innovation and future goals. Kongsberg Automotive solely has knowledge about their mentor supplier's technology roadmap but was expressed as a key factor in their segmentation project of the supplier pool, to get an increased understanding of their suppliers' capabilities. The degree of technological change varied some, with the market moving slowly in all product categories except Powertrain & Chassis and the consumer-oriented market in Off Highway. Lastly, the last step of the model which is the degree of supplier's design expertise, all respondents thought it existed to some degree in their supplier pool and respondents within R&D thought it was highly beneficial for the development projects.

With the two parts explained the researcher can explain his main conclusion to the second research question. Kongsberg Automotive can facilitate early supplier involvement in new product development projects, by involving strategic or important suppliers in one of the direct material segments, before the concept phase, that displays innovative capabilities and shares needed expertise and know-how, which will result in operating benefits and diminishing the problems and errors that occur during the concept and development stages. With the early supplier involvement model, it is also possible to conclude that the organisation has the necessary knowledge of mentor suppliers to involve them strategically in the product categories where technological change is not rapid and supplier design expertise exists and is needed. The information described also makes it possible for the researcher to answer the sub-question regarding what product categories suppliers can be involved early. Based on the findings depicted in Table 7, it can be concluded that according to the early supplier involvement model, mentor suppliers can be involved early in all product categories except Powertrain & Chassis

and the consumer-oriented market in Off Highway, based on their technological change in the market being fast which might create lock-in effects with the supplier, which results in the possibility of the product being rendered obsolete before or when it reaches the market.

However, if the organisation seeks to actually achieve the benefits of early supplier involvement, the researcher has found areas of improvement that should be addressed. Firstly, Kongsberg Automotive needs to emphasise more internally on the earlier stages of their new product development and increase purchasing's knowledge about the processes, which was mentioned by both purchasing and R&D. Not involving purchasing at an early stage and not having the necessary knowledge about what supplier capabilities are needed at different stages in the new product development process, makes it difficult for them to source and involve the ideal suppliers for the current projects. This problem could be minimised through emphasising on the start-up meetings at the beginning of projects, to make certain that the departments involved are integrated early and further developing the cross-functional communication through the category management teams. Secondly, for Kongsberg Automotive to actually start involving suppliers, their mindset described by respondents of having the necessary expertise and know-how in-house regarding development, or if they do not have it they should acquire it from suppliers and do it on their own, needs to be addressed. With that mindset, the organisation as a whole will not start seeking to involve suppliers since their perception is that it can be achieved in-house instead.

Further, if the organisation also wants to increase their own capabilities, making it possible to involve more than mentor suppliers, they should invest more resources into using technology roadmap as a tool in their segmentation, instead of doing it after the supplier base has been segmented and consolidated. The choice of acquiring the knowledge after the segmentation might be counteractive since acquiring this knowledge should seem to be an important step in assessing their innovative capabilities, which is one of the key factors in the segmentation project.

6.4. Implications

Even though this study did not seek to find results that could be generalised, some important implications to academia can be noted. Most noticeably, the research contributes to academia by generating insights in how a company within the automotive supply chain perceive their own innovative capabilities, actors in their supply chain innovative capabilities and how to they might increase it. The research also gives further detailed insights on how a purchasing

department is working with their innovative capabilities, which is seen as by several scholars as a department that possess a key role in facilitating supplier innovation and involvement. Acquiring external innovative capabilities should be seen as especially interesting in the field of automotive, based on the forecasted trends that might disrupt the market.

6.5. Future Research

The researcher mainly sees three different orientations for future research that might be interesting to further develop, both in the scope of Kongsberg Automotive and academia.

Firstly, given the scope of the written report, solely focused on acquiring data and insights from the purchasing department and R&D department, future research could widen the scope of research, by collecting data from more departments within the company and from suppliers. The research could yield a more holistic view by understanding the organisation and supplier base better. This could, for example, provide more nuanced answers to the technology roadmap, showing if the current suppliers to Kongsberg Automotive perceive the information sharing and incentives to be enough to strategically involve themselves. Secondly, future research could instead focus on the downstream interaction, investigating how Kongsberg Automotive can make more use of their own innovative capabilities towards their customers.

Thirdly, future research could focus on validating, if the simplified or Handfield et al. (1999) original early supplier involvement model has statistical significance to be a good measurement for assessing where suppliers should be involved in new product development projects. This could be achieved by, for example, testing the model through a multiple-case study in a quantitative research perspective, collecting data from several companies that have integrated the early supplier involvement model into their daily operations.

7. Bibliography

1. Azadegan, A., & Dooley, K. J. (2010). Supplier innovativeness, organizational learning styles and manufacturer performance: An empirical assessment. *Journal of Operations Management*, *28*(6), 488–505. https://doi.org/10.1016/j.jom.2010.02.001

2. Bidault, F., Despres, C., & Butler, C. (1998). The drivers of cooperation between buyers and suppliers. *Research Policy*, *26*(78), 719-732. https://doi.org/10.1016/S0048-7333(97)00034-6

3. Bryman, A. & Bell, E. (2015). Business Research Methods. 4th ed., Oxford: Oxford University Press

4. Business Sweden (2012). *Automotive Suppliers and the U.S. Market.* USA: Business Sweden. https://www.business-sweden.se/contentassets/2eb303405d2b4015b93241d0c1ec4441/automotive-suppliers-and-the-u.s.---fact-pack.pdf

5. Cabigiosu, A., Zirpoli, F., & Camuffo, A. (2013). Modularity, interfaces definition and the integration of external sources of innovation in the automotive industry. *Research Policy*, *42*(3), 662–675. https://doi.org/10.1016/j.respol.2012.09.002

6. Cooper, R.G. (1990). Stage-gate systems: a new tool for managing new products. *Business Horizons*, *33*(3),44-54.

7. Cross, N. (2004). Expertise in design: An overview. *Design Studies*, *25*(5), 427–441. https://doi.org/10.1016/j.destud.2004.06.002

8. De Meyer, A., & Ferdows, K. (1990). Lasting Improvements in Manufacturing Performance: In Search of a New Theory. *Journal of Operations Management*, *9*(2), 168–184.

9. Deloitte (2017) *Driving automotive supplier performance and growth in a slowing market.* United Kingdom: Deloitte. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-manufacturing-driving-automotive-supplier-performance-growth-in-slowing-market.pdf

10. EY (2016). *Automotive change drivers for the next decade.* London: EY. https://www.ey.com/Publication/vwLUAssets/EY-automotive-change-drivers-for-the-next-decade/$FILE/EY-automotive-change-drivers-for-the-next-decade.pdf

11. Fossas-Olalla, M., Minguela-Rata, B., López-Sánchez, J. I., & Fernández-Menéndez, J. (2015). Product innovation: When should suppliers begin to collaborate? *Journal of Business Research*, *68*(7), 1404–1406. https://doi.org/10.1016/j.jbusres.2015.01.022

12. Gatignon, H., Tushman, M. L., Smith, W., & Anderson, P. (2003). A Structural Approach to Assessing Innovation: Construct Development of Innovation Locus, Type, and Characteristics. *Management Science, 48*(9), 1103–1122. https://doi.org/10.1287/mnsc.48.9.1103.174

13. Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(1), 109-12.

14. Hakansson, H. (1987) Industrial Technological Development. A Network Approach. Routledge, London.

15. Handfield, R. B., Ragatz, G. L., Petersen, K. J., Monczka, R. M. (1999). Involving Suppliers in New Product Development. *California Management Review, 42*(1), 59-82. https://doi.org/10.2307/41166019

16. Hauser, J., Tellis, G. J., & Griffin, A. (2006). Research on Innovation: A Review and Agenda for "Marketing Science". *Marketing Science, 25*(6), 687–717. https://doi.org/10.1287/mksc.l050.0144

17. Kongsberg Automotive (2018a). *Corporate Presentation* [in-house material]. Gothenburg: Kongsberg Automotive.

18. Kongsberg Automotive (2018b) *Purchasing Presentation* [in-house material]. Gothenburg: Kongsberg Automotive.

19. Kongsberg Automotive (2018c) *DM Category Codes* [in-house material]. Gothenburg: Kongsberg Automotive.

20. Kongsberg Automotive (2018d) *Purchasing Organisation* [in-house material]. Gothenburg: Kongsberg Automotive.

21. Kongsberg Automotive (2018e) *Category Management Team Instruction* [in-house material]. Gothenburg: Kongsberg Automotive.

22. Kongsberg Automotive (2019) *KA-Group Purchasing Strategy* [in-house material]. Gothenburg: Kongsberg Automotive.

23. Isaksen, A., & Kalsaas, B. T. (2009). Suppliers and strategies for upgrading in global production networks: The case of a supplier to the global automotive industry in a high-cost location. *European Planning Studies*, *17*(4), 569–585. https://doi.org/10.1080/09654310802682131

24. Legenvre, H., & Gualandris, J. (2018). Innovation sourcing excellence: Three purchasing capabilities for success. *Business Horizons, 61*(1), 95–106. https://doi.org/10.1016/j.bushor.2017.09.009

25. Leiponen, A., & Helfat, C. E. (2010). Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal, 31*(2), 224–236. https://doi.org/10.1002/smj807

26. Mansfield, E. (1995). Academic research underlying industrial innovations: Sources, characteristics, and financing. *Review of economics and statistics*, *77*(1), 55-65.

27. Petersen, K. J., Handfield, R. B., & Ragatz, G. L. (2005). Supplier integration into new product development: Coordinating product, process and supply chain design. *Journal of Operations Management*, *23*(3–4), 371–388. https://doi.org/10.1016/j.jom.2004.07.009

28. Roland Berger (2017). *Global Automotive Supplier Study 2018: Transformation in light of automotive disruption.* Munich: Roland Berger. https://www.rolandberger.com/en/Publications/Global-Automotive-Supplier-Study-2018.html

29. Roy, S., Sivakumar, K., Wilkinson, I, F. (2004) Innovation Generation in Supply Chain Relationships: A Conceptual Model and Research Propositions. *Journal of the Academy of Marketing Science, 32*(1), 61-79. https://doi.org/10.1177/00.92070303255470

30. Scannell, T.V, Vickery, S.K., & Droge, C. L. (2000). Upstream Supply Chain Management and competitive performance in the automotive supply industry. *Journal of Business Logistics*, *21*(1), 23–48.

31. Statista (n.d)**.** *Size of the automotive supplier market worldwide 1985-2015.* https://www.statista.com/statistics/269618/size-of-the-automotive-supplier-market-worldwide-since-1985/ [2019-03-19]

32. Statista (2018a). *Automotive supplier´s proportion of value added to worldwide automobile manufacture from 1985 to 2015*. https://www.statista.com/statistics/269619/automotive-suppliers-share-of-worldwide-automobile-manufacture-since-1985/ [2019-03-19]

33. Statista (2018b). *Percentage of global research and development spending in 2018, by industry.* https://www.statista.com/statistics/270233/percentage-of-global-rundd-spending-by-industry/ [2019-03-19]

34. Veloso, F. & Fixson. (2001). Make–Buy Decisions in the Auto Industry: New Perspectives on the Role of the Supplier as an Innovator. *Technological Forecasting & Social Change, 67*(2-3), 239-257. https://doi.org/10.1016/S0040-1625(00)00092-5

35. von Haartman, R., & Bengtsson, L. (2015). The impact of global purchasing and supplier integration on product innovation. *International Journal of Operations and Production Management*, *35*(9), 1295–1311. https://doi.org/10.1108/IJOPM-03-2015-0128

36. Wagner, S. M., & Bode, C. (2014). Supplier relationship-specific investments and the role of safeguards for supplier innovation sharing. *Journal of Operations Management*, *32*(3), 65–78. https://doi.org/10.1016/j.jom.2013.11.001

37. Wagner, S. M. (2009). Getting innovation from suppliers. *Research Technology Management*, *52*(1), 8–9. https://doi.org/10.1080/08956308.2009.11657543

38. Wynstra, F., Von Corswant, F. & Wetzels, M. (2010). In chains? An empirical study of antecedents of supplier product development activity in the automotive industry. *Journal of Product Innovation Management*, *27*(5), 625–639. https://doi.org/10.1111/j.1540-5885.2010.00741.x

39. Xian, H. (2008). Lost in Translation? Language, Culture and the Roles of Translator in Cross-Cultural Management Research. Qualitative Research in Organizations and Management: An International Journal, 3(3), 231-245.

8. Appendixes

8.1. Appendix 1: Interview Information

8.1.1. Interview Information on the Purchasing Department

Purchasing	Name	Duration in KA	Duration in Role	Date	Meeting	Duration
Interior	Respondent A	8,5 Years	2 Months	2019-04-24	Skype	45 Minutes
Powertrain and Chassis Products	Respondent B	1 Year	1 Year	2019-04-17	Skype	30 minutes
Speciality Products	Respondent C	7 Years	1 Year	2019-04-29	Face to Face	55 Minutes
Category Manager	Respondent D	8 Years	4 Years	2019-05-02	Face to Face	30 Minutes
Electronics	Respondent E	4 Years	1,5 Years	2019-04-23	Face to Face	55 Minutes
Metal, Plastics & Textile	Respondent F	3,5 Years	1,5 Years	2019-04-23	Face to Face	50 Minutes
Raw Material	Respondent G	3,5 Years	7 Months	2019-04-23	Face to Face	40 Minutes

8.1.2. Interview Information on the R&D Department

R&D	Name	Duration in KA	Duration in Role	Date	Meeting	Duration
Interior Products	Respondent H	19 Years	4 Years	2019-05-02	Skype	45 Minutes
Powertrain and Chassis Products	Respondent I	27 Years	1 Year	2019-04-29	Skype	50 Minutes
Off-Highway	Respondent J	1 Year	1 Year	2019-04-17	Skype	65 Minutes
Fluids	Respondent K	3,5 Years	3,5 Years	2019-04-15	Skype	40 Minutes
Couplings	Respondent L	10 Months	10 Months	2019-04-17	Skype	60 Minutes

8.2. Appendix 2: Interview Guides

8.2.1 Purchasing Interview Guide

Interview Guide – Purchasing

This guide should only be seen as a helpful tool for the interview. A way for me to more clearly show what I want to ask you, and the possibility for you to be readier for the questions. Which will hopefully result in more nuanced answers.

The main topics for discussion will be in **bold** text whereas the sub-questions will be clearly marked with bullet points.

The sub-questions are not set in stone and should more be seen as a guideline to where I might want to direct the questions/discussion. This is because we want the interview to be open and flexible and your knowledge about the subject might be higher/lower than the sub-questions suggested.

Perception of supplier innovation

- What do you think product innovation is in a generalised context?
- What do you think is a supplier product innovation is in a generalised context?
- How do you think involving suppliers as an external source of innovation could affect KA-Group?
- How could supplier product innovation affect your specific field?

Knowledge about suppliers

- What level of contact do you have with suppliers?
- How often are you in contact with suppliers?
- Do you have knowledge about your suppliers short and long-term plans regarding future product development plans?
- What is the level of information sharing between KA-Group and suppliers in your specific field?
- Do you think suppliers have incentives to involve themselves strategically with KA-Group?
- What is the degree of technological change in your specific field?
- Do your suppliers in your field have a high degree of design expertise?

New product development processes

- Do you have knowledge about the new product development processes in KA-Group?

8.2.2. R&D Interview Guide

Interview Guide – R&D

This guide should only be seen as a helpful tool for the interview. A way for me to more clearly show what I want to ask you, and the possibility for you to be readier for the questions. Which will hopefully result in more nuanced answers.

The main topics for discussion will be in **bold** text whereas the sub-questions will be clearly marked with bullet points.

The sub-questions are not set in stone and should more be seen as a guideline to where I might want to direct the questions/discussion. This is because we want the interview to be open and flexible and your knowledge about the subject might be higher/lower than the sub-questions suggested.

Lastly, on page 2 in this interview guide, you will find the theoretical new product development model that I have used in my thesis.

Perception of supplier innovation

- What do you think product innovation is in a generalised context?
- What do you think is a supplier product innovation is in a generalised context?

Knowledge about suppliers

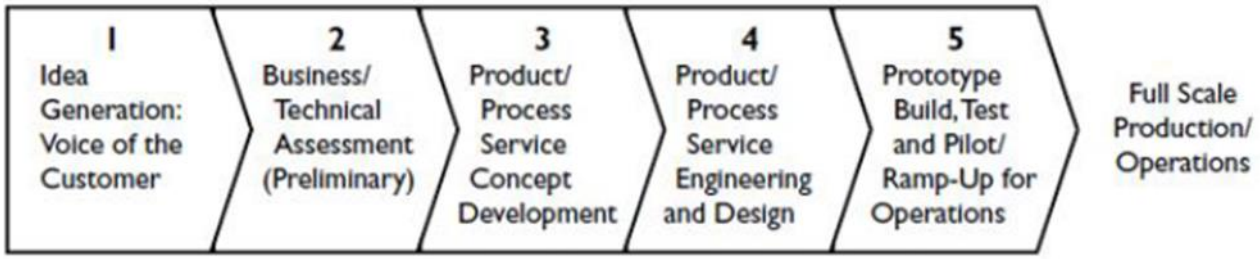
- What level of contact do you have with KA-Group´s suppliers?
- What is the degree of technological change in your specific field?

New product development process

- How is the new product development process in your specific field?
- Do the processes differ significantly from the picture shown on page 2?
- Are you content with the current NPD process in your specific field?
- What level of communication do you have with the purchasing department regarding new product development projects?

Perception of involving suppliers in new product development

- Are you currently involving suppliers in your new product development projects?
- Do you think it could be beneficial to involve suppliers in new product development projects?
- Where in the new product development process do you think involving suppliers would be most beneficial?
- If suppliers contribute with a high degree of design expertise, is that something that would be valuable in your new product development projects?


1
Idea Generation: Voice of the Customer
2
Business/ Technical Assessment (Preliminary)
3
Product/ Process Service Concept Development
4
Product/ Process Service Engineering and Design
5
Prototype Build, Test and Pilot/ Ramp-Up for Operations
Full Scale Production/ Operations

Summary of Thesis

1. Introduction

1.1. Background

In today´s globalised and highly competitive markets, incumbents face rapid changes in their respective market and it has become a necessity to adapt to remain competitive. One market especially faced with disruptive changes is the automotive industry, an industry that might witness more changes in the next decade compared to the last 20 years (EY 2016). The theorised disruptive changes stem from the "four megatrends" currently being developed and innovated, these are ride-sharing services, automated vehicles, digitalisation and electrification (Roland Berger 2017).

Innovations are usually in the eye of end consumers and media related to the organisations that supply the product or service, that is, the original equipment manufacturers [OEM]. For example, autonomous driving is linked to automotive manufacturers such as Tesla or Volvo Cars. However, one aspect that is often forgotten is the importance of the whole supply chain needing to follow the innovative push to realise the desired results. Involving the supply chain have specifically grown in importance in the automotive industry, which has undergone dramatic changes regarding the level of relationship and level of importance suppliers today have. Relationships have evolved from arm´s length trade to close strategic relationships (Isaksen and Kalsaas 2009) and automotive suppliers were forecasted in 2015 to create 82% of value-adding activities to the final product.

One company that is in the middle of the automotive supply chain is Kongsberg Automotive [KA-Group], the company that this report also will be based on through a collaboration between the researcher and the organisation´s purchasing department. KA-Group is an automotive parts manufacturer with their main customer base being original equipment manufacturers (OEM´s) and Tier 1 suppliers, to which they supply three distinct product categories to, namely, Interior, Powertrain & Chassis and Speciality products. KA-Group has a global reach but also focuses on local support, which results in the organisation having a direct presence in 18 countries worldwide. KA-Group has stated that "You find KA-Groups products in one out of 5 passenger cars" (Kongsberg Automotive 2018a), which depicts their current global presence in the market.

KA-Group has expressed a desire to enhance their innovative capabilities to increase their competitiveness. This report will focus on one of the organisation's objectives, the purchasing department's goal of incorporating supplier innovations.

1.2. Problem Discussion

KA-Group´s objective to increase their understanding of how to incorporate supplier innovation mainly stems from a need to increase their competitive advantages. The organisation has succeeded with innovations in-house but acknowledges, that there is room for improvement. KA-Group´s objective can be seen as a highly relevant area to prioritise since innovations (Business Sweden 2015; Deloitte 2017a; Roland Berger 2017) and strategic partnerships (Deloitte 2017; Roland Berger 2017) are seemed to be two of the key differentiators for automotive suppliers if they want to succeed in the changing competitive landscape. Further, purchasing department within organisations are seen to have a key role in facilitating supplier innovation and involvement (Legenvre and Gualandris 2018; Handfield, Ragatz, Petersen & Monczka 1999; Bidault, Despres & Butler 1998), making the research scenario within a purchasing department highly relevant as well.

KA-Group has a clear goal to strive for but does not have the necessary knowledge to conceptualise how they will achieve it. KA-Group lacks the knowledge of what a supplier innovation actually is and in what product categories suppliers should be more involved.

1.3. Research Purpose

The general purpose of this research is through a single case study of KA-Group, investigate what a supplier innovation actually is in the context of the organisation and further detail how and where it can be facilitated within the organisation. The findings of this research will be rather specific to the collaboratory organisation, since the researcher did not seek to find generalised results but will still yield valuable insights to how an incumbent firm in the middle of the automotive supply chain, works with innovations in general and their perception of acquiring external innovative capabilities.

The researcher and organisation decided to limit the scope to enhance the possibility to find valuable answers to the research purpose, which is closely related to their future strategic agenda and resulted in the research questions depicted below.

1.3.1. Research Questions

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*
- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

2. Literature Review

2.1. Background

The theoretical framework will start with a background with the aim to strengthen the choice of research, provide general information of the chosen research area and clearly depict the rationale of how the research questions were formed. The background is divided into three different areas, the automotive industry, Kongsberg Automotive, conceptualising innovation and ends with a brief summarisation that connects to the research questions. Based on the restricted size of the summary, the researcher will solely depict the summarisation of the background (2.1.4.) in this summary.

2.1.4. Summary of the Background

To sum up innovation as a concept and the background information. Innovation is in its essence a process to bring new products and services to the market with the goal to enhance profitability, can be categorised into incremental, radical, competence-enhancing and competence-destroying innovations, can be divided into product innovation and process innovations and lastly, can be created solely internally by different departments, or by collaborating with external actors. Scholars have proven that purchasing as an internal actor and suppliers as an external actor both are proficient in creating successful innovations. As stated earlier, support has been given that KA-Group´s objective to increase their understanding of involving suppliers in innovation processes is a relevant field to further investigate, both in the scope what it can yield to the organisation by the new changes and new trends in the market, and by theory that wider source of knowledge (suppliers explicitly in this report) and innovation is associated with higher innovation success.

With KA-Group´s strategic plan towards 2025 (Kongsberg 2019), the width of the concept supplier innovation can be broken down into more precise research questions which were depicted in the introduction chapter.

These stem from KA-Group´s future state of the technical involvement in the QSTCM perspective, where KA-Group wants to proactively bring in supplier innovations and suppliers themselves to bring in innovations through extensive collaboration with suppliers, with ESI in focus. To make the research area more feasible to find answers within the short time frame of the report, the researcher further delimited the report to solely focus on how KA-Group can bring in suppliers' early product in the NPD process.

2.2. Supplier Innovation

Using external knowledge as a potential source to generate innovations has according to Roy, Sivakumar and Wilkinson (2004) roots from the late 80s when scholars such as Hakansson (1987), challenged the then general acceptance that innovation within supply chains solely originated from the buyer. The notion that a substantial part of innovations are generated through the interaction between buying and selling firms within the supply chain, are today widely known (Roy, Sivakumar & Wilkinson 2004) and is a key factor for manufacturers to achieve the necessary improvements to remain competitive, especially when taking into consideration that purchased materials accounts on average for over 50% of organisations total cost of goods sold (Handfield et al. 1999). According to scholars, using suppliers to generate innovations has grown based on several factors, some of these are; Product and service complexity continues to grow (Azadegan & Dooley 2010) and technological developments and customer demand change more rapidly (Handfield et al. 1999; Roy, Sivakumar & Wilkinson 2004), which has made it increasingly difficult for firms to gain competitive advantages on their own (Fossas-Olalla, Minguela-Rata, López-Sánchez & Fernández-Menéndez 2015). One last example of why supplier involvement has grown is that supplier's role within the supply chain has grown in importance, based on the focal firms' trend to outsource more and more production in the form of design, development and engineering activities to suppliers, a trend that have been especially noticed in the automotive industry (Wynstra, Von Corswant & Wetzels 2010) which was explained in the background regarding changes in the automotive industry.

In the widest scope of benefits of involving suppliers in the viewpoint of operations, Azadegan & Dooley (2010) stated that supplier innovativeness has positive associations to the improvement of all the five manufacturing performances (Cost, quality, product development,

delivery and flexibility) for the manufacturer and does not necessarily entail that trade-offs need to happen. Trade-offs in operations management perspective are according to De Meyer & Ferdows (1990) a general theory explaining that a manufacturer cannot increase one of the performance objectives without the expense of another unless there is slack in the system. Supplier innovations are comparable with the general notion of innovations described earlier, that they can be distinguished into the two main groups of innovation, that is, process innovations and product innovation (Wagner & Bode 2014). With the earlier description to delimitate to only focus on product innovation and through discussion with KA-Group, the focal point of this research regarding supplier innovations will be through the context of NPD. Even though product development will be the key performance objective the researcher explores, it is important to note that the other objectives will also be taken in consideration, based on Azadegan & Dooley (2010) description that trade-off theory does not necessarily imply when incorporating suppliers in product development.

The purchasing department is seen to have a key role in facilitating supplier innovations by scholars, meaning to incorporate suppliers in innovation projects. Legenvre and Gualandris (2018) mention involving suppliers in innovation projects as one of the key purchasing capabilities for success, Handfield et al. (1999) stated that the role of purchasing will increase in importance and Bidault, Despres and Butler (1998) further described that purchasing has a key role in achieving ESI. With this, the next step will be to discuss how purchasing actually can facilitate ESI in NPD processes.

2.3. New Product Development

NPD is easily described as the process of creating new products, the NPD process can further be defined as a "series of interdependent and often overlapping stages during which a new product (or process or service) is brought from the idea stage to readiness for full-scale production or service delivery" (Handfield, Ragatz, Petersen & Monczka 1999, p. 62). These specific stages of NPD will be described below.

2.3.1. New Product Development Process

The stages mentioned by Handfield et al. (1999) are based on their own depiction of how the NPD process is built. Several scholars have over the years created similar NPD processes, for example by Hauser, Tellis and Griffin (2006) or the famous stage gate system by Cooper (1990), but to be able to reach viable findings in the report one model had to be chosen and the

researcher deemed the chosen model to be the most applicable based on Handfield et al. (1999) simplified and detailed stages.

As can be seen by Figure 3, all stages of the NPD process are deemed to be sufficient to involve suppliers according to Handfield et al. (1999). In general, the authors proclaimed positive results from involving suppliers in NPD, both from their own literature review and survey. From the survey, Handfield (1999) found strong indications to improvements in all categories tested, purchased material cost, purchased material quality, development time (time to market), development cost, functionality and product manufacturing cost. This to some extent goes in line with what was stated earlier, that improvements do not necessarily imply that trade-offs will happen (Azadegan & Dooley 2010).

Even though suppliers evidently can be incorporated at any step throughout the NPD process, KA-Group has a focus on involving suppliers early which will be the next part of the discussion.

2.3.2. Early Supplier Involvement

ESI can be described as "vertical cooperation where manufacturers involve suppliers at an early stage in the product development innovation process, generally at the level of concept and design" (Bidault, Despres & Butler 1998, p.719). Even though ESI is not a concept that has been directly linked to specific stages of NPD shown in Figure 3, the definition described provides a general direction, that the first four stages can be seen as involving the suppliers early. Furthermore, Petersen, Handfield and Ragatz (2005) tested in their study if the different stages of Handfield et al. (1999) NPD process affected the result of ESI and found no support for a positive correlation. Thus, this research will take all of the four stages as possible entry points to involve suppliers early. Even though a specific stage in the NPD process cannot be defined as the optimal entry point it is important to note the importance of taking the right path as early as possible. Handfield et al. (1999) state that although the concept stage and design stage of the NPD process (stage 3 and 4) contains a relatively small portion of the total NPD cost, they "lock in" as much of 80% of the total NPD cost. Meaning that when the NPD process has reached this stage, a majority of costs which is accumulated in idea generation and business assessment will be difficult to change. Handfield et al. (1999) further state that this makes it crucial for firms to have as much expertise as early as possible in the development process.

Further, it is also possible to explain what actually drives ESI, Bidault, Despres and Butler (1998) created an ESI adoption model where the authors tested three different categories and if these affected the adoption of ESI. The three categories tested were environmental pressures,

social norms and industry norms, which can be seen as two external categories and organisational choices which is internal choices by the organisation. The authors found that all categories affect the adoption of ESI to some extent, but the most interesting finding was that organisational choices were deemed the have the highest impact, making the authors conclude that "ESI adoption is more a question of strategic priorities than external forces, pressures or circumstances" (Bidault, Despres & Butler 1998, p. 731). With this, it can be concluded that ESI should be seen as a strategic choice by the organisation that can be actively pursued and therefore, the focus was set on organisational choices and not external situations.

Handfield et al. (1999, p.65) created a process model for reaching a consensus if and where a specific supplier should be involved in NPD projects, a modification to this model has been created and renamed which will be shown below. The modifications done is to simplify and show the most important steps in when ESI is applicable. Discussing steps from the original model, like identification of pool of supplier or if the supplier has an acceptable history and are qualified, is not deemed necessary to go in-depth about, mostly since actions to solely work with top class suppliers are already in KA-Group´s future strategy (Kongsberg Automotive 2019) and cross-functional collaborations are already in place at KA-Group, which is seen as one of the crucial steps to identify the pool of potential suppliers. With this, the simplified model will instead show the three key factors to take in consideration if the supplier should be involved early.

As can be seen in Figure 4 above, deciding if to involve suppliers early in NPD process can be seen as a three-step process and is as explained earlier, a simplified and modified model based of Handfield et al. (1999) original model.

With a more detailed view of where suppliers can be involved early in NPD processes and what criteria that need to be fulfilled for ESI to achieve high results, it is now possible to link the research questions to the theoretical framework, which will be the next step.

2.4. Linking Theory to the Research Questions

It is now necessary to link the theory to the research questions, to clearly depict what can be assessed now at what is needed to be collected from the primary data collection.

2.4.1. Linkage to Research Question 1

Linking the earlier descriptions of innovation and supplier innovation it is possible to conclude a very generalised answer to what a supplier product innovation is in the context of KA-Group.

A supplier product innovation is an innovation in the form of incremental, radical or competence-enhancing from one of the purchasing segments (Electronics, Metal, Plastic & Textile and Raw Material) that should enhance the product development of a product that aligns in one of the three categories in their product portfolio (Interior, Powertrain & Chassis Products and Specialty Products). With the enhancement in product development meaning a possible improvement in, purchased material cost, purchased material quality, development time (time to market), development cost, functionality and product manufacturing cost.

As can be clearly depicted this is quite a descriptive question since the research does not go in depth to analyse specific suppliers, thus making it infeasible to conclude a more detailed answer. However, the interesting part is to through primary data collection, compare the theoretical findings to KA-Group´s own perception of what a supplier product innovation actually is and their general attitudes towards incorporating suppliers more closely, which if misaligned, can have impacts to what they can expect from a supplier in a product development perspective. But also, interesting to actually contextualise more directly what respondents within KA-Group believe a supplier product innovation could be in their specific fields.

2.4.2. Linkage to Research Question 2

What can be derived from the theory is that adopting ESI should be seen as a strategic choice by the organisation (Bidault, Despres & Butler 1998) and can be applied in any of the four first stages of Handfield et al. (1999) NPD process model shown in Figure 3, from idea generation to design development. Furthermore, Petersen et al. (2005) found no significance of ESI having stronger effects in any specific stage, thus all of the four stages ESI can be adopted into, should be deemed as possible entry points for KA-Group´s suppliers, even though Handfield et al. (1999) stresses the importance of evolving as early as possible based on lock-in effects. With this, primary data collection will be needed to be collected, to find where KA-Group believes they need supplier involvement the most in the NPD process and how to see how applicable the Handfield et al. (1999) model is in the context of KA-Group.

The second step to conceptualise is how KA-Group can facilitate ESI in NPD processes, which will be analysed through the modified ESI-model depicted in Figure 4, regarding when to integrate suppliers. The simplified model shows that the supplier's technology roadmap needs to be aligned with KA-Group, the product being developed should not be in a product category of rapid technical change and for the supplier to be involved early, it should have high design expertise. What needs to be collected from primary data is more knowledge about the specific

purchasing segments and product categories, to conceptualise if KA-Group currently has the necessary knowledge to decide which suppliers should be involved and where ESI is applicable, thus also in which product categories ESI is applicable.

3. Methodology

3.1. Research Strategy

Since the research questions are quite broad and explanatory in nature, mostly regarding the complexity to understand how KA-Group can facilitate ESI in NPD processes but also finding what a supplier product innovation is for KA-Group, makes the inductive approach the most logical approach to answer the research questions. With a choice made over what relationship between theory and research are most applicable, it is possible to decide the research strategy, the choice of using an inductive approach, a qualitative research strategy was a natural choice, since an inductive approach and qualitative strategy often goes hand in hand.

3.2. Research Design

The choice of research design becomes rather apparent based on that the research is through a collaboration where the most important findings are through conceptualising the organisation as a single case instead of separating the organisation into multiple cases based on different departments. KA-Group will be the single-case the researcher will base his report on, seeking to answer the research questions through an intensive analysis of the problem and organisation. The single-case study is a representative case study, defined by Bryman and Bell (2015) as a case study type, seeking to explore a case the exemplifies an everyday situation of an organisation. This case type fits the research most appropriately because the problems of understanding supplier innovations can be put in a more general context, namely the problems for organisations to understand and value innovations and suppliers as a strategic partner, which should be seen as common pitfall that many organisations have fallen into over the decades.

One argument against case studies is that the results usually cannot be generalised. However, since the research is not aiming towards generalised results but rather, in-depth information about the sole case, making it an ideographic approach, meaning that the study does not seek to generalise results to others, should make the argument invalid in the scenario. Also, Bryman and Bell (2015) argue that it is the particularisation compared to generalisation, that is one of the main strengths with case studies.

3.3. Research Method

The research methods that were used to collect data is through both primary and secondary data collection and will be presented below.

3.3.1. Secondary Data

Secondary data were collected to create the theoretical framework (literature review) of the research, the literature review consists of two main sections, a review of scientific articles and organisational documents from KA-Group. Narrative review was the approach this research applied. A narrative review instead at finding important interpretations of the literature it covers, through an initial impression of the topic the researcher wants to explore. The narrative approach is deemed more applicable than the systematic approach based on, firstly, the research topic requires a more flexible approach, where the researcher has the ability to modify boundaries based on what is found. Secondly, the approach requires less strict inclusion and exclusion criteria which yields a wider scope, which suits this research based on the need to be exploratory.

3.3.2. Primary Data

Primary data were collected to get a richer understanding of KA-Group and were based on the main findings from the secondary data.

3.3.2.1. Sampling

Generic purposive sampling resembles the theoretical sampling approach to some extent but is not connected to grounded theory and thus does not have the same iterative sampling style. This sampling method fits the research since it is described by Bryman and Bell (2015) to be useful when the researcher wants to gain insights to a wide range of roles within an organisation, which fits this research since it was important to get an understanding from different roles and departments at KA-Group to fully conceptualise the organisational problems presented.

3.3.2.2. Respondents

From the literature review the researcher concluded that the most relevant respondents would be people from the purchasing and R&D departments, Table 1 and Table 2 will depict the chosen respondents from both departments. Further, more detailed information about the respondents can be found in Appendix 1.

3.3.2.3. Choice of Qualitative Data Collection Method

The only research method that was deemed to be viable in this research was ordinary interviews, based on the difficulties the other would present. Based on the research having a clear focus on what will be investigated from the start, a semi-unstructured interview approach was applied.

3.4. Data Analysis

The researcher has chosen to analyse the research through a thematic analysis, which basically follows the same codification of data as grounded theory (Bryman & Bell 2015) but does not have the same iterative and extensive processes. Since the predetermined categories in the interview guide were rather separated from the start and the researcher categorised the questions to easily be linked to what was needed to be investigated to supplement the findings in the literature review, it resulted in a quite simple thematic analysis. The answers from the interviews where codified which then could be used to create three distinct themes; Perception of product innovation and supplier product innovation, New product development processes and perception of supplier involvement, and knowledge about suppliers.

6. Conclusion

6.1. Background to the Research Questions

The purpose of this research was, through a single-case study of Kongsberg Automotive, investigate what a supplier product innovation is in the organisation's context and how the organisation can facilitate it through early supplier involvement in new product development projects, to enhance their innovative capabilities.

6.2. Research Question 1

- *What is a supplier product innovation for Kongsberg Automotive in the context of their 1-tier direct material suppliers?*

Based on the researchers own conceptualised definition of what a supplier product innovation is, the conclusion can be made on what it is in the context of Kongsberg Automotive.

"The ability to develop new products and/or technologies in anticipation of, or in response to, customer requirements with the main goal to enhance profitability"

By using the definition above it can be concluded that a supplier product innovation stemming from a 1-tier direct material supplier can be, an innovation in one of the direct material segments, Electronics, Metal, Plastics & Textile and Raw Material, in the form of an

incremental, radical or competence-enhancing innovation, that contributes to enhanced abilities to create new products or technologies, which addresses a need in the market, with the end result of increased profitability.

The varying answers from the empirical findings and the researcher choice to not go into depth in each product category, made it not possible to conclude a more precise answer. Although, what can be further implied based on the empirical findings is that Kongsberg Automotive, probably will yield the most benefit from strategic or important suppliers given their innovative capabilities, in the form of radical or competence-enhancing innovations, yielding the competitive advantage or increased know-how in-house that was seemed to be of most importance. Moreover, it can be stated built-to-print suppliers, that usually are only designing components from clear specifications presented by Kongsberg Automotive, also might be able to use their innovative capabilities if the organisation focus on using functionality specifications instead of specific requirements, which have been successful in the area within purchasing that have previously implemented it.

What Kongsberg Automotive can do to further their understanding of product innovations and supplier product innovations, is to as an organisation in whole, conceptualise a common definition to what a supplier innovation is and what kind of innovation they are seeking, based on that most of the respondents at Kongsberg Automotive touched upon the key characteristics but did not mention them all. One definition that could be adopted is the one mentioned by the Respondent within the Speciality Product category Off Highway, the definition touches upon all of the key characteristics of a supplier product innovation, which is the ability to develop new products, addressing a need in the market and profitability.

"Unique solutions that addresses a need that turns into money"

6.3. Research Question 2

- *How can Kongsberg Automotive facilitate early supplier involvement in new product development processes?*
    - *Where in Kongsberg Automotive´s product portfolio is early supplier involvement in new product development most applicable?*

The second research question has throughout the report been divided into two parts for the researcher to more clearly show what was needed to be investigated to reach a conclusion. First part surrounds Kongsberg Automotive´s own perception of supplier involvement and if

positive, conclude where suppliers should be integrated into the new product development process. The second part surrounds if the organisations have the necessary knowledge based on the simplified early supplier involvement model created by the researcher, to actually integrate suppliers more strategically and if, in what product categories early supplier involvement will be most beneficial.

Regarding the first part, it can be concluded that the theoretical new product development model chosen by the researcher was of enough resemblance to Kongsberg Automotive´s model that it was deemed possible to draw general conclusions. In its essence, suppliers should be involved early for Kongsberg Automotive to benefit most of the acquired expertise and know-how from the suppliers, which might yield reduced costs, shorter development time and improved functionality of the products. The researcher is not able to define a specific phase the suppliers should be involved but can emphasise on the importance of involving suppliers before the concept phase, to diminish the problems occurring at the concept and design phase. It is important to minimise errors and problems at those stages because even though these stages by themselves amount to a rather small portion of the total cost in an NPD project, lock in as much as 80% of the total cost.

Regarding the second part, it can be defined, that according to the level of contact with suppliers and early supplier involvement model, only mentor suppliers can currently be involved early in Kongsberg Automotive´s new product development projects. The level of contact with suppliers varied based on the company´s large supplier base, but what could be noted is that the organisation had the most contact with their key suppliers or mentor suppliers, with the last one being suppliers in which both parties seek to form a closer relationship, where both parties actively pursue the goal of establishing tighter connections, sharing information about technology, innovation and future goals. Kongsberg Automotive solely has knowledge about their mentor supplier's technology roadmap but was expressed as a key factor in their segmentation project of the supplier pool, to get an increased understanding of their suppliers' capabilities. The degree of technological change varied some, with the market moving slowly in all product categories except Powertrain & Chassis and the consumer-oriented market in Off Highway. Lastly, the last step of the model which is the degree of supplier's design expertise, all respondents thought it existed to some degree in their supplier and respondents within R&D thought it was highly beneficial for the development projects.

With the two parts explained the researcher can explain his main conclusion to the second research question. Kongsberg Automotive can facilitate early supplier involvement in new product development projects, by involving strategic or important suppliers in one of the direct material segments, before the concept phase, that displays innovative capabilities and shares needed expertise and know-how, which will result in operating benefits and diminishing the problems and errors that occur during the concept and development stages. With the early supplier involvement model, it is also possible to conclude that the organisation has the necessary knowledge of mentor suppliers to involve them strategically in the product categories where technological change is not rapid and supplier design expertise exists and is needed. The information described also makes it possible for the researcher to answer the sub-question regarding what product categories suppliers can be involved early. Based on the findings depicted in Table 7, it can be concluded that according to the early supplier involvement model, mentor suppliers can be involved early in all product categories except Powertrain & Chassis and the consumer-oriented market in Off Highway, based on their technological change in the market being fast which might create lock-in effects with the supplier, which results in the possibility of the product being rendered obsolete before or when it reaches the market.

However, if the organisation seeks to actually achieve the benefits of early supplier involvement, the researcher has found areas of improvement that should be addressed. Firstly, Kongsberg Automotive needs to emphasise more internally on the earlier stages of their new product development and increase purchasing's knowledge about the processes, which was mentioned by both purchasing and R&D. Not involving purchasing at an early stage and not having the necessary knowledge about what supplier capabilities are needed at different stages in the new product development process, makes it difficult for them to source and involve the ideal suppliers for the current projects. This problem could be minimised through emphasising on the start-up meetings at the beginning of projects, to make certain that the departments involved are integrated early and further developing the cross-functional communication through the category management teams. Secondly, for Kongsberg Automotive to actually start involving suppliers, their mindset described by respondents of having the necessary expertise and know-how in-house regarding development, or if they do not have it they should acquire it from suppliers and do it on their own, needs to be addressed. With that mindset, the organisation as a whole will not start seeking to involve suppliers since their perception is that it can be achieved in-house instead.

Further, if the organisation also wants to increase their own capabilities, making it possible to involve more than mentor suppliers, they should invest more resources into using technology roadmap as a tool in their segmentation, instead of doing it after the supplier base has been segmented and consolidated. The choice of acquiring the knowledge after the segmentation might be counteractive since acquiring this knowledge should seem to be an important step in assessing their innovative capabilities, which is one of the key factors in the segmentation project.

6.4. Implications

Even though this study did not seek to find results that could be generalised, some important implications to academia can be noted. Most noticeably, the research contributes to academia by generating insights in how a company within the automotive supply chain perceive their own innovative capabilities, actors in their supply chain innovative capabilities and how to they might increase it. The research also gives further detailed insights on how a purchasing department is working with their innovative capabilities, which is seen as by several scholars as a department that possess a key role in facilitating supplier innovation and involvement. Acquiring external innovative capabilities should be seen as especially interesting in the field of automotive, based on the forecasted trends that might disrupt the market.