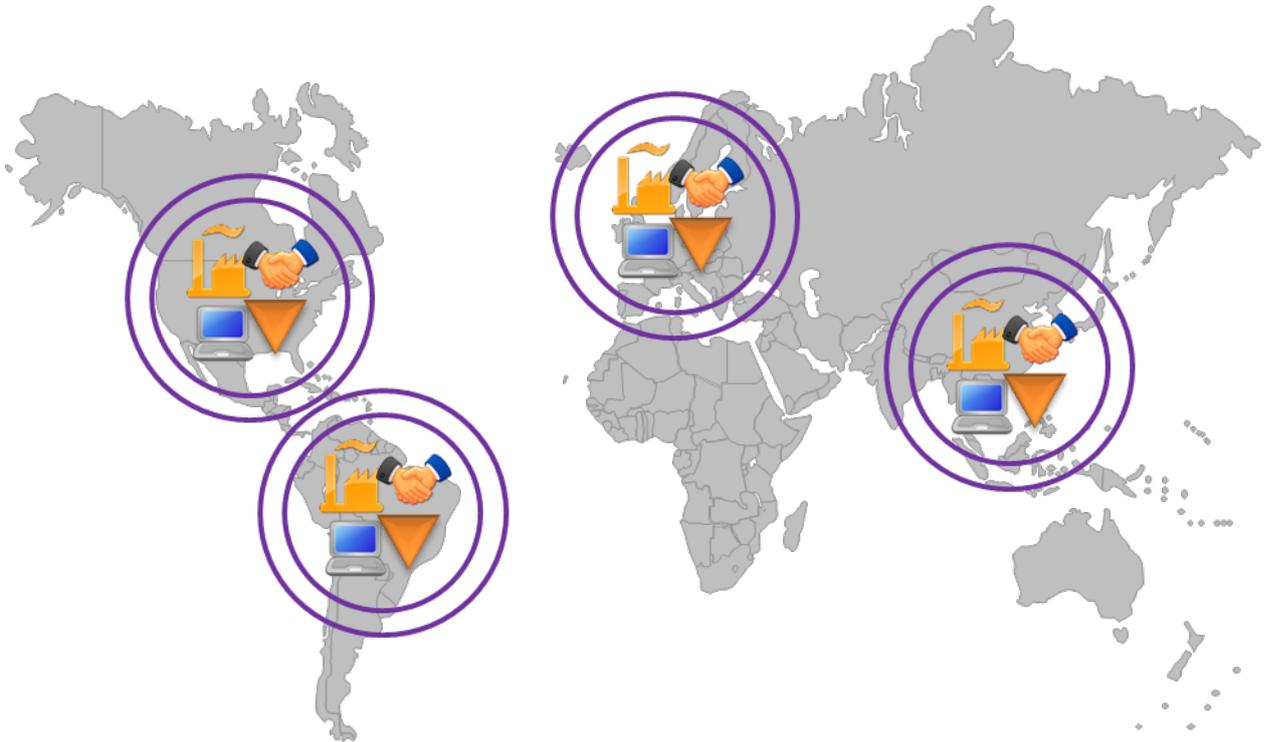


CHALMERS



Supply Chain Localization Strategies for the Future A study of Swedish AIE companies

Master of Science Thesis in the Master Degree Program Supply Chain Management

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CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden, 2012
Report No. E2012:041

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Cover:
Regional Supply Chain Hub setup, refer to *section 5.3.2* for further details.

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Abstract

Today, companies are dealing with suppliers and customers on a global basis. The localization of activities such as purchasing, manufacturing and R&D are of great importance for companies to be able to stay competitive and prosper. Context variables are constantly changing and since they are pre-requisites for every strategy the evolvement of these needs to be considered. The global spread of companies, the changing context and the impact of localization on company results, together with the fact that no previous study of this kind exists, called for further investigation. The purpose of the study was threefold: First, to identify, evaluate and rank external factors of localization and derive how these affect companies' decisions. Second, to identify which localization strategies that is probable in the future and how these differ between various company types. Finally, to give recommendations regarding localization for companies to remain successful in the year of 2020.

The study suggested a number of important considerations regarding localization decisions. Firstly, 18 external factors of localization were identified and ranked by the decision makers at approximately 55 Swedish automotive and industrial equipment companies. These were analyzed to map which factors companies emphasize the most and believe will be most important in the future. Secondly, localization strategies were mapped taking the previously mentioned external factors into account. Most notably was that companies predominantly favor to regionalize their manufacturing, supplier base and R&D. Thirdly, a set of recommendations regarding localization, as well as additional considerations to reflect upon before a decision, was given to companies based on their characteristics.

The major contribution of this study is the wide focus which allows for a holistic overview of localization of supply chain functions. The connections and interrelations of the supply chain functions of a producing company could be analyzed. Furthermore, the focus on global Swedish automotive and industrial equipment manufacturers provides a view into a subject in which previously no academic studies have been conducted. The contributions from the study will therefore hopefully help companies design their localization strategies to allow them to remain prosperous in the future.

Keywords: Supply chain strategy, localization, drivers of localization, external factors of localization, manufacturing, purchasing, R&D

Preface

The work presented in this study was conducted in close collaboration with Accenture Management Consulting in Gothenburg, Sweden. The project idea was created by Daniel Szirányi, senior manager at Accenture, who realized the need to investigate a shift in localization patterns. The project was initiated in early January 2012 and finalized in June the same year.

We would like to show our gratitude to all involved in the project, especially Daniel Szirányi and Karin Hamnén, our supervisors at Accenture Management consulting, and Patrik Jonsson, our supervisor as well as examiner at Chalmers University of Technology. Their commitment and support was invaluable for the project.

Furthermore we like to thank the following people at Accenture Management Consulting and Chalmers University of Technology who supported us during the start-up phase of the project:

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Martin Andersson
Rickard Segerdahl

Gothenburg
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1 Introduction

In this section the background of the study is presented followed by the problem definition and hypothesis. Finally some project specific definitions as well as scope is described.

1.1 Background

Today, companies are dealing with suppliers and customers from all over the world (Brudvig et al., 2008). The activities for the manufacturing company such as purchasing, manufacturing and distribution is thus no longer limited to one country, rather it is globally spread. Hence, the geographic placement where these activities take place and where facilities are established is of great importance (Meijboom & Voordijk, 2003). Evidently companies' costs are highly affected by their localization strategies: transportation cost and risk increases with longer distances to customers, labor costs varies extensively around the world and tariffs stands for major parts of product costs when trading over country and/or regional borders. Localization is defined as the placement of the physical facilities of the company.

The importance of localization decisions differ between companies. Companies that are more spread throughout the world need to consider localization setups to a higher degree than companies that have few markets. Companies with a single market do not face problems to the same extent as companies with presence in several markets. Furthermore, the importance of industry and product characteristics on localization can also be argued to differ. Companies manufacturing products which are small in size and of high value will for example not have the same incentives to minimize transport distance, since transportation cost will make up such a small part of the total product cost. Thus, the need to be locally present is lower for those kinds of companies compared to those with large products of low value. Similarly, for companies acting in industries which have high demands on customization as well as speed and flexibility will inherently have to localize close to their customers; especially if the product cannot be stored in a cost efficient way.

Many success stories that arose due to companies' superior supply chain strategies exist. Two examples are Dell and Wal-Mart. Dell embraced direct distribution in an industry where distribution through retailers was standard. This revolutionary strategy helped them to cut cost and increase profitability and growth. Dell's strategy has however evolved over time. In order to keep their market share they had to incorporate indirect distribution in addition to direct distribution (Morris & Morris, 2002). Wal-Mart is another company that has managed to excel due to their superior supply chain practices. Through their wide network of distribution centers, Wal-Mart was able to achieve high cost savings resulting in a lower customer price and increased revenue (Comm & Mathaisel, 2008). Wal-Mart is restructuring their supply chain in order to become even more efficient (Birchall, 2010). The conclusion from these two cases is that even companies that have had great supply chain practices needs to conform and adapt to the current trends and changing market conditions.

When designing strategies, context variables are pre-requisites (McGee et al., 2005). The context is changing, which will be described by the following factors: the market, buying behavior and trade regions.

Two market factors were identified as crucial for changing the market conditions and thereby the demands on companies; the global market growth and differences in market growth throughout the world

(later referred to as “market shift”). In 2010 the average market growth in the world was 4.9 percent. There are however differences between countries. China had an annual GDP growth of 9.5 percent in 2010 while the United States had only 1.5 percent (CIA, 2012). There is thus a shift in buying power occurring. From the traditional market domination by Western Europe, USA and Japan towards a more balanced market demand, where especially many Asian countries are increasing their buying power more than their European counterparts. In many industries local presence is important, and thus re-localization can be inevitable.

Changes in buying behavior is expressed through the increasing demands from customers in terms of lower lead times, more customization and lower prices (Christopher & Towill, 2001). Companies do therefore need more flexibility and responsiveness while maintaining a low cost. In order to cope with these three factors, companies must ensure that their supply chain strategies are effective.

Decreased tariffs within trade regions are making trade more regionalized (Andresen, 2009). Regionalized is in this project defined as using a regional setup. A region is defined as a continent, and the ones included are Asia, Europe, North America and South America. More and more large trade regions have appeared such as the Association of South East Asian Nations (ASEAN), followed by the European Union (EU) and the North American Free Trade Agreement (NAFTA), (ASEAN, 2012; European Union, 2012; USTR, 2012). By reducing or removing the tariffs within the regions the incentives for focusing on a more regionalized presence have increased for many global companies. A global company is in this project defined as a company being present in at least three regional markets where each constitute of at least five percent each based on revenue. This will clearly affect the supply chain strategies and later the supply chain design.

To summarize the paragraphs above, three main reasons for conducting this study was identified. One: localization is very important for company results. Two: to have the appropriate supply chain strategy is very profitable. Three: the business landscape and thus the appropriate supply chain strategies are at constant change.

1.1.1 Previous research

Several studies related to localization strategies have been conducted in the past, e.g. Lapide (2008), Klier (2009), Meijboom & Vos (1997). In the MIT SC 2020 there are several focus areas included, one of them being macro factors that impact the global supply chain and another being general underlying scientific principles that drive supply chain structure and design. Critical macro factors are identified from which a number of scenarios are created (Lapide 2008). Klier (2009) looks at intermediate parts and the globalization of supply chains with focus on relocation of production to low cost countries and the changes in production cost therein attained. Meijboom & Vos (1997) highlight the various available factory setups and some of the characteristics of each. They also stress that different setups will imply different coordination approaches. Pries (2009) discusses the localization strategies of the international automotive industry. The study suggests that economic reasons alone cannot explain localization strategies but other factors such as product complexity influence the decision. The study is of the exploratory kind and does not provide any recommendations for the future. Morgenstern (2006) studies the localization of the supplier base, focusing on low cost sourcing.

There are also several studies about manufacturing network design, e.g. Zhang & Gregory (2011), Feldmann, Olhager & Persson (2009). These studies focus on the manufacturing plant and its suppliers

and primarily on the historical and current state. Cheng, et al., (2011) studies the evolution of the manufacturing network and the integration of plants within that network. The primary focus is on how changes in one manufacturing plant affect the other plants within the network as well as the network itself.

When it comes to the purchasing organization, numerous studies exist where a combination of centralized- and decentralized organizations is described and compared (van Weele, 2010; Johnson, et al., 2006; Trautmann, et al., 2009). The decision between them is often based on factors such as saving potential, commonality and expertise required. The focus is not specifically aimed at geographic location, rather at structure and responsibilities. In addition, the literature does not consider the influence of industry type.

To summarize, several studies regarding supply chain management exist but few are focused on localization and at the same time covering all supply chain- and related functions including manufacturing, logistics, purchasing and R&D. Furthermore, few are focusing on the future, and none has been found that has a Swedish context as basis. There is thus need for further research within localization strategies for the future, especially with focus on Swedish based enterprises.

1.2 Purpose & Problem Analysis

The business landscape is changing and a lack of understanding regarding this change and its impact on strategic choice limits the potential performance of a company. Supply chain strategies are critical for a company's success (Simchi-Levi et al., 2009). The purpose of this project is thus to investigate how business landscape parameters, i.e. external factors, affect choice of supply chain localization strategies and to provide strategic recommendations to Swedish manufacturing companies. An external factor is defined as a factor that lies outside the company walls that affects localization. Since strategic decisions need to include implementation time, horizons often stretch five to ten years wherefore a project focus on the year 2020 is appropriate (Friedman & Segev, 1976). In order to determine what external factors that affect localization and that the likely strategies are, the following research questions were derived:

***RQ1** What external factors affect supply chain localization decisions and which are most important?*

***RQ2** Which are the most probable supply chain localization strategies the year 2020 and how do they differ between various companies, industries and products?*

Once the external factors and likely strategies are evaluated recommendations for 2020 will be provided.

***RQ3** In order to remain prosperous in year 2020, what supply chain localization strategies should companies pursue?*

1.3 Hypothesis

As seen above, there are several factors pointing towards regionalization in the world. The following three main reasons were identified in the start-up phase: transportation costs, the need for increased responsiveness & flexibility and trade regions. Transportation costs increase with increasing transportation distance. By having a more regional focus the transportation distances are reduced and thus

the transportation costs as well. Increasing customer demands requires the companies to have an increased responsiveness and flexibility in order to maintain its competitiveness (Christopher & Towill, 2001). By being close to the market these advantages are attained. Trade regions require companies to be present within a region in order to avoid heavy tariffs. There are currently three big trade regions which include the markets of Asia, Europe and North America.

With these regionalization tendencies in mind, a working hypothesis was compiled:

“Global supply chains tend to move towards regional supply chain hubs”

A supply chain hub is here defined as a clustering of supply chain functions and actors, where products are manufactured, sourced and developed for the same market as the location of the hub. That implies that within each market there should be a factory, supplier base and R&D center. Markets are here referred to as geographic regions (continents).

1.4 Project Definitions

Below project specific definitions are explained. These are presented to increase the understanding of the project and its scope.

1.4.1 AIE company

An AIE company is defined as a company operating within the Automotive or the Industrial Equipment industry (Accenture, 2012). The automotive industry is defined as the industry producing vehicles. Examples are Volvo and Scania. The industrial equipment industry is defined as all companies that manufacture equipment primarily for industrial use. Examples are SKF and ABB.

1.4.2 Localization

Localization is in this project referred to as the physical placement of facilities and organization. More specifically, the project investigates the placement of production resources (named “manufacturing”), the location of the supplier base and the purchasing organization (named “purchasing”) and the placement of warehouses and the resulting transportation (named “logistics”). In addition, the implications for the R&D department (Research & Development) are investigated in terms of localization and coordination.

1.4.3 Internal factors

Internal factors are those factors which affect the localization of facilities and organization which is related to the specific company of interest. The internal factors will be used to understand which localization strategy is suitable for which type of company, i.e. a segmentation process. Internal factors can be exemplified as type of product, industry, revenue and capabilities. Company characteristics such as EBIT (Earnings Before Income Tax) will be used for a benchmark and best practice study.

1.4.4 External factors

External factors are drivers which causes a particular phenomenon to happen or develop (Oxford Dictionaries, 2012). In this project External factors are referred to as those factors which affect the physical placement of industrial facilities and organization, but cannot be related to the company itself. External factors of interest are mainly those which tend to change over time and therefore require reconfigurations. Examples are the market, customer demands as well as laws and regulations

1.4.5 Localization strategies

A localization strategy is in this project defined as a part of a supply chain strategy, which in its turn is a subset of the corporate strategy of a company. The localization strategy will in this project be assumed to solely depend on internal and external factors. Any factor affecting localization which is not in the concept of those will not be accounted for. Examples are personal preferences, company policies and objectives etc. which all are hard to account for in an objective manner.

1.5 Scope

The study focus on companies with major operations, such as headquarters and factories, in Sweden. The study further focuses on AIE companies with a global presence. Companies within the process or clothing industry are not included. For example, the process industry is very capital-intense which implies that their preferred supply chain setup would likely differ from the selected companies. Both companies in the automotive industry and in the industrial equipment segment, i.e. the manufacturing industry, are quite wide spread in terms of market presence and were therefore expected to have a similar view regarding localization.

It was decided in collaboration with Accenture that a suitable company size was companies with a minimum annual revenue of 500 million SEK. These companies did generally fulfill the criteria of being global, which was investigated by conducting a random inspection on one fourth of the companies included in the population. The study included the supply chain functions: manufacturing, purchasing, logistics and R&D and the supply chain strategies regarding localization of these (see *section 1.4.2*). Logistics refers to the placement of finished goods inventory and transports only.

The main focus of the thesis is on localization of factories, supplier base and R&D function for the year of 2020. The localization of organizations such as the purchasing organization and how to organize R&D will be discussed more briefly. In addition, localization regarding logistics activities such as warehouse placement and transportation structure is covered.

In some cases localization decisions will be affected by internal inertia. This can be due to earlier higher level strategic decisions, company culture or other factors. The effects of inertia will not be analyzed in this project. The consequence is that in this study it is evaluated where the respondent wants the company to be in 2020, which does not necessarily mean that it is feasible for them to reach there within the given timespan. The focus of localization is on the global and regional level. Country specific localization within regions is thus not considered. Regions included are Asia, Europe, North- and South America.

2 Methodology

In this section the methodology is presented and discussed. The chapter begins with outlining the research process and continues with presenting the data collection methods. This is followed by the statistical analysis methods, approach on regionalization and segmentation, the usage of scenario planning and finally the recommendations and methodology discussion.

2.1 Research Process

To fulfill the purpose and answer the research questions in previous chapters, a process consisting of five major steps was derived, which will be presented and justified below (*Figure 1*):

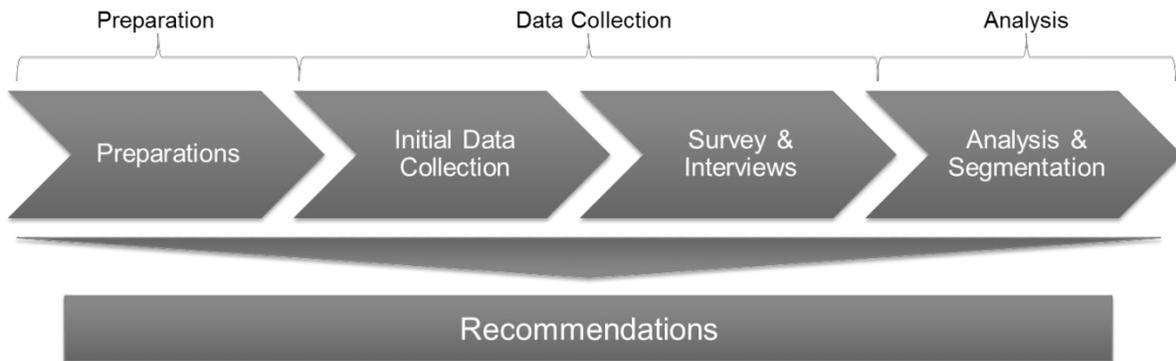


Figure 1: Project process

2.1.1 Preparations

The preparation step consisted mainly of setting the definitions, formulating the problem and deciding on appropriate methodology with sufficient validity and reliability. Furthermore an appropriate sample of companies was selected, possessing the characteristics that ensured that the full population of the target industry was represented (*see section 1.5*). Crucial to this step was to make sure that the process could effectively collect sufficient data. This data also had to be collected from the correct people and industry, which could lead to recommendations on future supply chain localization strategies.

2.1.2 Initial data collection

In the second step of the process, the aim was to find the most important internal- and external factors as well as strategies of localization. To capture these, three main sources was exploited – namely a literature study, a focus group and internal interviews with participants from Accenture and Chalmers University of Technology.

The literature study aimed at firstly examining history and understanding what have formed the historical strategies. Secondly the aim was to identify what will be the important future external factors of localization and the appropriate strategies given those factors, as well as the characteristics of the company (internal factors). This was crucial to gain understanding and form a basis for the study. The literature findings were used to design the survey questions (*see process step 3 in Figure 1*).

To complement the literature study, internal interviews were held to gather information from two main sources – firstly, from experts at Accenture and secondly from the academic world. Interviews are suitable when a deeper understanding of the subject is required (Gillham, 2008). The data gathered is

presented in the theory framework marked with footnotes. The quite unconventional placement was chosen since it prevented a fragmented impression for the reader. Interviews with open questions were used, which are especially useful when the interviewee is more knowledgeable than the interviewers, since the interviewee can then decide to a higher degree which subjects are the most important to discuss (Dalen, 2008). Participants from all areas of interest were interviewed: manufacturing, purchasing, logistics and R&D. A conceptual model was created to guide the coming data collection and analysis phases.

In the focus group experts were gathered from the area of supply chain management at Accenture to discuss the external factors and strategies possible in the future. Focus groups are suitable when the intent is to find the range of ideas and perceptions, when there exists a need for information to design a large scale quantitative study or when there is a use in making ideas emerge from the group, i.e. exhibit a synergy that individuals alone do not possess (Krueger & Casey, 2009). In this study, all three are valid. Areas discussed in this part of the project was guided by the literature study and internal interviews described above. By using the focus group, data was collected which by some reason was not discussed during the internal interviews nor found in the literature study. The final design of the survey was also discussed and later settled.

The outputs from the literature review, internal interviews and focus groups were used for the creation of a survey which was sent to selected Swedish companies within the AIE industry.

2.1.3 Survey & interviews

The third step aimed gather attitudes regarding internal- and external factors as well as localization strategies. This was accomplished in the above mentioned web based survey and was complemented with qualitative interviews. Surveys are preferred when a high number of respondents are required (Gillham, 2008). Both the speed of acquiring and processing data is improved (Olsson & Sörensen, 2007). The survey was sent to approximately 300 participants, from purchasing, manufacturing and logistics, in approximately 110 companies. The responses were thereafter used to statistically evaluate attitudes and opinions in a broad range, which was generalized and analyzed from different perspectives. To enable the chance to find statistical significance, the questions were of the structured kind. Participants represented themselves, i.e. they provided their personal opinion in the matter, but given the context of their own company (company size, types of products, industry etc.).

Complementary interviews were held to gain a deeper understanding of attitudes on external factors and strategies found in the survey results. A total of 15 interviews were conducted at nine companies. All participants were asked to participate in the survey before the interview was conducted, since that simplified their understanding, and also implied more valuable data collected in the study. The reasons and implications of the opinions found in the survey were discussed so as the challenges and opportunities it implied for the functions of interest (manufacturing, purchasing, logistics and R&D). In addition, two interviews were held with Invest Sweden and the Swedish Trade Council in India. During the interview, important considerations when entering Asia and especially India were discussed. As mentioned above, the focus of the data collection was on the survey, and the interviews were held mainly to derive the underlying reasons for the survey results. Instead of analyzing the interviews in a separate section, statements were placed both in the Empirical Findings- (*section 3.5*) and the Analysis &

Discussion (*section 5*) section to strengthen the outlined survey findings. This prevented a fragmented impression for the reader, in the same manner as described in *section 2.1.2*.

2.1.4 Analysis & segmentation

In the fourth step, all gathered data from the interviews, focus groups, literature study and the survey was analyzed. The goal was to map the attitudes on external factors and localization strategies from the participants to answer research question one and two. Furthermore, the companies attitudes were divided into segments based on company characteristics (internal factors). The segmentation process used the participants' localization attitudes as dependent variable, and the internal factors as independent variables (see *section 2.5*).

In addition, some of the remaining internal factors were used to understand how different kind of company characteristics affected attitudes on localization. These are presented in the Empirical Findings and Analysis & Discussion sections.

The statistical software SPSS Statistics was used to conduct the analysis and the results were exported to Excel. Four different tests were used (see *section 2.3*).

2.1.5 Recommendations

The final step was to provide recommendations to the company segments on their future supply chain strategies for them to remain prosperous in the year of 2020. The basis for the recommendations was created from previously mentioned steps. Proposed recommendations were then discussed in a second focus group (same participants as the first), who helped to develop a set of recommendation proposals for the various segments given a possible and plausible future. The future scenario was created in advance and brought to the focus group meeting (see *section 2.6*).

2.2 Data Collection

The gathering of data was conducted through a literature review, a set of interviews, a survey and through two focus groups. In this subsection the focus is on the methods used rather than the process. Find the approach to each below.

2.2.1 Literature review

The literature review was conducted in two steps. Firstly, an initial step was conducted where the subject of interest was studied in depth to gain a necessary basic understanding of the project. This step was conducted with a broad focus to gain as much understanding of previous work within the field as possible. Secondly, a step focusing on identifying a strategy framework with external factors and strategies for the survey and interviews was conducted. In addition to using the actual framework, theory regarding each of the three factors included was searched for. Similar studies were used to point the focus of the second phase, ensuring an effective information gathering and also to ensure a stringent analysis. The results of these two steps were used as input for the survey and interviews, and did together with the first focus group meeting (see *section 2.2.4*) help to ensure that relevant questions were asked in the survey.

A variety of sources were used for both phases. Several article databases within supply chain and operations management were used. It is important to use several databases since one rarely contains all possible information and views on a subject. In addition to databases, relevant books within the subject

were used to both gain an understanding of the subject at hand but also to gain knowledge regarding research methodology. Finally, Accenture provided material regarding their understanding of the studied topic.

2.2.2 Interviews

Interviews provide a deeper understanding compared to other data collection methods. Interviews can be used either to gather initial information or to test different scenarios (Gillham, 2008). The possibility for instant feedback and to adapt follow-up questions is one of the key differences between interviews and surveys. During interviews, the time spent per respondent is much higher compared to surveys and a smaller sample is thus required (Gillham, 2008). Two kinds of interview methods were used within this study.

Unstructured interviews were used at the start of the study so that an overview of the subject and functions studied was gained (Dalen, 2008). The respondents were more knowledgeable than the interviewers and the unstructured interviews with its general questions enabled the respondent to a high degree decide what questions to discuss. The end result was improved since information was not withheld due to the wrong questions being asked. Unstructured interviews were used for initial information gathering from two kinds of sources. An academic view was gathered from one representative from Chalmers University of Technology for each of the three of the functions manufacturing, purchasing logistics. R&D was discussed with those experts from manufacturing and purchasing. This was in order to make sure that an adequate understanding of the functions was reached when constructing the survey before the data collection began. The unstructured interviews were again used when interviewing experts at Accenture as well.

The second type of interview used was of the semi-structured kind, where questions of a more general kind formed the basis. Follow-up questions were formulated during the interview, when the beforehand prepared subtopics was not spontaneously discussed (Wallén, 1996; Gillham, 2008; Berg, 2009). At the focus group setting, which will be discussed in *section 2.2.4*, the external factors and scenarios were developed. These were in turn used to compose the interview and survey questions. The semi-structured interviews facilitated a deeper understanding of the external factors and strategies, and the connection between them. It was used when gathering data from selected companies within the study. A mix of companies of different sizes and industries were interviewed to gain a deeper understanding of the entire sample.

The interviews were performed by two interviewers to ensure that the appropriate follow-up questions were asked, so that the full scope was covered (Olsson & Sörensen, 2007). This was done to strengthen the reliability of the interview data acquired. The interviews were recorded and as soon as possible transcribed, then sent to the respondent for comments. This ensured both the trust of the respondents as well as increased the reliability of the results (Gillham, 2008).

Sample description

As was mentioned above, two types of interviews were conducted. The unstructured interviews were conducted in the beginning of the project to gain an understanding of the subject. 10 initial interviews were conducted at Accenture and at Chalmers (*see Table 1*). All interviewees have considerable experience within their area.

Table 1: Internal interviews at Accenture and Chalmers

Company	Position
Accenture	Senior Executive
Accenture	Senior Executive
Accenture	Senior Manager
Accenture	Senior Manager
Accenture	Manager
Accenture	Manager
Accenture	Business Analyst
Chalmers	Professor in Purchasing
Chalmers	Associate Professor in Manufacturing
Chalmers	Associate Professor in Supply Chain Management

The semi-structured interviews were conducted with 15 persons in managerial positions out of which 69 percent were at the top level within their function (*see Table 2*). They are thus key decision makers when localization decisions are to be taken wherefore their opinions were very valuable. Nine companies were represented out of which seven were global manufacturing ones. The other two interviews with Invest Sweden and Swedish Trade Council were conducted to gain an understanding of what needs to be considered when establishing oneself in a low cost country such as India or China. The interviewees represented all the four functions included within the study. Additional to the survey R&D executives were included to gain a deeper understanding of what needs to be considered in terms of R&D localization.

Table 2: External interviews

Company	Position
Company A	VP Manufacturing
Haldex	VP Global Sourcing
Haldex	VP R&D
Husqvarna	VP Manufacturing & Logistics
Husqvarna	Director Industrial Strategy
Invest Sweden	Executive Director
Metso Paper	Project Manager R&D
Scania CV	Director and Senior Advisor, Technical Product Planning & Vehicle Validation
SKF AB	CPO Direct Material
SKF AB	Supply Chain Manager
Swedish Trade Council	Country Head India
Volvo Cars	VP Manufacturing Planning & Logistics
Volvo Cars	Logistics Development
Volvo Trucks	VP Manufacturing & Logistics
Volvo Trucks	Purchasing Director

2.2.3 Survey

A survey generally falls under the structured kind of information gathering. Open ended questions can be used but the ability to understand and ease of processing the resulting data is reduced considerably (Olsson & Sörensen, 2007; Gillham, 2008). If each question instead has a set of alternative answers or a scale the ease of processing increases. In certain situations it can be easier to get an answer if the alternatives are presented in a scale. Therefore, predefined questions with scales were used where possible.

When using a survey it is thus easier to handle a big sample compared to using interviews (Gillham, 2008). Due to the nature of the study, where a big number of respondents was desirable, a large amount of data was required. A statistical testing of the survey output was then possible which helped to ensure a high reliability. Several authors point out the importance of careful preparations before the start of the actual data gathering, since the likelihood of relevant questions being asked in the survey increases (Gillham, 2008; Dillman, 2007; Olsson & Sörensen, 2007). Input to the survey questions came from the focus group meeting, internal interviews and the literature review. This helped to ensure that relevant questions were asked.

As mentioned previously, four functions were of interest in this study, namely manufacturing, purchasing, logistics and R&D. The main goal when designing the survey was to, where possible, ask the same questions to all participants since that simplifies the analysis. As a consequence, it was decided not to approach R&D managers in the survey, since their background is very different than those of the three remaining functions. R&D related questions were instead asked to managers from manufacturing and purchasing, since they are highly familiar with R&D setups.

The survey was divided into three parts, one for each of internal factors, external factors and strategies. The internal factors were the same for all three types of managers (manufacturing, purchasing and logistics) that answered the survey. The external factors were in the survey divided into groups based on their characteristics (*see section 3.3*). In the survey each respondent were asked to rank the factors within each group from the most important to the least important. The ranking system was used in order to prevent an overall high score with little difference between the factors¹. The respondents were then required to give an overall value to each group of external factors. Each external factor was then normalized to account for the fact that the different groups had different numbers of factors. To make a comparison between groups of external factors possible, each external factor was multiplied with its respective group value to provide an overall score. A ranking between all external factors were made and the top ranking factor were given a number of 100 percent while the bottom ranking factor were given the number 0 percent. Each external factor were then adjusted so that they got a ranking in between, making a comparison between all factors possible. For exact calculations (*see Appendix B*).

The manufacturing and purchasing functions had the same external factors. The logistics function did not have the external demography factors since they were considered to be of less importance for logistics setup decisions. The final part in the survey, i.e. strategies, differed between the functions. Almost all questions were unique for each function since different aspects need to be considered for different functions. For an exact description on what questions were given to each function, refer to *Appendix C*.

In the following two paragraphs the survey sample is presented, followed by disqualifications. A non-respondent bias test as well as a sample error discussion is found in *section 2.8*.

Sample description and handling

The sample registry was bought from PAR – “Postens Adressregister” and consisted entirely of relevant decision makers for these kinds of localization questions. The sample contained 395 potential respondents from PAR and 10 interviewees that were asked to respond as well resulting in a total of 405 respondents. The population consists of the all companies with the characteristics defined in the scope. The sample consisted of almost the entire population with exception to a few companies not included in the registry. Telephone numbers were included to the entire PAR sample and e-mail addresses to 325 of them. There were thus 70 potential respondents where only telephone numbers were included.

An Internet based survey was used and it was sent to all 325 respondents with e-mail addresses. Two reminders were sent to all respondents that had not answered after one- and two weeks respectively. For those who still had not responded after three weeks a telephone follow up was conducted (Dillman, 2007). The follow up respondents were picked randomly and approximately one third was reached. During the calls the error-rate was 26 percent, meaning that 26 percent had not even had the chance to answer the survey. All errors were however corrected. In order to get a correct response rate the remaining sample had to be adjusted. The remaining sample, i.e. those that had not responded and had not been called were reduced by 26% according to the below formula:

¹ Daniel Szirányi, Senior Manager Accenture, Interviewed 3rd of February 2012

$$E - \text{mail sample} = 325 - \underbrace{(325 - 88 - 3)}_{\text{Not responded or called}} \cdot 0.26 = 264$$

The number 88 corresponds to the number of responses from the survey included in the e-mail sample. This includes the results of the telephone follow up. The number three corresponds to three that were corrected but still decided not to respond to the survey. The response rate was 33 percent in total for the e-mail based respondents.

For the part of the sample that only had telephone numbers included all 70 were called. Out of these 24 were reached and thus had the opportunity to get the survey link and answer the survey. 21 respondents answered the survey when they received the link, thus providing a response rate of 88 percent.

Ten of the interviewees were asked to respond to the survey as well and nine of them completed it, resulting in a response rate of 90 percent.

To summarize, in *Figure 2* and in *Table 3*, the estimated samples and response rates can be seen. A total response rate of 40 percent was attained.

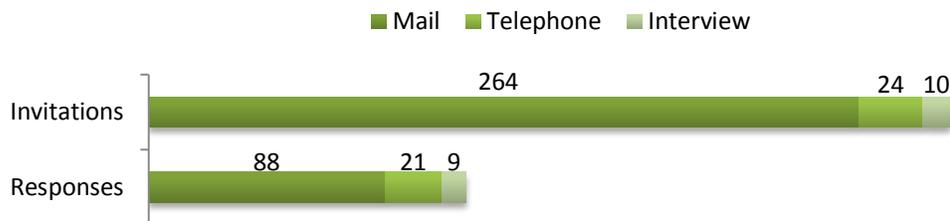


Figure 2: The sample and the responses obtained

Table 3: Response rate per gathering method

	Total	Email	Phone	Interview
Invitations	298	264	24	10
Responses	118	88	21	9
Rate	40%	33%	88%	90%

Disqualifications

About 11 percent of the survey sample had provided answers that were incomplete, i.e. one or more questions were unanswered. There were two clearly characterized groups: the first group that had only answered the position question but nothing else and the second group which had answered most of the questions but missed one or a few of them. The first group, which consisted of six respondents, was removed all together from the analysis. The second group was included in the analysis for those questions that were properly filled in. This group consisted of seven respondents. Due to some missing answers they were included only when answers were available. There is thus different amount of answers for different questions.

Outliers that are mistakes should be either corrected or removed (Blumberg et al., 2005). In this project it was decided that the best way was to remove them. These were most often found by comparing the

number of markets as answered in the survey and with the annual report. These answers were likely mistakes where respondents that answered in this manner probably referred to their own division or business unit, rather than the whole company as was intended.

2.2.4 Focus groups

Focus groups is a qualitative research method where data is collected by a discussion among participants under the guidance of a moderator (Morgan & Hoffman, 2010). The main goal of the two focus groups was to facilitate discussions to emerge from the group as opposed to interviews where the interviewer takes a more active role. The participants were chosen on the basis of their knowledge regarding supply chain strategies. They were free to share perceptions without the pressure to vote or reach consensus (Krueger & Casey, 2009). Four participants were included, all of which are Senior Managers at Accenture Management Consulting.

Focus groups are suitable when the intent is to find a range of ideas and perceptions, when the researcher needs information to design a large scale quantitative study or when it is useful to make ideas emerge from the group, i.e. exhibit a synergy that individuals alone does not possess (Krueger & Casey, 2009). Thus using focus groups was suitable in the initial data collection phase (*see section 2.1.2*) of the project, since it ensured that identified external factors and strategies were exhaustive. Furthermore, when conducting surveys, inputs from focus groups are recommended to be used as a basis for the questions (Krueger & Casey, 2009; Olsson & Sörensen, 2007). Since a survey was used in this project, focus groups were suitable. In the same manner, a focus group was used in the recommendation phase to derive a set of possible directions. These directions were reduced to one recommendation per segment, and the discussions were based on a set of possible solutions provided in the beginning of the meeting.

When conducting focus group meetings there are four important factors to consider. Firstly, as in any project, defining and planning is crucial. This is true for focus groups too. Jumping into the problem without a proper understanding of the actual purpose is a common mistake. Each participant got pre-prepared material a couple of days in advance so that the goal and expected outcome of the focus group would be clear to everybody even before start. Secondly, carefully pre-selecting participants is decisive of the study's outcome, since their opinions will affect the overall results. As mentioned above the participant are Senior Managers within Accenture and all have extensive knowledge within their area of expertise. Thirdly, the nature of the discussion is important. The focus group interviews were focused, i.e. stuck to the subject of external factors and strategies, but still had open ended questions. Finally, the environment must be permissive and conducive to sharing, listening and responding to make the focus group successive. Since consultants are familiar with focus groups and workshops, the fourth factor was not a problem. (Krueger & Casey, 2009)

2.3 Statistical Analysis

To test the significance and be able to segment companies' attitudes and opinions, statistical analysis was used. The aim of the analysis was to cluster companies' attitudes and opinions and to investigate the importance of certain scenarios for the respondents.

All tests were conducted using SPSS Statistics. The following tests were used: Binominal tests for categorical one-sample data, McNemar tests for related categorical data, Chi-square tests for categorical independent data and t-tests were used in the case of interval data. Depending on whether the sample type was independent or related, independent or paired t-tests were used.

The significance levels used were 90, 95 or 99 percent, whichever was the highest possible. All statistical tests can be viewed in *Appendix E*.

2.4 Regionalization

As outlined in *section 1.1*, the hypothesis was that companies move towards regional supply chain hubs. To investigate this, it was decided to look at the setup of manufacturing networks, the supplier base and the R&D. The regionalization of these is explained below after which the concept of regional supply chain hubs follows.

A number of possible factory setups were identified. These were Few markets, which meant that the company had one or two market (regardless of number of factories), Global factory setup, which implied that the company had three or four markets, but in some markets had no factories, and Regional factory setup which implied that every region with a market also had a factory. The few markets alternative is not analyzed due to it being outside of the scope of this study. These setups are illustrated in *Table 4*:

Table 4: Possible factory setups

Setup	Description
Few markets	One or two markets
Global factory setup	Three or four markets but not a factory setup in every region with market
Regional factory setup	Three or four markets and factories in every region with market

Three potential supplier base setups were identified. The first is a one factory setup which means that the company only has one factory which is supplied from within or outside of the region. The second is a global supplier base setup which means that the company is, for half of its regions or more, sourcing from outside of the region the factory are localized within. The third and final setup is a regional supplier base which implies that the company has manufacturing in two or more regions and that the majority of the factories are supplied from within the region. In the case of one factory there is but a single supplier base. It is of less use to discuss supplier base setup when only one factory exists wherefore the one factory alternative is not included in the analysis regarding regionalization. This is illustrated in *Table 5*:

Table 5: Possible supplier base setups

Setup	Description
One factory	One factory which is supplied from within or outside of the region
Global supplier base	Manufacturing in two or more regions and half the factories or more are supplied from outside of the region
Regional supplier base	Manufacturing in two or more regions and the majority of the factories are supplied from within the region, e.g. two out of three but not two out of four

Three R&D setups were identified: Central R&D, Central R&D with local adjustments and Regional R&D (see *Table 6*). The amount of adjustments that are made for the local markets is the main difference between the different setups. Each of the three setups can be conducted in either in a developed- or low cost country.

Table 6: Possible R&D setups

Setup	Description
Central R&D	R&D is handled completely centrally with no local adjustments
Central R&D with local adjustments	R&D is handled centrally but local adjustments are being made in at least one additional market
Regional R&D	R&D is performed regionally with comprehensive development in most regions with market presence

For a company to be considered completely regional the following rules were derived: The company has to have a regional factory setup, a regional supplier base setup and either purely regional R&D or central R&D with local adjustments taken regionally. When a company fulfills all those requirements, it has what is referred to as a “Regional Supply Chain Hub”.

The somewhat looser requirement on R&D was because of the fact that R&D is considered to be core activities in most companies and therefore seldom entirely decentralized. The warehouse setup and localization of the logistics function are not included since they are not included in the regionalization definition used within the study.

2.5 Segmentation

The aim of the segmentation was to find groups with diverse opinions regarding localization. It was conducted in two parts; first an overall analysis of each individual internal factor was conducted against regionalization. This was to find which factors showed significantly most difference. Secondly, a deeper analysis was conducted in order to reduce the resulting significant factors from the first part into four segments with varying opinions using only two factors.

Three factors out of 15 showed significantly different opinions regarding regionalization. Due to the fact that the alternatives were categorical, a Chi-square analysis was used (Siegel & Castellan, 1988). The limitation with a Chi-square analysis is that only two factors can be tested at the same time. Therefore the factors having more than two possible alternative answers (continuous or discrete) were tested multiple times with different groups. For example, when a discrete scale of three alternatives existed the test was conducted in two stages, first alternative 1 vs. 2-3; and later alternative 1-2 vs. 3. Thus, all possible combinations were included. In the case of a continuous scale the split was made first in big groups and then the groups with the best significance was tested once more in finer intervals to get a more exact split. The overall results can be seen in *Appendix A*.

Due to the size of the sample few segments was desirable and the three factors was therefore reduced to two which determined the four segments. What two factors to use for the segments were determined by both looking at the difference in statistical significance using a Chi-square analysis and also by qualitatively determining what factors should logically imply the biggest differences. Both had to hold.

For the quantitative part, to determine which factors should be used to get the most clearly distinguished segments, two factors at a time was tested against each other using a Chi-square analysis. There were thus three possible combinations of factors which should be tested. For each factor the analysis was conducted by testing each potential segment, e.g. high revenue and OEM, against the other three potential segments (*see Appendix A*). The result was that revenue and OEM vs. supplier should be used which together form

the four segments (*see Table 7*). Examples of typical companies within each segment can be also seen in *Table 7*. Two out of four segments have significantly different opinions regarding regionalization compared to other segments. The other two still show clear differences but not significant ones. The segments thus are Segment 1: suppliers with revenue below 30 BSEK; Segment 2: OEMs with revenue below 30 BSEK; Segment 3: suppliers with revenue equal to or higher than 30BSEK; Segment 4: OEMs with revenue equal to or higher than 30BSEK. The number of respondents in each segment can be seen in *Table 8*. Note that all the numbers of respondents are above the recommended minimum of five for using a Chi2 analysis (Siegel & Castellan, 1988).

Table 7: The four segments

Supplier	LR, supplier Haldex	HR, supplier SKF
	LR, OEM Metso Paper	HR, OEM Scania
	Revenue below 30 BSEK	Revenue above 30 BSEK

Table 8: The number or respondents in each segment

Segment	LR, Supplier	LR, OEM	HR, Supplier	HR, OEM	Total
Number of respondents	31	41	8	23	103

The differences between the segments do make sense even when not considering the answers in the survey. There should be a difference between companies with high and low revenue. The bigger companies may sell more in each market which provide financial incentives for expanding the manufacturing or supplier bases. Thus, higher revenue should imply more regionalization. Between the suppliers and the OEMs there should also be some differences. Firstly, today OEMs put increasingly higher demands on their suppliers in terms of lead times, flexibility and responsiveness. Secondly, suppliers should generally have bigger and fewer customers. This should imply that suppliers should have more benefits from adopting a Regional Supply Chain Hub setup.

2.6 Scenario Planning & Learning

The evolvement of business context is often disruptive. Extrapolating trends is therefore often not adequate. Scenario planning makes it possible to construct a plausible future including these disruptions (Fahey, 1998). Since disruptions are always present, these are important to understand and include. This

is why scenario planning was used in the recommendation phase of the project, where a likely and plausible future was derived to be used as input for the recommendations.

Simpson (1992, p. 11) defines scenarios as “*the process of constructing alternate futures of a business’ external environment*” and points out that “*the goal is to learn to use these alternative futures to test the resiliency of today's action plan*”. This was exactly the goal with scenario planning in this project – to create a probable and plausible future and learn how it would affect the industry.

According to Fahey (1998), scenarios should be built up by four elements (*see Figure 3*). Firstly, drivers (in this project referred to as “External factors”) must be identified and evaluated. Two to three external factors should be used as scenario parameters. This is suitable since it is sufficient to cover the essentials, while still being able to grasp their implications. Secondly, scenarios consist of logics, or the fundamental reasons for it to happen. Thirdly, the scenario should include a plot, which describes what will have to happen for the end-state to take place. Finally, the scenario should have an end-state, which is what will happen at a certain point of time. In the project, all four elements were created/investigated by preparatory interviews, focus groups and literature study. (Fahey, 1998)

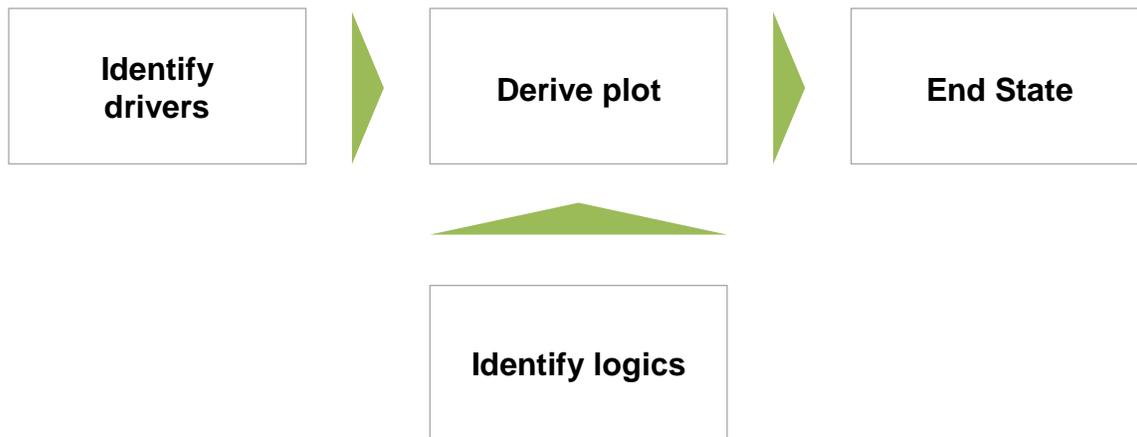


Figure 3: The four steps of scenario creation (Fahey, 1998)

2.7 Recommendations

In addition to the mapping of companies' future localization attitudes, localization recommendations were created to direct companies towards a supply chain structure to meet their future goals.

A similar framework to that of McGee, et al (2005) was created (*Figure 4*):

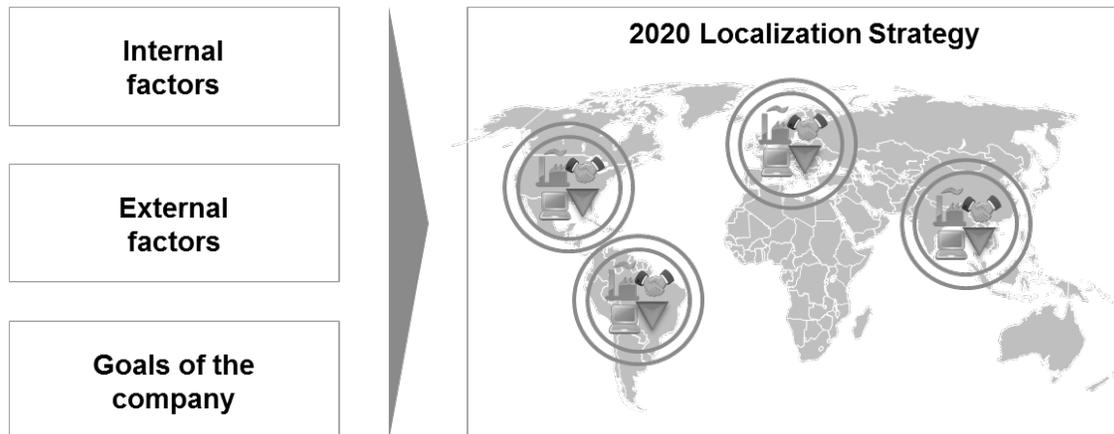


Figure 4: Supply chain localization recommendations framework

As seen above, it is assumed that localization strategies are based on the company's internal factors and conditions, the external factors present, and finally the goals of the company. The goal of a company should be a unique intent that distinguishes it from its competitors. Since this study aims at recommending localization strategies for segments of companies, collecting vision, mission and values of the individual companies are of limited use and was therefore not investigated nor analyzed. These cannot be ignored for the recommendations however, meaning that when companies use the framework, they have to take their company specific goals into account. The other two factors were however covered as were the actual recommendations. For more on McGee, et al (2005) strategic model, refer to *section 3.1*.

2.7.1 Scenario parameters

As mentioned above, a scenario was created to be used as the basis for the recommendations. The scenario was built the following way:

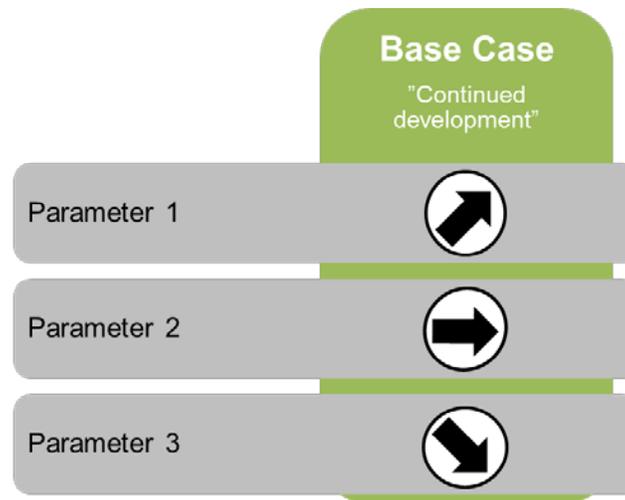


Figure 5: Scenario framework

As seen in *Figure 5*, the future business context which was to be used comprised of a scenario called “Base Case”. The base case implied that the future would evolve in the same pace as of today. An example of that could be that the market of India will continue to grow at a steady 7 percent annually. The base case would then assume that the total GDP would be $1.07^8=1.72$ of what it is today in 2020.

It was decided to use three scenario parameters inspired by theory from Fahey (1998). Using three parameters is suitable since it is sufficient to cover the essentials, while still being able to grasp their implications. The parameters were what is in this study is referred to as External factors (*see section 2.2.3*). The three parameters used were simply those three that was identified as most important by the respondents in the survey and interviews, and are therefore likely to be those that decision makers will refer to when making localization decisions.

The evolvement of the scenario parameters was then developed. The development of each external factor was derived based on theory and was later confirmed in a focus group comprised of senior managers² from Accenture. Total consensus was not reached, but the group finally settled the end state.

2.7.2 Internal factors

The internal factors were defined as those internal factors which affects the supply chain localization setups of the companies. The internal factors were used to segment the companies’ attitudes on localization (*see section 2.5*). The segments were created outside the scope of recommendations, but used as input for them. Naturally, the segments did however not cover a company’s entire internal context.

² **Focus group participants:**

Daniel Sziranyi, Senior Manager, Operations & Footprint Strategies, Accenture

Joakim Percival, Senior Manager, Strategy, Accenture

Mikael Davidsson, Senior Manager, Operations & Sourcing, Accenture

Mikael Håkansson, Senior Manager, Operations & Manufacturing & Logistics, Accenture

Therefore, in addition, other factors were identified and used in the model as “additional considerations” (see *section 5.4.2*).

2.7.3 Recommendations creation

The final step was to create the actual recommendations. The localization and regionalization opinions of the companies were used as a basis for the recommendations. The recommendations were then developed and brought to the focus group setting mentioned in *section 0* where they were further discussed and developed. This while considering the internal context of the segments and the implications of the scenario. A “what-if” outcome was also discussed, i.e. it was discussed what would happen if the plausible future created would not take place.

2.8 Methodology Discussion

In this subsection the use of certain methodology and its implications is presented and discussed. It starts off with a discussion regarding validity and reliability, followed by a sample error discussion for the survey and ends with a short discussion on the implications of the survey approach.

2.8.1 Validity & reliability

The validity and reliability of the project was strengthened by the fact that data was gathered from three sources: the industry, management consultants and the academia, by four gathering methods: literature, focus groups, interviews and surveys, and finally from four areas: manufacturing, purchasing, logistics and R&D.

The following three aspects of validity were used to evaluate the study: construct validity, internal validity and external validity. Construct validity concerns whether what is believed to be measured actually is measured. Internal validity concerns how believable the findings of the study are. Causality is also included, i.e. is it certain that it is input A and not B that gives the output. The external validity concerns whether the results can be generalized for the entire population. The reliability concerns whether the findings are replicable using the same method one more time. (Bryman & Bell, 2011)

The construct validity of the study is considered to be high. What was to be measured was relatively clear and the methods were verified by expert from Chalmers as well as by several consultants from Accenture.

The internal validity was strengthened by the fact that the interviews were recorded and continuously documented while as much as possible was fresh in memory. The interview respondents were also asked to comment on the interview statements included in the study. To strengthen the study many methods and sources were combined, referred to as triangulation, which increases both validity and reliability (Quinn Patton, 2002). The internal validity could have been strengthened further should several similar questions have been asked about the same thing. Too many questions can have bad influence on the response rate wherefore redundant questions were not asked.

Two non-respondent bias tests were conducted to evaluate the external validity (*Table 9* and *Table 10*). The distribution of respondents per industry and revenue for the sample companies are compared to the corresponding distribution for the entire population. The population does include all companies in the registry bought from PAR, which as outlined in *section 2.2.3* compiled most Swedish companies within the industries of interest. There was no significant (95 percent level) difference between the respondents and the non-respondents in terms of industry or company size. In addition, when evaluating the

companies these respondents represent 55 out of 109 companies. This means that 50 percent of the population was included in the study wherefore the results are strengthened considerably. The conclusion is that the results of the study can be well generalized to the entire population.

Table 9: Non-respondent bias test (industry)

Industry	Sample	Percentage	Population	Percentage
Metal industry	12	10%	27	9%
Machine manufacturing	54	45%	121	40%
Automotive	28	24%	66	22%
Electrical components	18	15%	46	16%
Other IE	6	5%	38	13%
Total	118	100%	298	100%

Table 10: Non-respondent bias test (company size)

Revenue	Sample	Percentage	Population	Percentage
0,5-1 BSEK	31	26%	78	26%
1-5 BSEK	41	35%	109	36%
5-50 BSEK	16	14%	46	16%
>50 BSEK	30	25%	65	22%
Total	118	100%	298	100%

The reliability was increased through the use of two interviewers at all times. Both could then make sure that the appropriate follow up questions were asked and that all required questions were answered. The fact that both the survey and the interview sample were large helps to increase the reliability of the study. Oftentimes several of the interviewees have had the same opinion which further strengthens the reliability. The thorough description on how data have been processed and handled enhances the reliability of the study further.

2.8.2 Sample error of the survey

When conducting a survey there are four types of errors that need to be minimized to ensure high quality (Dillman, 2007). The first is sampling error which is the result of not surveying the entire survey population. In this project the majority of the population was included in the survey and the risk for this error was thus low. There was however some sources for error, e.g. the registry with contact information did not include the entire population; some contact information was not up to date etc. The second error is coverage error which is the result of not drawing the sample from the entire population, which means that not everybody has a possibility to be selected. The coverage error was also low, since the same sources for errors existed as was the case above. The third error is measurement errors which occurs when a respondent's answer cannot be understood, compared or when some questions remains unanswered. Since the survey used closed questions with response alternatives, the likelihood of getting an answer which cannot be understood or compared is nonexistent. There were however some incomplete responses which increases this error somewhat. Complete responses were gained in 89 percent of the cases. The fourth error is the non-response error which occurs when significant part of the sample does not respond to the survey and have different opinions to the ones responding. A part of this error was hard to measure

since it was impossible to know whether the non-respondents had different opinions or not. In order to reach a high rate of response, Dillman (2007) point to the importance of using several contact occasions and reminders. The non-response error within the survey was reduced by using several attempts for contact through e-mail. When not effective, an additional telephone follow-up was conducted randomly to about one third on the remaining non-respondents.

2.8.3 Implications of survey approach

As discussed in *section 2.1.3* the respondents in the survey were asked to answer the questions according to their own opinions, but given the context of their company. The reason for this was to see the true opinions of the decisions makers, not the company's official opinions and policies. This has implications in the sense that the data gathered will not necessarily represent the expected setup of the industry in 2020, rather what the decision makers would have liked to see if they could take their own decisions without considering the opinions of other decision makers in the company. The clearest benefit with this approach was that the results attained corresponded to the best setup without being affected by organization inertia. The drawback is that decisions will always be made in collaboration with others. Therefore, some of the strategic intents proposed by the respondents would be hard to realize in reality or at least within the given timeframe.

Furthermore, the survey was divided into five sections; one on internal factors, one on external factors and three on strategies. The first two was answered by all participants, while the latter three consisted of specialized questions pointed at the three functions of interest: manufacturing, purchasing and logistics. These parts were only answered by experts in the areas, which implied that the later three parts were answered by roughly one third of the respondents. The approach allowed for a deeper analysis on the functions which could not have been possible otherwise and also ensured that the respondents felt that their expertise was used. The drawback was that some of the specialized questions received quite few responses, which was probably the reason why significance was not found in some of the questions. The possibility to generalize the findings to the entire population in those questions was thereby somewhat limited.

3 Theoretical Framework

In this chapter the theoretical framework is presented. It starts with the overall strategy framework used and thereafter the internal factors, external factors and localization strategies are presented in turn. These are finally summarized in a conceptual model.

3.1 Strategy Framework

One common definition of a strategy is the following:

“A plan of action designed to achieve a long-term or overall aim” (Oxford Dictionaries, 2012).

In addition to the definition, the strategy framework of McGee et al (2005) was used to identify the factors needed for strategy creation:

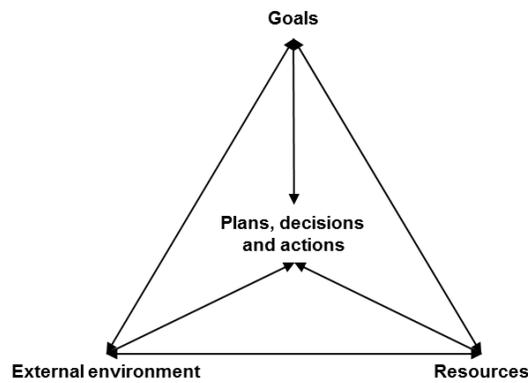


Figure 6: Strategy framework (McGee et al., 2005, p.9)

The framework seen above is created for corporate strategies. Localization strategy, which is the focus in this study, is a subset of the corporate strategy and must therefore support the corporate strategy in order to be effective³. As can be seen in *Figure 6* above, it is important to look into three factors when designing the strategy: Goals, Resources and External environment, which are all considered in the final recommendations of the study. These three together forms the basis of the strategy, in the framework named “Plans, decisions and actions”.

As mentioned in *section 0*, the Goals of the company are not included in this study. It is on the other hand very important for the individual company to take it into consideration when settling the final strategy, and is therefore covered in the recommendations (*see section 5.3.7*).

The Resources of a company is what in this project is defined as “Internal factors”. Factors such as size of the company in terms of revenue, information on the production facilities and type of products was collected in the survey (*see section 3.2*), while the more intangible was not. The surveyed companies’ attitudes will be segmented based on these factors.

Companies face the same external environment (i.e. external factors) even though they may be affected differently, and it is therefore easier to gather. External factors is a broad concept which involves more or

³ Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

less anything that has an effect on decisions. Examples can be governments, international trade organizations, the progression of technology and science, as well as buyer and supplier markets.

Based on the goals, internal factors and external environment, companies will plan, decide and take actions. This is usually a formal rather than an informal top down approach done by top management. It is an iterative, repeated process which often last for horizons around the length of the product life cycle. The decisions and actions taken by companies related to localization is what is in this project is referred to as “Localizations Strategies” (*see section 3.4*).

In the following sections, theory related to each of the above mentioned parts is presented in the following order: Internal factors, External factors and Strategies of localization.

3.2 Internal Factors

In *section 3.1*, the first influencing factor of actions taken is internal factors. These are important since they act as pre-requisites for possible decisions. The internal factors are in this project partly used as independent variables when segmenting the company attitudes received from the survey and interviews and partly to increase the understanding of how different company characteristics affect localization strategies. The following seven internal factors related to and influencing localization were identified:

The first factor is the point of departure for production. The point of departure can be raw material, components or modules (van Weele, 2010). This is interesting to determine due to the implication on manufacturing and the requirements it puts on purchasing. For manufacturing, the different points of departure will lead to quite different production processes, and therefore line setup up and machinery needed. If the tools required vary, consequently the capital involved will likely vary too. Capital intensive production is assumed to be more sensitive to duplication and it is therefore interesting to see how the results vary with the three alternatives. For purchasing, different amount of technical knowledge is required depending on the point of departure.

The second factor is competitive strategy. In marketing, companies are said to have a better chance to become prosperous if aiming for a clear strategy, preferably using one competitive element (Kotler & Armstrong, 2010). On the other hand companies can use different strategies for different markets or product groups (Kotler & Armstrong, 2010). Treacy & Wiersema (1993) define three strategies: “Operational excellence”, “Customer intimacy” and “Product leadership”. The companies focusing on Operational excellence are concerned with maximizing convenience and price, therefore focusing on being cost efficient and lean, e.g. Toyota. Companies focusing on Customer intimacy are more concerned with tailoring their offering to customers and focusing on customer relations. The customers are those who are willing to pay extra to get a premium product, e.g. Lexus. Product leadership is about innovations and design, and making new innovations reach the markets fast. Product leaders serve customers who want state of the art products, e.g. strong brand companies like Apple.

The third factor is the product life cycle. The product life cycle is the length from which a product is added to the product line until the time when it is removed (Kotler & Armstrong, 2010). The setup for a certain product including facility, production location, machinery needed as well as contracts with suppliers is likely to be hard to change during the product life cycle. This could thus therefore incorporate inertia in localization decisions, meaning that changes will need to wait until the product has been removed from the product line.

The fourth factor is industry and tier. Companies working in different industries are assumed to have different type of demands from customers, different type of production processes and in many cases different suppliers from different parts of the world. One example is the automotive industry which competes under extreme demands on customization and requirement on flexibility. Since the costs of the products are high in combination with the levels of customization it is often not feasible from a cost point of view to keep inventories. Hence, the requirement on localization is assumed to be reasonably different compared to companies not facing the same context. Similarly, suppliers and OEMs also face the same kind of differences. Therefore, it was of interest to see how localization attitudes varied with industry and tier.

The fifth factor is product size. Firstly, cost of shipping is dependent on weight and geometry of the product (Lumsden, 2007). This implies that a heavy and bulky product will cost much more to ship than a small one. Similarly, it is often not feasible to use faster modes of transportation for large products which will have impact on time to customer. Considering these arguments, it was likely that localization decisions would be affected by the features of the product.

The sixth factor is the size of the company. Localization for global companies is assumed to involve possible duplications of facilities, capital equipment and suppliers. To be able to duplicate and still be profitable, economies of scale levels need to be met (Simchi-Levi et al., 2009). A large company with high volumes is therefore more likely to be able to profitably set up a dispersed factory network. In addition, it is likely that large companies will have more financial strength, and thus can afford to localize differently than those which are small. The way companies chose to localize given the company size will thus be investigated.

The seventh and last internal factor is EBIT (earnings before income tax) and is used for benchmarking only. The factor can answer if the successful companies of today think differently than those which are not. It is assumed that those which are more profitable today are more likely to make decisions which make them more profitable in the future. It is therefore of interest to see if localization attitudes vary with level of EBIT.

Since the four last factors can be found in companies annual reports or homepages they were not asked for in the survey.

3.3 External Factors of Localization

This section aims at justifying and explaining which external factors that are important for localization and therefore are to be investigated in the survey and interviews. The external factors are sorted into four groups: External Market Factors, External Risk Factors, External Demography Factors and Other External Factors.

It is clear that the market is an important factor when localization decisions are to be taken (Lapide, 2008). The location of the customers determines the location of other supply chain functions, this in order to be able to meet requirements on order to delivery and flexibility as well as costs (Christopher, 2011; Fisher, 1997).

Risk is another factor that affects supply chain management and localization decisions (Lapide, 2008). With a total cost measured to \$265 billion the crisis in Japan is one example of risks that depend on where

the supply chain is localized (World Bank, 2011). Outsourcing to low cost countries also implies considerable exposure to risk (Christopher & Mena, 2011; Cavinato, 2004).

The third group of external factors is external demography factors which includes factors such as cost of labor and availability of competence. One of the main reasons for outsourcing production is often to get cost benefits and it is therefore interesting to evaluate how the external demography factors affect localization (Fredriksson & Jonsson, 2009). Production costs consists on average of 63 percent of the costs in manufacturing companies which further highlights the importance of the external demography factors (Ellram, 1996). Demography also refers to availability of workers and productivity (Heidrick & Struggles, 2011).

In the fourth group, the external factors that did not fit into any of the categories above are placed. These include for example IT & Integration as well as environmental factors which are all important for localization (Lapide, 2008). IT & Integration are important external factors since they can be used to support and enable supply chain strategies and also increase the efficiency. Environmental factors are increasingly interesting, not only because they are heavily debated, but also since they can have impact on companies cost structure, due to new green taxes being introduced (IEA, 2010).

Many of the external factors were investigated using macro factors. There are considerable differences between the western developed- and the developing countries. Therefore USA, Sweden and China will be used as examples.

All identified external factors are summarized in *Figure 7* below:

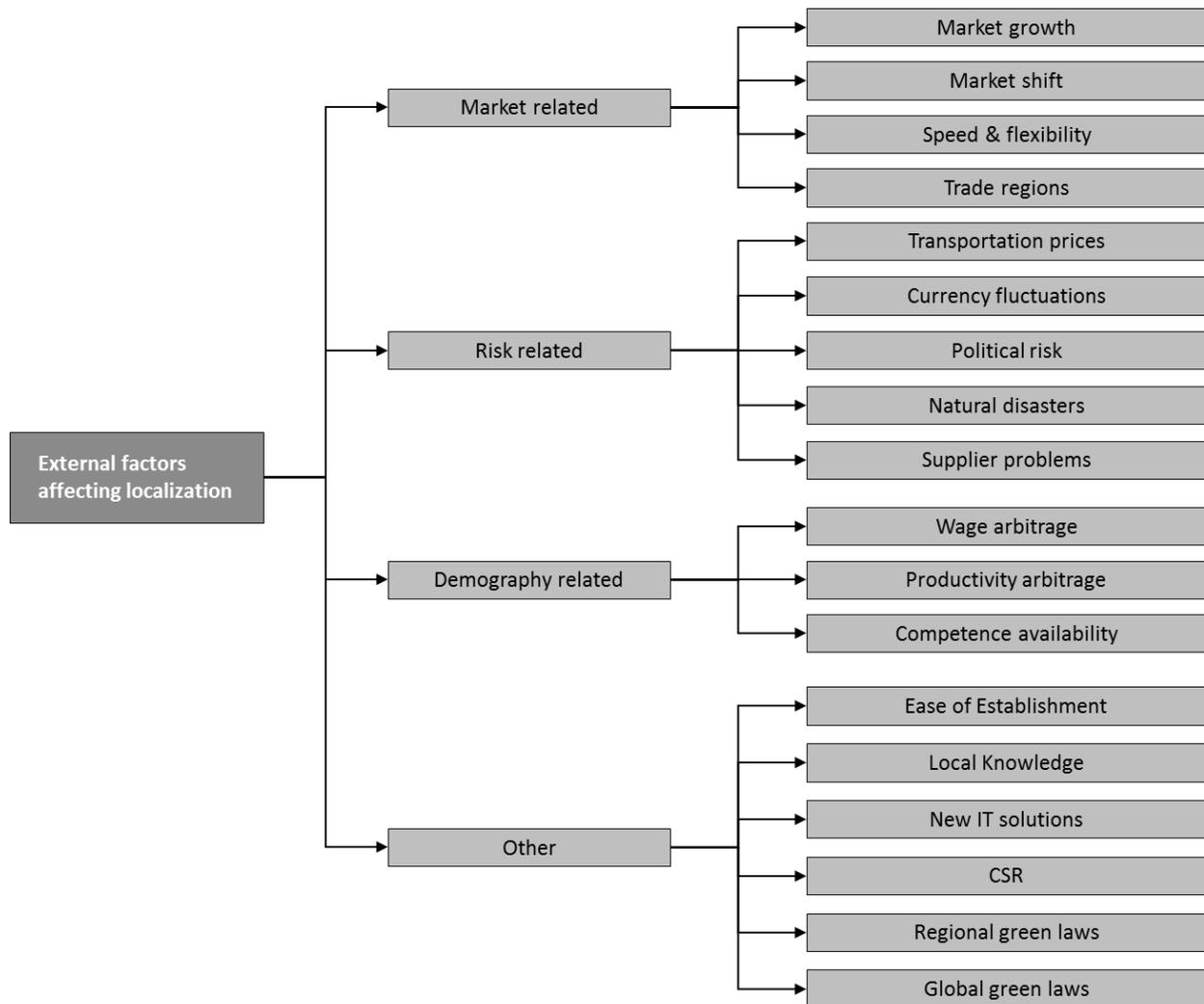


Figure 7: External factors affecting the localization decision of companies

3.3.1 External market factors

The group of external factors “Market” is a combination of all market related factors that affect the localization decision. The factors covered below are market growth and shift, customers’ delivery requirements and trade regions.

Market Growth and Shift

Some markets, such as the Chinese, are growing faster than others, e.g. Swedish and other western countries (World Bank, 2012). The long term implication is that new regions will become more important than they used to be. The increased buying power of these regions will in the future be an important factor to consider when deciding on where to localize a company’s operations (Lapide, 2008). The growth becomes apparent in *Figure 8* where China has had an average GDP growth of approximately 10.3 percent the last 10 years while Sweden’s corresponding number was just 2.3 percent.

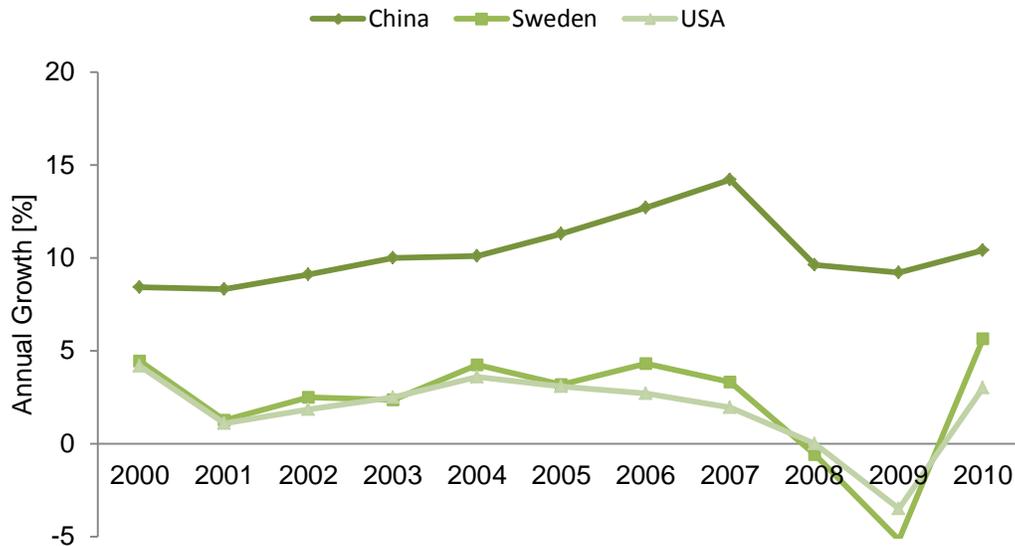


Figure 8: GDP growth for China and Sweden from 2000 until 2010 (World Bank, 2012)

The diverse growth characteristics of different regions indicate that market growth is important to investigate. For the individual company, the specific market for the actual product is of greater interest than the overall market growth, even though these are often correlated. However, in the truck industry the changes in sales closely follow changes in GDP (Accenture, 2011). Therefore the survey and interview will instead investigate the individual company's market growth and shift.

Customers delivery requirements

Customers demand for faster and more flexible deliveries are increasing (Christopher & Towill, 2001; Christopher, 2011). There is a correlation between transportation distance and the speed and flexibility with which the product can be delivered. The localization of manufacturing facilities is therefore of interest when trying to meet these demands. This is also true for the supplier base, e.g. due to material requirements and lead time. Especially when the distances are long, the choice of transportation mode will determine the speed and flexibility of product delivery (Lumsden, 2007). This does however often come at a cost, i.e. transportation costs are increasing with faster speed of delivery. It is therefore interesting to look at how important the customers changing demand for faster and more flexible deliveries affect localization decisions.

Trade regions

The importance of trade regions were discussed in *section 1.1*. The implications of lower tariffs within a region are that it fosters trade (Andresen, 2009). Global companies have therefore an increased incentive for localizing functions within different regions, creating a more regionalized presence.

3.3.2 External risk factors

Risk is defined as the "variation in the distribution of possible outcomes, their likelihoods, and what their subjective values could be" (March & Shapira, 1987, p.1404). In this project risk factors are considered only if they have impact in geographic localization of supply chain functions. In truly global supply chains, the risk is higher due to higher levels of exposure. Handling risk in global companies is therefore

important, since a single supply chain event, if not handled properly, can wipe out an entire company (Accenture, 2011).

Risk is often sorted based on how it can be anticipated and controlled. Simchi-Levi et al. (2009) defines a range of risk factors stretching from “unknown-unknowns” to “known-unknowns” where the latter is assumed to be controllable and the former is not (see Figure 9).

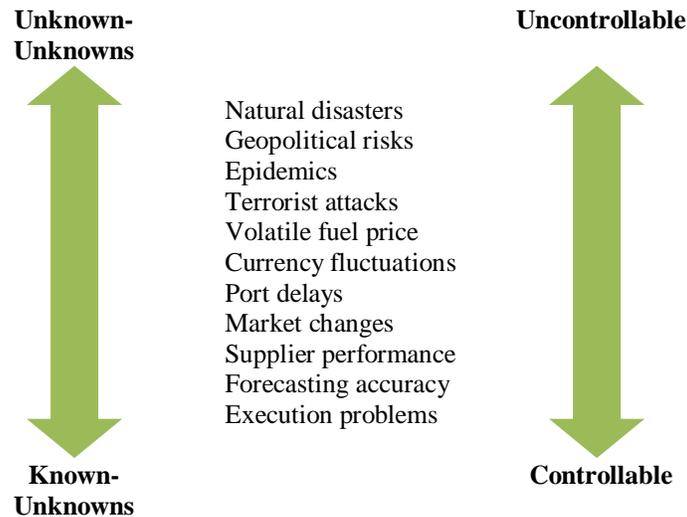


Figure 9: Supply chain risk scale (Simchi-Levi 2009)

Some of the factors, including epidemics, port delays and execution are not covered due to its non-strategic level. Similarly, forecasting accuracy is not included since it is too farfetched to believe it affects localization. Market changes are considered to be sufficiently important to be covered alone (outside the concept of risk). The remaining risk factors are covered in the following order: volatile fuel prices which are here named transportation costs, currency fluctuations, political risk, natural disasters, and supplier performance. Terrorist attacks are implicitly covered in the political risk section.

Transportation Costs

In a global economy with worldwide trade a lot of transportation is required to move the goods being traded. There is a clear connection between the localization of the manufacturing functions as well as suppliers and the transportation costs (Lapide 2008).

Oil price constitutes a high part of transportation costs and is therefore used as an indicator. The historical barrel prices can be seen in Figure 10. In the year 2035 World Energy Outlook IEA predicts an oil price of \$135 (2009 dollars) with current environmental regulations (IEA, 2010) Alternative fuels is another potential source of energy. However, in 2009 alternative fuels consisted of only 4 % of the world-wide fuel use for the road transportation business with a projected increase to 11 % by 2035 (IEA, 2010). This is partly due to increasing oil prices which makes it more profitable to use alternative fuels.

With increasing transportation costs it will be more beneficial to keep production closer to the market instead of outsourcing production and transports the goods great distances (Singh, 2004).

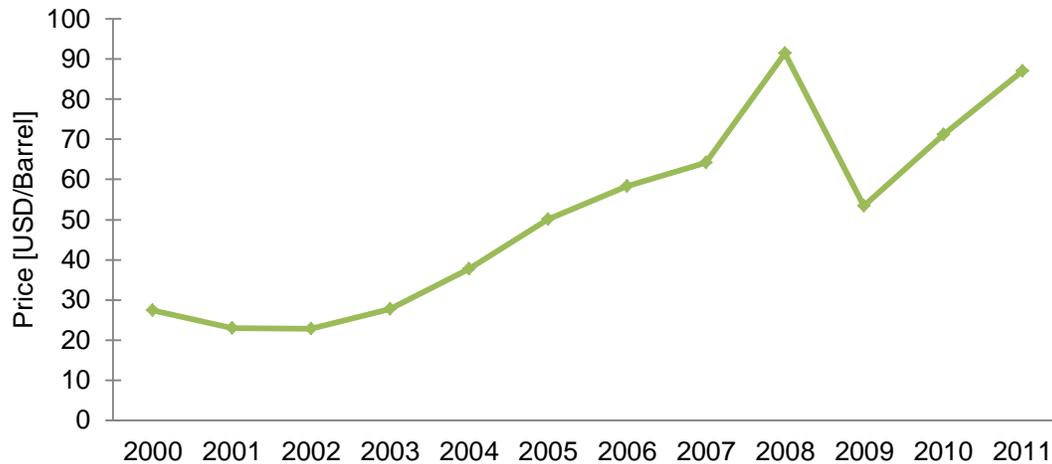


Figure 10: Historical oil prices in USD/barrel (IEA, 2010)

Currency Fluctuations

For companies, risk of trading in various currencies is obvious. Many companies struggle with tight margins, and quick changes in currencies can have disastrous effects⁴. The outcome of exchange rates from 2001-2011 can be seen in *Figure 11*.

If considering the Swedish Krona, Euro, US-dollar and Chinese Yuan, the largest swings were from year 2007 to 2008, where the Euro, US dollar and Yuan dropped 15%, 22% and 30% respectively, in comparison to the Krona. That implied cheaper long distance sourcing for the Swedish companies trading in SEK, but also much more expensive end products for export. Thus, any company with international operations or trading is exposed to losses due to currency swings (Makar & Huffman, 1997). As a result, currency management goes hand in hand with globalization.

Fluctuations can be handled in many ways. One common way is through currency derivatives, a financial instrument, which includes options, swaps, forwards and futures (Block & Gallagher, 1986). Companies can also use non-derivate solutions such as natural hedging which can be as simple as timing payables and receivables or adapting location of operations (Arterian, 1993; Bartram, et al., 2008). The easiest way is evidently to sell and buy in the same currency. Swedish global manufacturers are constantly facing this issue, and how it affects their localization choice is therefore of interest.

⁴ Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

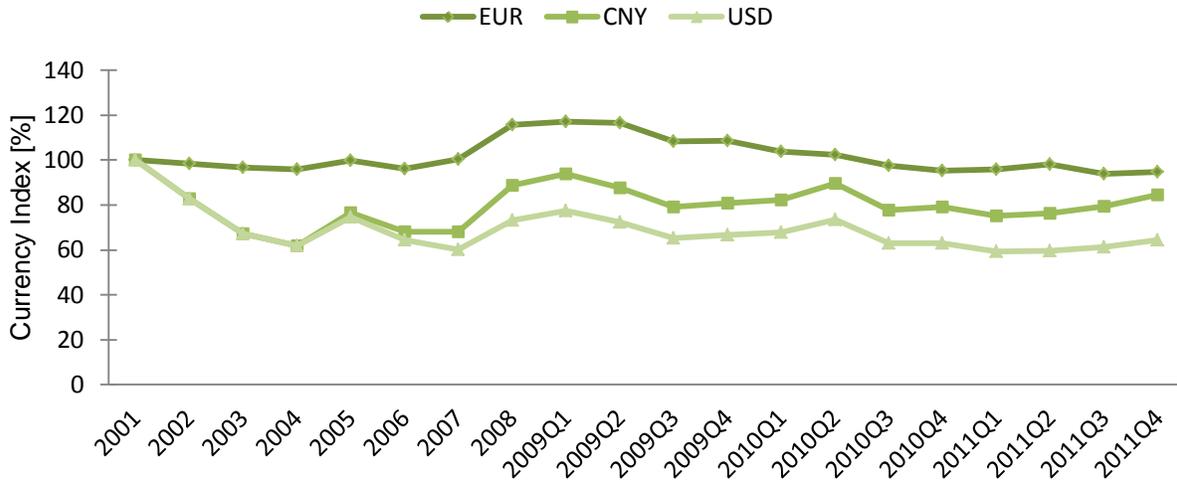


Figure 11: SEK Index; Exchange rates from 2001 to 2011 (end of period numbers), (UN, 2011), (Forexinvestor, 2012)

Political Risk

Political risk, which consists of factors such as government stability and corruption, is often affecting whether a company will settle in a certain region or not. A country with high political instability risks having lower levels of growth, little investments and few entrepreneurial initiatives, and in the case of a low-functioning juridical system, the enforcement of legal contracts is slowed down (Shahabuddin, 2007). Political risk assessment of countries is conducted over time by PRS Group (Political Risk Services Group). The political risk assessment is based on a number of factors⁵ and summarized into a score ranging from 0 (worst) to 100 (best). The rankings for Sweden, USA and China from July 2009 can be seen below in *Figure 12*:

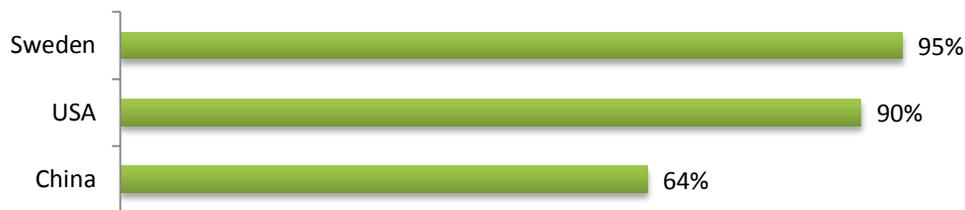


Figure 12: Political risk rating from 0 to 100 (PRS-Group, 2009)

Natural Disasters

In addition to these more “controllable” factors, the least controllable factor is natural disasters. Natural disasters have severe impact on the society, but also on the industry. The 2011 flooding in Thailand is estimated to \$32billion in economic loss for the manufacturing sector (World Bank, 2011). The tsunami in Japan is measured to a \$265billion in economic losses, which represents 4.5% of Japan’s GDP (World Bank, 2011). In addition to those, seven significant hydrological events, e.g. floods, landslides and flash

⁵ Government stability, socioeconomic conditions, investment profile, internal conflict , external conflict , corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability and bureaucracy quality

floods, and four geophysical events, e.g. earthquakes and tsunamis, occurred during 2011, (see Figure 12) below. (Münchener Rückversicherungs-Gesellschaft , 2012)

Due to the big losses that can occur it is of interest to evaluate how natural disasters affect localization (Figure 13).

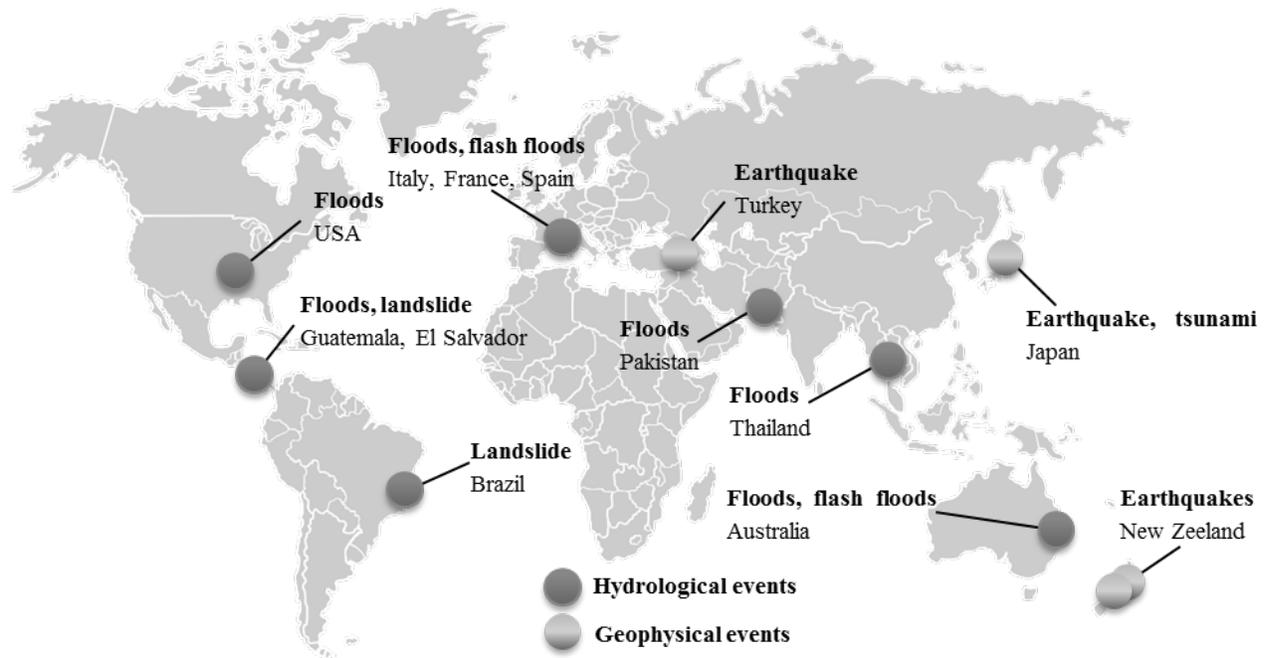


Figure 13: Significant natural disasters 2011 (Münchener Rückversicherungs-Gesellschaft , 2012)

Supplier Performance

Performance of suppliers can differ depending on geographic location. Sourcing remotely is very common today and is usually cost-oriented (Ruamsook et al., 2009). Sourcing from low cost countries often implies additional consequences and considerable exposure to risk (Christopher & Mena, 2011).

Ruamsook, et al., (2009) identifies 14 factors which differs significantly (99 percent level) between LCC and developed country sourcing, ranked with highest significance first: information system capability, communication infrastructure, business culture and practices, on-time receipt, product price (positive for LCC), product quality, production capability, cycle-time length and time for logistics, safety stock levels, accurate quantity and selection, invoice accuracy, and delivery damage. Most are related to supplier uncertainty.

Many risks covered by Ruamsook, et al., (2009) are also taken up by Christopher & Mena, (2011). They stress the risk of supply disruptions due to poor infrastructure, quality problems, longer lead times and decreased earnings from global sourcing due to hidden costs. The risks of higher cost than expected and low product quality is backed up by Fredriksson & Jonsson, (2009).

3.3.3 External demography factors

The external demography factors include labor arbitrage, productivity arbitrage and competence availability. These were deemed to be important for localization and are outlined below (Fredriksson & Jonsson, 2009; Ellram, 1996).

Wage arbitrage

The cost of labor is to a high degree affected by the wages of the employees which in turn is affected by what country of operation that is used. There is still a considerable labor arbitrage, i.e. wage differences between developed- and developing countries, but it is changing fast. The worker wages in China increased by 69 percent between 2005 and 2010 (BCG, 2011). The corresponding number in Sweden was 20 percent (World Bank, 2012). These numbers represent an average annual growth of 11.1 and 3.7 percent respectively (see Figure 14). The financial crisis in 2008 is included which resulted in a downturn for both countries. The labor arbitrage was reduced from 27 times as expensive in China vs. Sweden in 2005 to 17 times as expensive 2010. The gap is thus closing fast and according to BCG (2011) the gap will be small enough for American manufacturers to be indifferent to outsourcing in 2015 from a cost point of view. They assume that the Chinese Yuan will be somewhat strengthened against the dollar. The Swedish Krona has during the last years strengthened itself against the dollar but not to the same degree against the Yuan. It is therefore likely that the year 2015 is a somewhat early number when looking the Swedish perspective. The labor arbitrage is however being reduced and Sweden will most likely soon or later end up in the same situation as BCG (2011) predicts for USA in 2015.

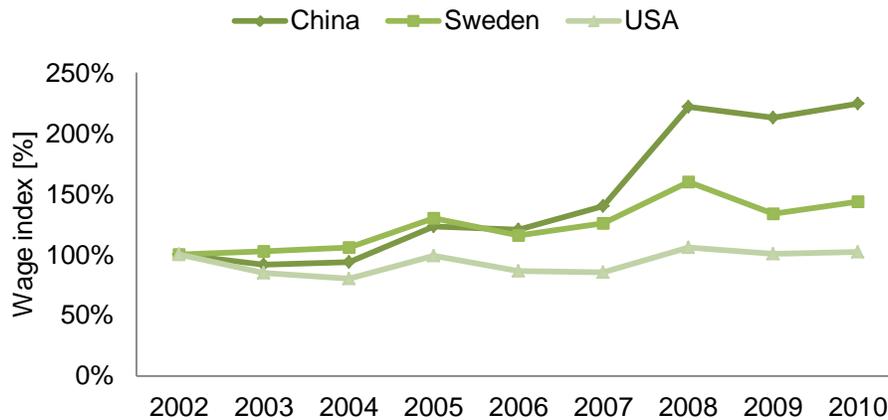


Figure 14: Labor wage index of China and Sweden 2002 until 2010 based on Swedish currency (World Bank, 2012)

Productivity arbitrage

The productivity arbitrage is together with labor arbitrage an important aspect affecting localization⁶. The productivity arbitrage is the difference in productivity between two countries. Productivity can be measured in several ways; two of them are output per man hour and total factory productivity. The latter is a better way since it removes the effect of investments (Zheng et al., 2009). A considerable amount of Chinas recent GDP growth comes from heavy investment rather than productivity increase (Zheng et al., 2009). China is still at the top of regular total factory output as well with an average annual increase of 4.1 percent between 1990 and 2008. Many other Asian countries such as India, 2.8 percent, and Singapore

⁶ Joakim Percival, Senior Manager Accenture, Interviewed 24th of February 2012

with 2.3 percent have increased their productivity the most. Most western countries, such as USA, Japan and Germany, have had a total factory productivity increase of 1 percent. (The Economist, 2009) The productivity arbitrages between developed and low cost countries have thus been reduced. It is therefore important to understand to what degree the productivity arbitrage affect localization strategies for Swedish companies.

Competence availability

It is evident that to be able to run business effectively, companies need competence regardless of geographic location. As recent as just three years ago, right after the recession, companies struggled to find employees that fit their needs (Heidrick & Struggles, 2011). Heidrick & Struggle’s (2011) ”The Global Talent Index Report”⁷ provides a number of interesting findings on the subject:

- The US and Nordic companies outperform other countries
- China is the country with highest improvement
- 30 percent of surveyed companies are not confident that they will find the competence they need over the next two years
- Especially in Asia, employers are relying on developing workers themselves
- A common headache is how China and India will be able to provide talented workers in the same pace as the economies are growing

The 2011 score and predicted 2015 score for regions, *Figure 15*, and countries, *Figure 16* provided below:

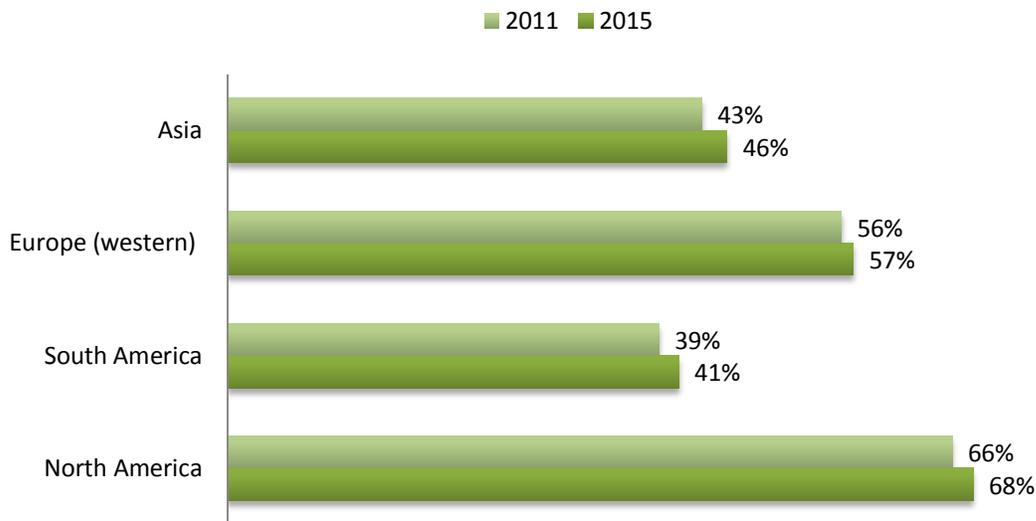


Figure 15: Global Talent Index per region 2011 vs. 2015 (Heidrick & Struggles, 2011)

⁷ GTI ranges from 0-100% and is based on Demographics, Compulsory education, University education, Quality of the workforce, Talent environment, Openness and Proclivity to attracting talent.

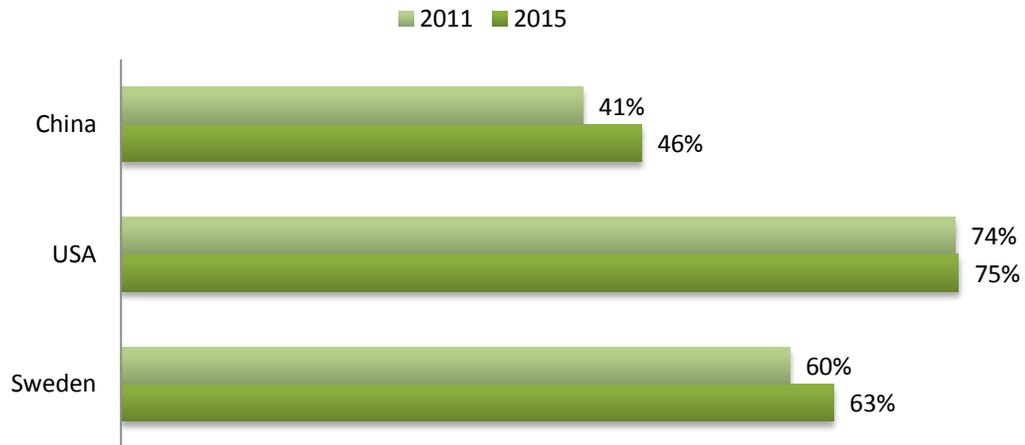


Figure 16: Global Talent Index for selected countries 2011 vs. 2015 (Heidrick & Struggles, 2011)

As education goes up in developing countries, the possibility to move more operations to those regions is increasing. The gap between developing countries and developed countries is still wide, but is diminishing continuously (Figure 17):

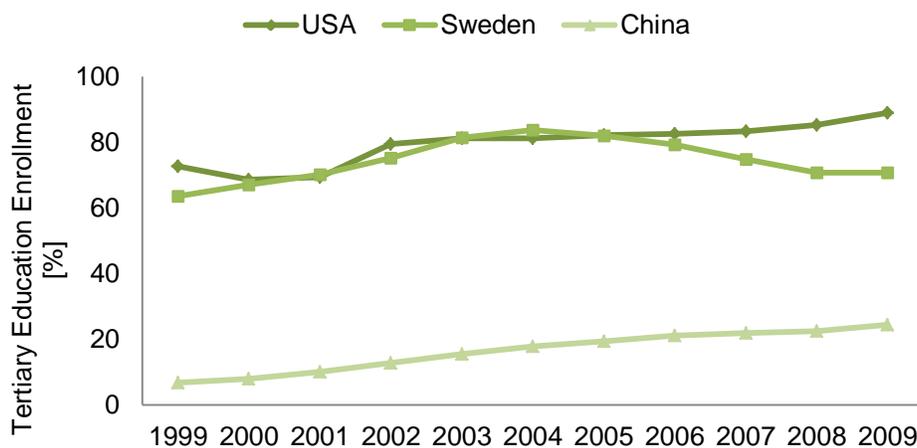


Figure 17: Tertiary education level in China and Sweden 1999 until 2009 (World Bank, 2012)

How the availability of competence affect localization decisions will be investigated in the survey.

3.3.4 Other external factors

Four other factors have been identified as important for localization. They are: ease of establishing new factories, local knowledge, IT & integration and sustainability.

Ease of establishing

Data from “Ease of doing business” can be used by companies to evaluate the appropriateness of entering new countries. Ease of doing business ranks countries on how easy it is to start up new business, dealing with construction permits, getting electricity, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing contracts and resolving insolvency (World Bank, 2012).

All factors are considered equally important. Data for USA, Sweden and China can be seen in *Figure 18* below (worst country =0, best =100%):

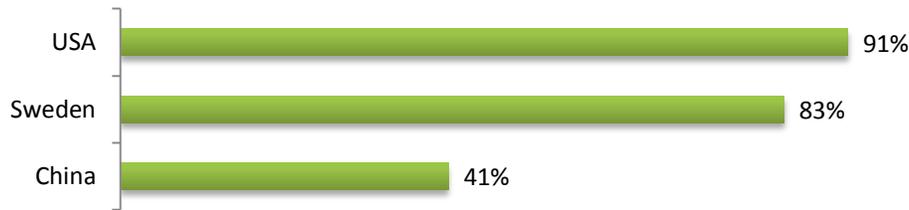


Figure 18: Ease of Doing Business score⁸ (World Bank, 2012)

The ease of establishing new factories and supplier base is of course important for localization and will therefore be tested in the survey.

Local Knowledge

For any company establishing operations in new markets, it is important to attain local knowledge to overcome market uncertainties (Stopford & Wells, 1973). Local knowledge is critical for the success of almost all aspects of entry into a new host country (Lord & Ranft, 2000). Local knowledge consists of cultural traditions, norms, values, and institutional differences so as market intelligence and understanding how to serve local markets (Inkpen & Beamish, 1997). Makino & Delios (1996) define three ways of gaining local knowledge: by “forming a joint venture with a local firm”, by “transference from the foreign parent’s stock of past host country experience” or by “the accumulation of operational experience in the host country”. The study suggest that a local partner can have great impact of results during the first years, but that having a local partner might harm results in the long run. The same holds in the event of past experience by the parent company. If the company enters without knowledge about the local markets and conditions, the levels of performance is positive with time, but starts of at low levels.

How important Swedish AIE companies consider local knowledge to be is of interest because of the above explained, and will therefore be tested in the survey.

IT & Integration

Through integration, a higher performance can be reached within the supply chain (Cooper & Pagh, 1998). IT can be a powerful tool in enabling and supporting supply chain strategies (Lee, 2002). A full visibility of goods, assets and inventories can be reached which can help increase the efficiency of the supply chain in several ways, e.g. removing the bullwhip effect (Lapide, 2008; Lee, et al., 1997). It can also enable cooperation between geographically spread out offices in the same company or between companies in different regions. This is of course very important for large global companies and is why this study investigates how important IT & Integration is for a global company.

Sustainability

Sustainability can be divided into social, economic and environmental sustainability (Ammenberg, 2004). The focus in this section will be on the environmental and social aspects. As long as sustainable economic

⁸ Calculated as the percentage attainment on mean factor ranking in comparison with the country with the highest and lowest mean ranking.

growth is not regulated by law (e.g. material consumption) it is in this project assumed to be outside the scope of localization. Two of the driving forces identified as affecting sustainability are regulations and Corporate Social Responsibility (CSR). (Lapide, 2008)

Environmental factors are getting increasingly important with new green taxes being introduced (IEA, 2010). Currently only the European Union and New Zealand have CO₂ taxes but it is likely that more will be inspired to do the same and that taxes will increase (IEA, 2010). In 2009 the prices were \$22 per ton of emissions and the current predictions ranges from \$37 to \$105 per ton in 2030 (IEA, 2010). These taxes affect both the production costs as well as transportation costs which are both in the future likely to become more expensive. That could in turn affect the localization decision of the manufacturing, purchasing, logistics and R&D functions. There are both regional regulations, e.g. European Union's regulations, as well as global such as the Kyoto protocol. It was therefore of interest to study how these two different kinds of regulations affect localization decisions.

CSR includes making sure that child labor is not used and that the employees have fair working conditions (Oonk, 2008). This is often especially important in low cost countries where these problems are more frequently present. It is important to take these factors into account when evaluating a country in terms of localization possibilities. There can be additional costs associated with controlling working conditions, e.g. at suppliers'. Neglecting this can affect the brand name through negative publicity, Apple experienced this when in the beginning of 2012 the working conditions in their Asia factories were at the front page of several newspapers (CNN, 2012). It was therefore interesting to evaluate to what degree companies takes CSR into account when settling localization strategies.

To sum up, three parts of sustainability was investigated: regional green laws, global green laws and finally CSR.

3.4 Strategies of Localization

This section covers the Localization Strategies. The aim is to investigate which possible localization directions companies can take given internal and external factors. The focus is on the functions of interest: manufacturing, purchasing, logistics and R&D.

3.4.1 Manufacturing

The aim related to manufacturing localization strategies is to find out how companies may want to set up their manufacturing network. Therefore all relevant setups must be covered, to ensure that the hypothesis can be answered.

Meijboom & Vos (1997) discusses the manufacturing network setup and its implications. Differences involved when using a regional or global approach were identified. They stress that companies using a global setup normally have cost incentives while those which aim for a regional presence focus on the market and its requirements. In many areas in the world, the regional protectionism has been severe. In such areas, regional supply chains with manufacturing taking place regionally will benefit (Jiang, 2002). Jiang (2002) also emphasize clustering operations (not only manufacturing) since still in countries like China, companies operating locally will enjoy preferential tax rates. Considering that there are differences between the above mentioned potential in global and regional manufacturing, it was investigated how Swedish AIE companies chose to set up their manufacturing network by the means of the survey.

In addition to choose a global or regional setup, companies will also have to choose between using low cost countries, developed countries or both. Due to the fact that costs are an important part of manufacturing plant localization it is also of interest to determine whether the plant is localized in a developed or low cost country (Fredriksson & Jonsson, 2009). The choice will have impact on cost, but might also affect the output quality of the products.

The extent to which it is possible to move manufacturing between company-owned production facilities is another factor that is of interest to investigate. Through having a more standardized product it can be easier to move production between different production facilities as part of a hedging strategy. By being able to move the production companies can easier follow market fluctuations which in turn lead to less transportation, less customs and a lower order to delivery lead time⁹.

3.4.2 Purchasing

Purchasing is the function responsible for assuring material supply in the manufacturing company, which includes the sourcing and contracting of new suppliers, relationships with suppliers and also the actual ordering (van Weele, 2010). Purchasing is included in this project because of its high influence of a company's results. For AIE companies, cost of purchased goods often consists of around 50-70% of total costs of the product (van Weele, 2010). With this reason as one of many, a considerable number of companies are now considering purchasing as a strategic function. Purchasing must be handled strategically and strategic sourcing design should consider supply chain relationships and involve suppliers in product design where possible (see more about supplier involvement in *section 3.4.4*) (Ketchen et al., 2008).

There are two parts of purchasing related to localization that are of interest to this project: the origin of the supplier base and the physical placement of the purchasing organization.

The supplier base

The localization of the supplier base is an important factor to consider in order to reach a cost efficient material supply (Morgenstern, 2006). It is common that companies upon the localization of a new plant continues with their existing suppliers and just requires them to supply the new plant as well (Morgenstern, 2006). This is done in order to reduce potential problems in the startup phase of the new production. It is important to make sure it does not stay that way after the startup phase is over. Considerable savings can often be reached if a higher degree of local or regional suppliers are used when producing in a low cost country (van Weele, 2010). A local or regional supply base helps shorten lead times and lower inventory needs (Morgenstern, 2006). The localization of the supply base can thus according to Morgenstern (2006) be local or global. Since the focus in this study is to determine localization on a regional basis the local will here be defined as within the region. The global will thus be from suppliers outside of the region.

An additional issue pointed out by Morgenstern (2006) is whether to localize the supplier base in a low cost or a developed country. This is dependent on the localization of the manufacturing facility as well as the risk and cost involved. The cost reduction provided by localizing in a low cost country may be worth

⁹ Daniel Szirányi, Senior Manager Accenture, Interviewed 3rd of February 2012

less than the flexibility and reliability provided by having the supply base closer to the manufacturing plant.¹⁰

In addition to Morgenstern's (2006) work, Kraljic (1983) developed a framework that clearly shows the importance of handling supplier relations differently depending on what is purchased. He defines two characteristics where one is importance for purchasing (often determined by purchase volume) and the other strategic importance. In this project, only suppliers providing high volume items are of interest, but strategic versus non-strategic items must be handled separately.

The purchase organization

The organization of the purchasing function does to a high degree determine the effectiveness and efficiency of the purchase. The purchasing function can be organized in two distinct ways, in a centralized structure or in a decentralized structure (van Weele, 2010). These are two extremes and the most common is the hybrid structure where parts of both are used (van Weele, 2010). A centralized structure is characterized by a central handling of activities such as contract negotiation, supplier selection and product specification (van Weele, 2010). The advantages include better prices, service and more standardization of material. A decentralized structure is characterized by having all business unit managers being responsible for their own financial result and the manager therefore handle all purchasing activities one their own. A disadvantage is that the buying power is lowered which often results in higher prices. (van Weele, 2010; Quintens, et al., 2006)

The localization of the purchasing function depends on where the focus of the company is. It can be close to the headquarters of the company to enable a close interaction between purchasing and other central functions¹¹. The purchasing function can also be close to the supplier base, this is beneficial when a close connection with suppliers is needed¹². A third possibility is to be close to the production facility which enables a good communication in terms of material demands (van Weele, 2010). A fourth possible placement is close to the final customers or market, which enables a good understanding of what the customers require.

3.4.3 Logistics

Logistics is a wide concept that involves many subsystems. Normally material supply, production and distribution is included, but also the exchange of material and information. In a system, many storage points, transport distances and value adding activities occur (Jonsson & Mattsson, 2009). In this project production is covered outside the concept of logistics, but distribution, risk management and demands for fast and flexible deliveries are investigated.

The demand for higher speed and flexibility is affecting many industries today (Christopher, 2011). Some companies have proved that it is perfectly possible to meet those higher requirements. Hewlett-Packard, the computer and printer manufacturer, achieved both by using postponement (Feitzinger & Lee, 1997). That is, delaying all possible value adding activities as long as possible. One example is when HP reduced the inventory levels by 50 percent for a Deskjet printer by producing it as a generic product, possible to use both with Mac and Windows instead of two separate. Another example is their postponement of

¹⁰Joakim Percival, Senior Manager Accenture, Interviewed 24th of February 2012

¹¹Mikael Davidsson, Senior Manager Accenture, Interviewed 9th of February 2012

¹²Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

assembling PCs. The final assembly of components took place close to the customer, only when the actual order arrived. This made inventory levels drop, they could offer customized solutions rapidly while still decreasing costs. Of course, providing high speed deliveries is possible by arranging warehouse solutions close to customers, but it does not inherently allow for higher variety or increased cost efficiency. (Feitzinger & Lee, 1997)

Customers put more and more demands on companies in terms of speed and flexibility of delivery (Christopher & Towill, 2001). One way to achieve this is to improve the integration between different parts of the supply chain as well as better coordination of material and information. By having a higher level of coordination with suppliers and distributors an increased speed of delivery and flexibility can be achieved (Stadtler, 2005).

The choice of transportation mode affects speed of delivery, flexibility and environmental pollution (Lumsden, 2007; Christopher, 2011). By using a faster mode of transportation, such as air, the transportation lead time is reduced. Another benefit with air transportation, especially for high value products, is the low tied-up capital involved. It is however much more expensive than other means of transportation, and thus requires both a customer willing to pay for the extra service, but also a high value-to-weight ratio (Lumsden, 2007). Considering the above stated, there exist reasons to investigate companies' attitudes towards future usage of the various transportation modes. A summary of the energy consumption of various modes of transportation can be seen in *Table 11* below.

Table 11: Energy use and carbon dioxide emissions from transportation (Stenkvist, 2002)

Vehicle type	Energy (kWh per tonne*km)
Road	0.52
Rail	0.042
Sea	0.078
Air	3.27

A company can chose to distribute themselves or outsource the activities to a distributor. The responsibilities of the distributor can include warehousing, sales, transportation and customs broking (Christopher, 2011; Briggs, 1999). Simchi-Levi, et al. (2009) also emphasize the increased responsibilities of distributors but adds an important dimension: collect customer data. This data should be used for evaluating performance of the supply chain and for the development of new products. Outsourcing of other activities such as production, purchasing or similar is considered out of scope for this study and is therefore not included.

Within trade regions, tendencies have moved towards more centralized distribution networks (Simchi-Levi et al., 2009). This allows for higher economies of scale, but more movement for products. A centralized distribution lowers cost, but limits flexibility. How manufacturing companies chose to design their distribution network is therefore of interest.

How warehouse structures are designed is also a part of logistics. The structure can be defined by degree of centralization. 100 percent centralization implies that all products are delivered from one warehouse. The more hierarchies and warehouse locations involved the lower levels of centralization. Low degree of

centralization implies more closeness to customers, shorter lead times, lower transportation costs, but higher warehouse costs, especially in terms of tied up capital. The risk of obsolescence is also higher in a decentralized structure. The opposite applies for high levels of centralization. There are clear trends today pointing towards higher degree of centralization with fewer national warehouses, and more regional focus (Jonsson & Mattsson, 2009). The way the warehouse structure is designed is highly case specific, and there exist no universal solution. Design parameters are a combination of the product, market and location of other resources (Jonsson & Mattsson, 2009). Besides using a centralized or decentralized distribution network, a third way is to use direct distribution and thereby cut out the middleman (Rosenbloom, 1995). How Swedish automotive and industrial equipment manufacturers chose to set up their warehouse network given the trends seen and their different products and capabilities is of interest.

The focus on supply chain risk and disruptions have increased drastically the last fifteen years. The reasons are many: increasingly turbulent markets, higher vulnerability of supply chains due to more globalization, new business models (e.g. adoption of lean), reduced supplier bases and more outsourcing (Christopher, 2011). For example, Boeing lost \$2.6 billion in 1997 due to raw material shortages, internal- and supplier parts shortages and internal inefficiencies (The Wall Street Journal, 1997).

In 2008, Accenture Management Consulting surveyed global companies what processes they had in place to identify and mitigate supply chain risks (Accenture, 2008). The results were the following (Figure 19):



Figure 19: Supply chain risk identification and mitigation processes in place at global companies (Accenture, 2008)

Almost 50 percent of the responding companies had formal supply chain risk management processes in place, while 8 percent did nothing to mitigate possible disruptions. The difference between this study and Accenture's is the focus on Swedish based companies. How Swedish companies work with risk was investigated by asking the same question to them.

3.4.4 R&D

R&D is included in this project due to its increasing attention for global companies. As mentioned in *section 3.3*, customers in foreign markets require products to be adjusted to their local needs. People in developing countries no longer want western products not adapted to western people. They want products from western countries which are in line with needs (Govindarajan & McCreary, 2010). It is therefore of interest to determine whether a market closeness is needed or not. The adjustments will of course imply different things in different industries and for different products, wherefore it is investigated in the survey. R&D localization is crucial for understanding both knowledge flows and knowledge creation, since knowledge sources often is geographically concentrated (Karlsson & Andersson, 2005).

The R&D organization can take forms from centralized to decentralized. The setup chosen will have impact on the innovations that the company is able to provide (Argyres & Silverman, 2004). Argyres & Silverman (2004) found that firms with higher levels of R&D centralization, both in terms of the function and the budget authority, had higher impacts in their innovations than their decentralized counterparts. Higher levels of centralization decreased transaction costs and increased abilities to develop non product- or business unit specific innovations. Having a decentralized structure does on the other hand increase the ability to adapt to local needs. Due to the regional focus of the study a decentralized structure is in this project defined as a regional R&D setup. Apart from having a centralized versus decentralized R&D it is important to consider whether to localize the R&D function in a developed or low cost country. Some companies offshore their R&D activities in order to lower costs (Zhao, 2006). Offshoring R&D to low cost countries implies considerable risk, since many low cost countries have weak intellectual property laws in place. To summarize, the R&D department can be centralized or decentralized or a combination of the two, i.e. a central R&D department with a certain amount of decentralized R&D close to the market. It can further be placed in a developed or low cost country.

Another often debated subject is whether to involve the supplier in product development. This is often referred to as ESI, or "Early Supplier Involvement". As more and more innovations come from suppliers it is important to involve them early (van Weele, 2010). Birou & Fawcett (1994) state that "*environments that are conducive to highly co-operative relationships between buyers and suppliers are more likely to lead to supplier involvement*", which can then be seen as a pre-requisite. Benefits of supplier involvement stretch from shortened development lead times due to design concurrency, lower costs, reduced workload for the buying company and more manufacturable parts for the suppliers (Birou & Fawcett, 1994; Atkinson, 2008; Clark, 1989; Takeishi, 2006). ESI was investigated both in the survey, in terms of physical closeness between R&D and suppliers, and in the interviews with a focus on gaining a deeper understanding.

The production location is also important for the localization of R&D. A matter of fact, in some cases the co-location of the two is necessary (Ketokivi & Ali-Yrkkö, 2009). Ketokivi & Ali-Yrkkö (2009) found that product complexity, process complexity and rate of change have impact on R&D localization decisions. Ambos (2005) also stress the importance of placing R&D in the near proximity of the

manufacturing site. In addition to placing R&D close to production, market or suppliers, another possibility is to put R&D in proximity to headquarters.

For many products, there exist a need for local adaptations. These can be related to legislations but also to local wants and needs. Using reverse, bottom-up innovation assures the local insights and thus, products can be more successful (Govindarajan & McCreary, 2010). The amount of adjustments that are made between different markets are therefore of interest.

The R&D expenditure for countries varies extensively. OECD’s BERD or “Business Enterprise expenditure on R&D” is a useful measure since it is most closely linked to the creation of new products and production techniques, as well as to a country’s innovation efforts (OECD, 2012). In *Figure 20* below, BERD is displayed as a percentage of industry value-add in the corresponding country. It can be seen that Sweden has the highest R&D spend compared to USA and China. In fact Sweden is the number three spender in the world after Israel and Korea. The USA’s expenditure is growing slowly, China’s drastically and Sweden’s R&D is descending. The innovations are though still coming from the western world¹³, and the question is, how big part of companies’ total R&D expenditure that can effectively be transferred to low cost countries like China.

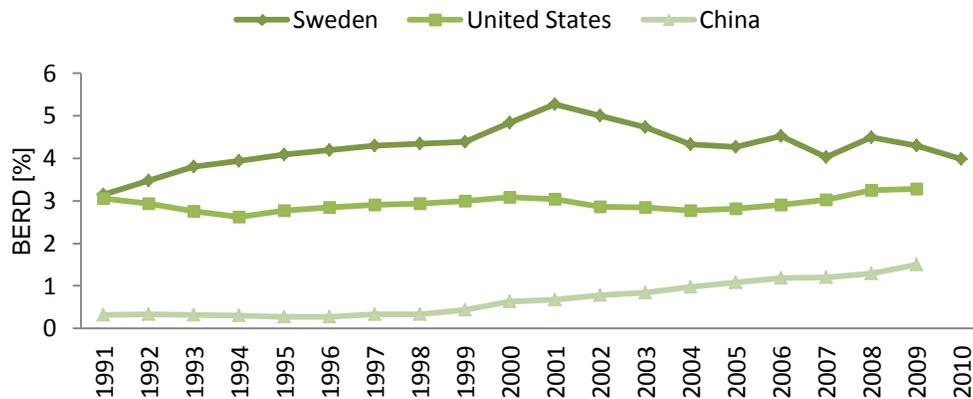


Figure 20: BERD as a percentage of value added in industry (OECD, 2012)

¹³ Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

3.5 Conceptual Model

Taking the previously mentioned strategy framework (*section 3.1*) and the theoretical findings (*section 3.2-3.4*) into account, a conceptual model was designed to lead the data collection and analysis parts of the project. The model comprises of the three parts of interest from the strategy framework; Internal factors, External factors and Localization strategies. For the localization strategies, the four functions; manufacturing, purchasing, R&D and logistics can be seen. In each of the boxes, examples of theory findings are presented. See the conceptual model below (*Figure 21*):

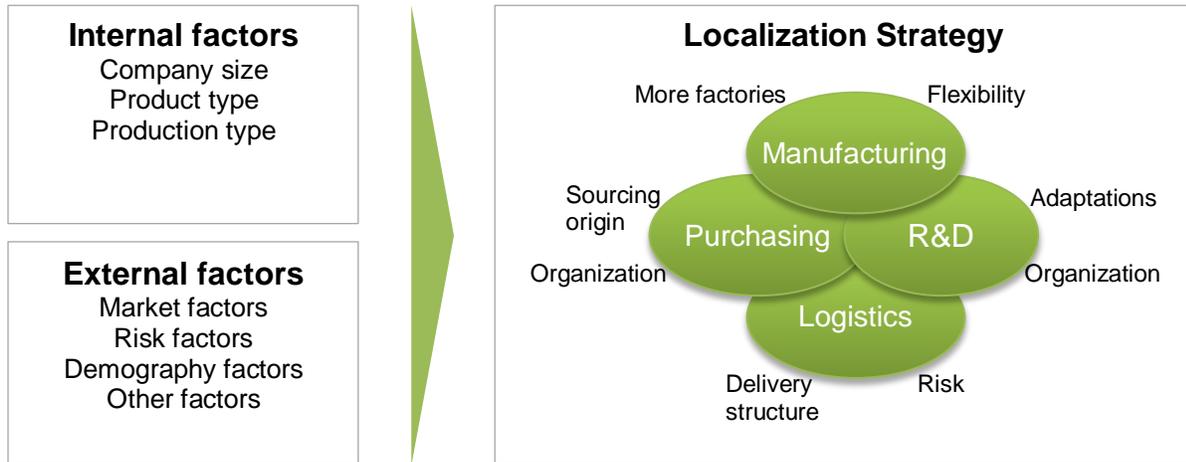


Figure 21: Conceptual model

4 Empirical Findings

This section presents all relevant findings from the data collection phase in the study. As mentioned previously, the data was gathered from a web based survey sent to Swedish AIE companies during the spring 2012. In addition to the survey, internal and external interviews were held. The internal interviews are presented mainly in the theory and method chapter, while the external interviews will be presented here and in the analysis section. The chapter starts off with data on the Internal factors, followed by the External factors and Strategies of localization.

4.1 Internal Factors

Starting this subsection, the samples from the survey and interviews is presented, including information on the respondents. This is followed by an overview of present and future market conditions of the surveyed companies. Finally, information about internal factors is presented.

4.1.1 Sample description

As mentioned in the section 2.2.3, the survey was sent to supply chain decision makers from three functions: production, purchasing and logistics. The interviews included the same functions but also participants from R&D and trade organizations. The following split between the functions was obtained:

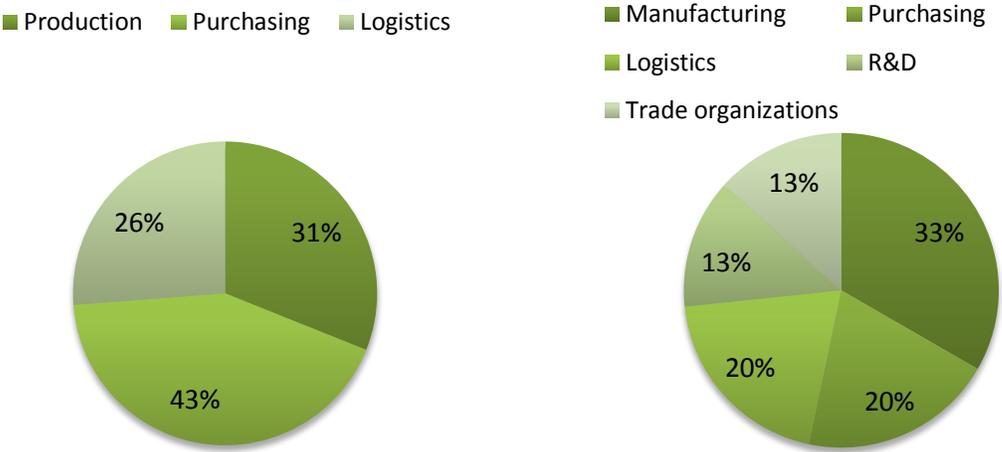


Figure 22: Position split of survey- and interview respondents (survey to the left, interviews to the right)

As seen above (to the left of Figure 22) the split between the functions in the survey is relatively even with 31, 43 and 26 percent for production, purchasing and logistics respectively. For the interviews (to the right), the main functions: manufacturing, purchasing, logistics and R&D are relatively even spread with a slight skew towards manufacturing.

To map the relevance and familiarity of localization decisions of the managers surveyed and interviewed, the respondents were asked whether they reported to a higher manager within their function or not. The point was that if the respondent did not report to any manager within its own function, he or she was more likely to take localization decisions. The following split was obtained:

■ Reporting up ■ Top level within function ■ Reporting up ■ Top level within function



Figure 23: Reporting to higher officer within function (survey to the left, interviews to the right)

As seen above (Figure 23) 56 percent of the survey respondents have answered that they do not report to any higher officer, meaning that the respondent is the highest executive within its function. The corresponding number for the interviews were 69 percent, this excludes the interviews with trade organizations.

The conclusion from Figure 22 and Figure 23 is that all respondents are in relevant functions and positions to make localization decisions and the majority are also the highest officers within their function which means that they have big influence on and are familiar with these types of decisions.

As described in section 2.5, four segments were derived based on revenue and whether the company was an OEM or not. The split between the segments are as follows (Table 12):

Table 12: Respondent segment split (survey to the left, interviews to the right)

	<30 BSEK	≥30 BSEK		<30 BSEK	≥30 BSEK
Supplier	30%	8%	Supplier	23%	15%
OEM	40%	22%	OEM	8%	54%

As seen above (Table 12), the split in the survey was relatively even with small OEMs slightly over represented and large suppliers slightly under represented. For the interview respondents, small OEMs are

represented to a smaller degree than in the survey, with eight percent share. Large OEMs are somewhat overrepresented with 54 percent. All in all, an even spread of opinions were collected with a slight underrepresentation by large suppliers.

Revenue distributions of the survey- and interview companies can be seen in *Figure 24* below.

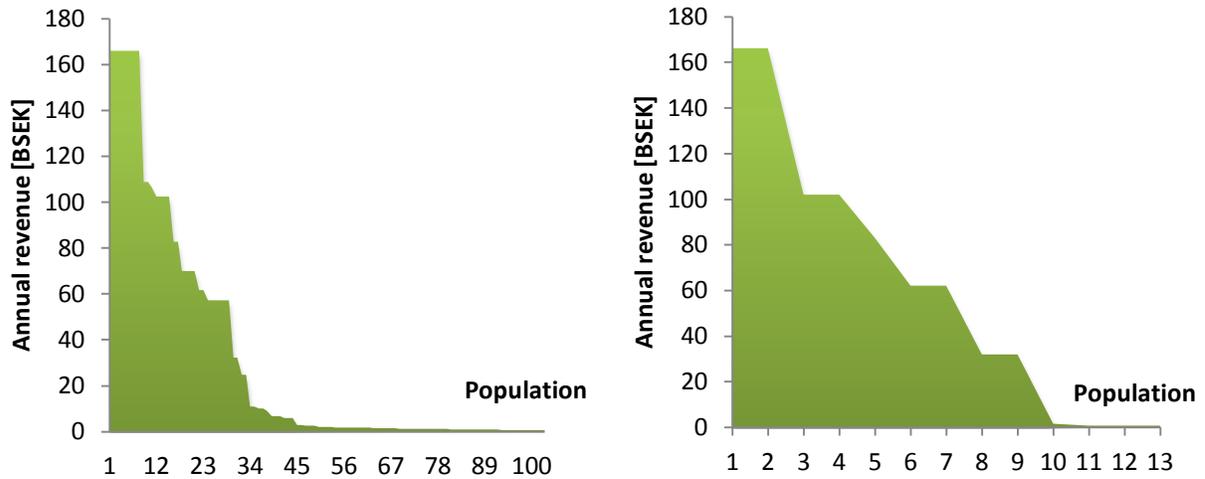


Figure 24: Revenue distribution of respondents (survey to the left, interviews to the right)

Figure 24 shows that about 2/3 of respondents in the survey consist of smaller companies while the split is approximately the opposite for the interviews (recall the 30BSEK limit).

4.1.2 Market description

The market situation for the surveyed companies was mapped to increase the understanding of the current states of the companies. Furthermore, the expected future market was mapped according to the respondents' estimations.

The companies' split between number of market regions (e.g. Asia, Europe) is presented below (*Figure 25*). The presence on a market was accounted for if the split was more than five percent.

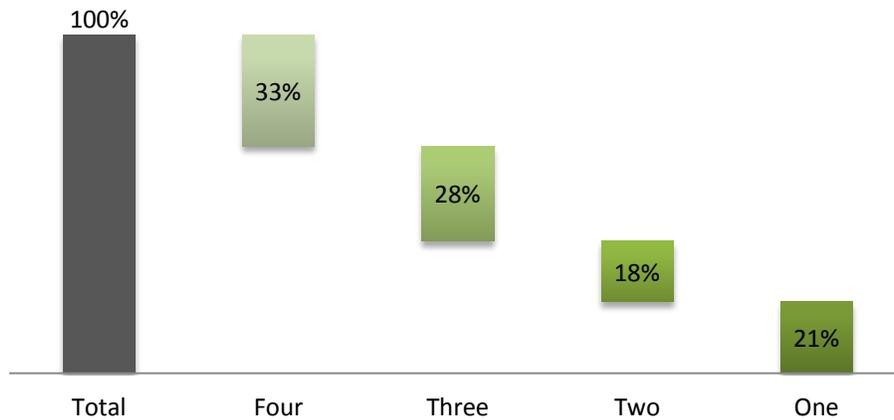


Figure 25: Number of current markets of the respondents

The spread between different numbers of markets is relatively even but with a slight skew towards more markets.

Below, the average number of markets between the segments is presented (Figure 26):

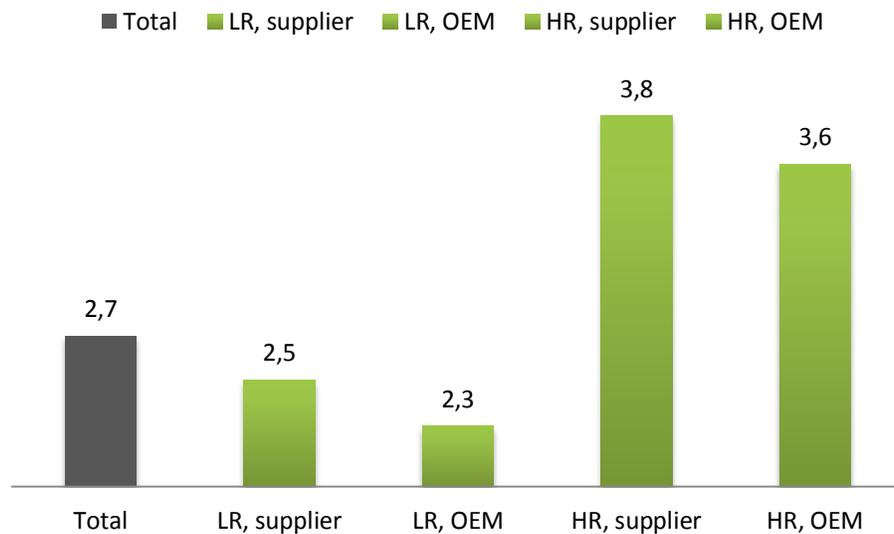


Figure 26: Average number of markets per segment

Figure 26 shows that on average, companies are present in 2.7 markets. It can also be seen that companies with higher revenue are present in more markets (99 percent significance level) than those with lower revenue. No significant difference can be seen between OEMs and suppliers.

The average global market split for the companies can be seen in Figure 27. The intervals¹⁴ are based on the alternatives from the survey. The information within the brackets corresponds to expected changes^a until 2020.

¹⁴ Intervals were 0-5%, 6-25%, 26-50% and 51-100%

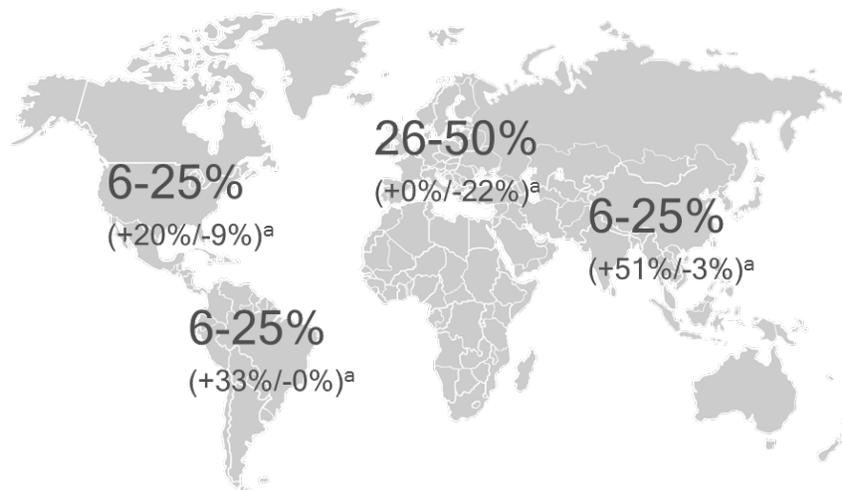


Figure 27: Present global market split and change until 2020

Europe is on average the largest market with 26-50 percent while North and South America so as Asia on average stands for 6-25 percent of companies revenue. Until 2020 major shifts will take place. 51, 33 and 20 percent will increase their presence in Asia, South America and North America respectively. The increases will mainly be taken up by decreases in Europe and North America.

The numbers are indicating a large market shift towards Asia and South America. This is highly supported by the opinions gathered in the interviews¹⁵¹⁶¹⁷¹⁸¹⁹. In addition, some products have over the years followed the GDP-development closely, one example is the truck industry²⁰²¹, which means that markets for these products are increasing around 7-9 percent annually in some parts of Asia.

The average market split by 2012 and 2020 is found in *Table 13*:

Table 13: Market split 2012 and 2020

	Asia	Europe	North America	South America
Total 2012	6-25%	26-50%	6-25%	6-25%
Total 2020	26-50%	26-50%	6-25%	6-25%

As seen above, based on the survey intervals, the average presence in Asia has moved one interval to 26-50 percent.

The percentage of companies that will go through redistribution of their market split is presented in *Figure 28* below. Redistribution is defined as moving from at least one market split interval until 2020. In

^a + corresponds to the percentage of companies that will enter or increase their market presence, - to the percentage of companies that will leave or decrease their market presence.

¹⁵ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁶ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

¹⁷ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

¹⁸ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

¹⁹ Anonymous, VP Manufacturing Company A

²⁰ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

²¹ Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

the figure it can be seen that 84 percent of the companies will re-distribute their market split. As a result, 40 percent of the companies will enter at least one new market region until 2020 (Figure 29).



Figure 28: Proportion of companies that will re-distribute their market presence



Figure 29: Proportion of companies that will enter a new market

The respondents were able to state specific new countries they wanted to enter. Preferred countries to enter were China, India and Brazil (those that received less than five responses are not included).

4.1.3 Internal factors

In this section, data gathered regarding internal factors is presented. In the cases of significantly different opinions between segments, these differences are included.

As mentioned in *section 3.2*, a company’s average product life cycle can have impacts on the inertia in localization decisions, and was therefore gathered. The results as follows (Table 14):

Table 14: Product life cycle length

	<1	1-2	3-5	6-10	>10
Total	1%	5%	23%	36%	35%

No significant difference between segments was present, but as much as 71 percent of the companies have a product life cycle of 6 years or more, with a significance level of 99 percent.

The size of the respondents' products is presented below divided into small, medium and large products (*Figure 30*):

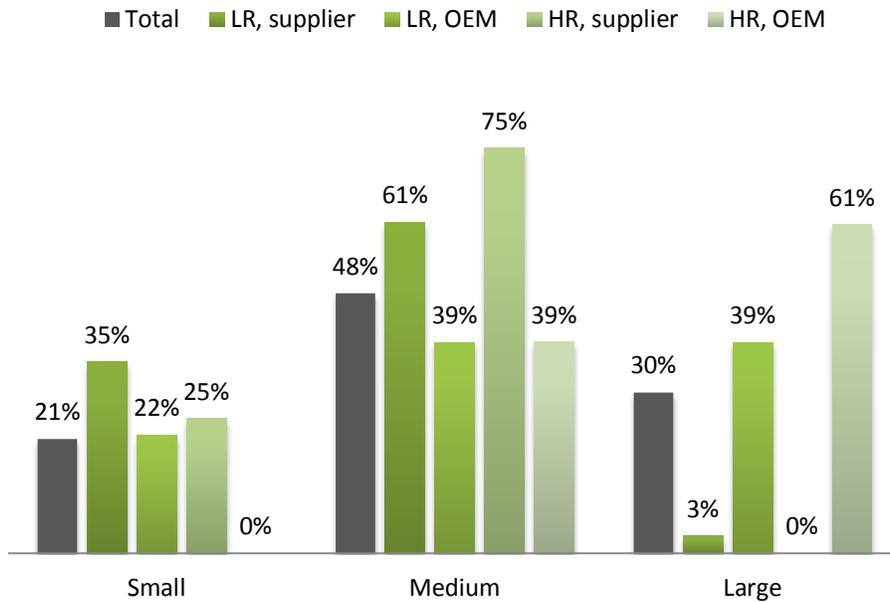


Figure 30: Physical product size

The notable difference found above (*Figure 30*) is that almost only OEMs have large products. Another is that suppliers have significantly more medium sized products than do OEMs (both at 95% significance level).

Point of departure for production is defined as the most common input for production/assembly. The input material is divided into Raw material such as steel or rubber, components such as electric motors, fasteners and rollers, and finally Modules which are systems based on many components. The distribution per input and segment are as follows (*Figure 31*):

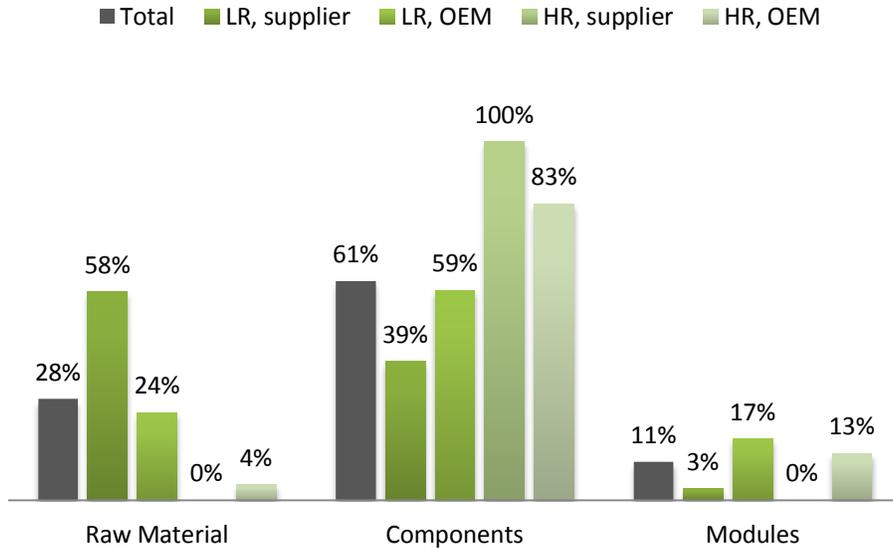


Figure 31: Point of departure for production

A significantly (99 percent level) larger proportion of Swedish AIE companies mainly use components as the basis of production compared to raw material and modules. This is true for all segments in the sample except low revenue OEMs. These instead use raw material more frequently. In the sample, high revenue companies focuses even more on components as a point of departure in the production than do low revenue companies. In addition, a smaller proportion of the Swedish AIE companies use modules as point of departure than raw material or components (99 percent significance level).

The companies competitive strategies were mapped to understand which elements Swedish AIE companies compete on, since this will influence the type of localization setup that is most appropriate. The split between the competitive strategies can be seen in *Figure 32*:

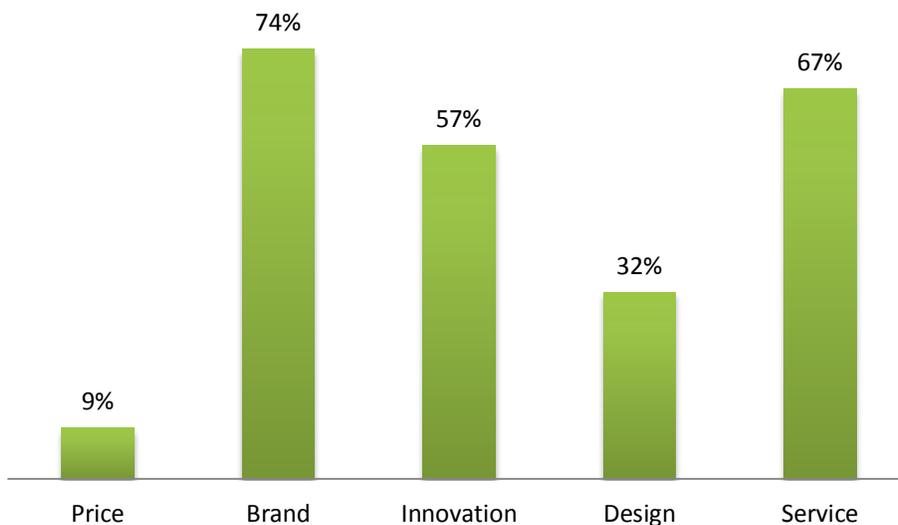


Figure 32: Competitive strategy elements used by the companies (using multiple factors possible)

It can be seen that Swedish AIE companies are not competing on price but rather on Brand, Service and Innovation (99 percent significance level). Apart from the above shown factors, high quality has been pointed out as an important aspect as well.

4.2 External Factors of Localization

This sub-section presents all relevant data gathered concerning external factors of localization. First the top factors within each driver group are presented, followed by the importance of each group of external factors and finally the overall importance of external factors as a whole is presented.

Below, the ranks of external factors within each group are presented (*Table 15*):

Table 15: External factor ranks per group

Rank	External market factors	External risk factors	External demography factors	Other external factors
1	Speed & flexibility	Supplier problems	Wage arbitrage	Ease of establishment
2	Market shift	Transportation prices	Productivity arbitrage	Local Knowledge
3	Market growth	Currency fluctuation	Competence availability	New IT solutions
4	Trade regions	Political risk		CSR
5		Natural disasters		Regional green laws
6				Global green laws

As seen in *Table 15* above, the external factors are divided into External market factors, External risk factors, External demography factors and Other external factors based on survey responses.

In addition to ranking each individual factor, the respondents were asked to state the importance of each group of external factors from one to five. The following results were obtained in total and per segment (*Figure 33*):

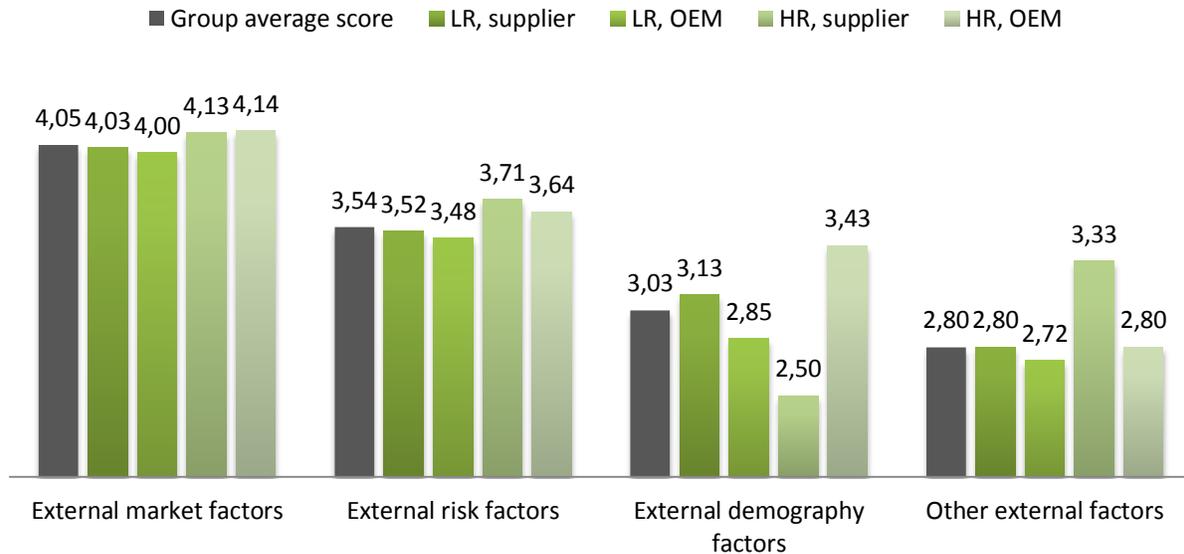


Figure 33: Importance of groups of external factors per segment

The results above indicate that external market factors are the most important group. This is proved at 99 percent significance level. Furthermore external risk factors are more important than the demography factors (99 percent significance level) which are more important than other external factors (90 percent significance level).

As for the segments, there are no differences found for the external market factors. High revenue suppliers consider risk significantly more important than do low revenue companies (90 percent level). For the external demography factors, no significant differences were found, even though the sample specific results vary quite a lot. For other external factors, significance is found between low- and high revenue OEMs (90 percent level).

In the interviews, speed and flexibility was the external factor that was emphasized²²²³²⁴²⁵²⁶²⁷ the most by the participants, the market (shift and growth) was considered the base of localization decisions²⁸²⁹³⁰³¹³², and trade regions³³³⁴³⁵³⁶³⁷ was the most discussed external factor of why plants are established in several regions.

²² Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

²³ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

²⁴ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

²⁵ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

²⁶ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

²⁷ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

²⁸ Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

²⁹ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

³⁰ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

³¹ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

³² Anonymous, VP Manufacturing Company A

³³ Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

³⁴ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

³⁵ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

When it comes to the environment and sustainability, companies in general aim for maintaining as low levels³⁸ as possible while still fulfilling the requirements set by law and the customers. This is also supported by the survey results, since green laws were ranked as least important of the “Other External Factors”.

4.3 Strategies of Localization

In this subsection, gathered data regarding localization strategies of 2020 for Swedish AIE companies is presented. The data is presented divided into the functions of interest for this study, namely: manufacturing, purchasing, logistics, R&D. Finally, the need for restructurings to meet those localization strategies is presented.

4.3.1 Manufacturing strategies of localization

The manufacturing related strategies were surveyed to production executives only, consisting of 29 managers. Areas covered are actual placement of factories, factory need, and flexibility.

Each respondent were asked how each market will be served 2020. Every respondent indicated if they thought that a particular market region would mainly be supplied by a factory within or outside that specific region and if that would be in a developed or low cost country. For each region, the number of companies that will have no presence were also mapped. The results as follows (*Table 16*):

Table 16: Placement of factories 2020 split per region

	Mostly in developed country within region	Mostly in developed country outside region	Mostly in low cost country within region	Mostly in low cost country outside region	Total ³⁹	No market	Respondents
Asia	44%	7%	48%	0%	100%	7%	29
Europe	79%	3%	17%	0%	100%	0%	29
North America	65%	19%	8%	8%	100%	7%	28
South America	42%	8%	42%	8%	100%	14%	28

The table above shows that the emphasis lies on regionalization (factory within region) and developed country (99 and 95 percent significance level respectively).

³⁶ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

³⁷ Anonymous, VP Manufacturing Company A

³⁸ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

³⁹ Excluding those with no market presence

In addition to the actual placement of factories, the respondents were asked whether they needed more factories until 2020 to meet their localization strategies. The following result was obtained (*Figure 34*):

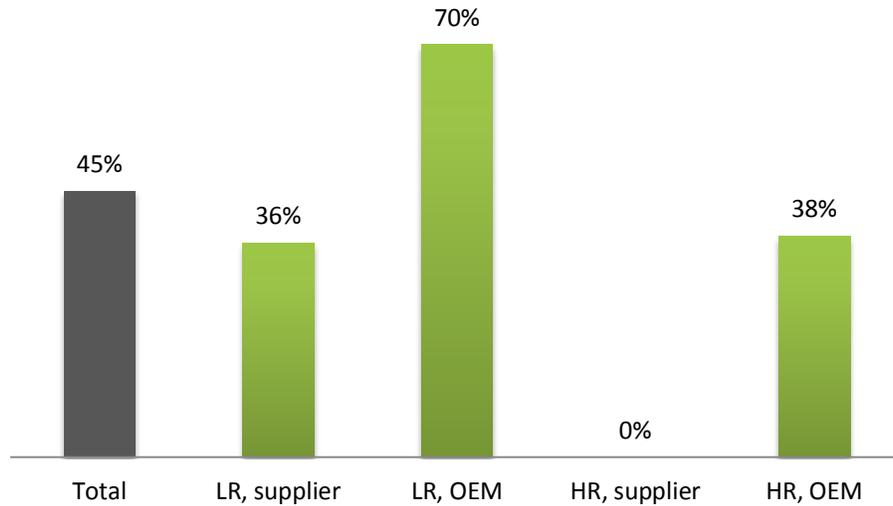


Figure 34: The amount of companies that need more factories until 2020

45 percent of the surveyed companies want to establish new factories until 2020. The significance of 28 percent supports the fact that close to half of Swedish AIE companies want to build more factories until 2020. The small OEMs are the most positive of establishing new factories with 70 percent in favor of doing so (90 percent significance level). There is no significant difference neither between high and low revenue companies nor OEMs and suppliers.

The respondents stated whether they were currently able to move the manufacturing of products between facilities or not. The results can be seen below (*Figure 35*):



Figure 35: Current ability to move production between manufacturing facilities

66 percent of the companies in the sample states that they today can move production between different manufacturing facilities. According to interview respondents, assembly is relatively easy to move between different facilities^{40,41,42}. It is however often harder to move component manufacturing due to a

⁴⁰ Niklas Broberg, VP Manufacturing & Logistics Husqvarna, Interviewed 3rd of April 2012

⁴¹ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

⁴² Anonymous, VP Manufacturing Company A

higher investment need, e.g. tooling costs^{43,44}. For Volvo cars it is especially true regarding the movement of stamping⁴⁵.

As stated in *section 4.2*, speed and flexibility was considered the most important external factor of localization. Each production executive was asked whether their company would aim for more flexible manufacturing facilities until 2020 for an increased ability to move production between production units. The following results per segment were obtained (*Figure 36*):

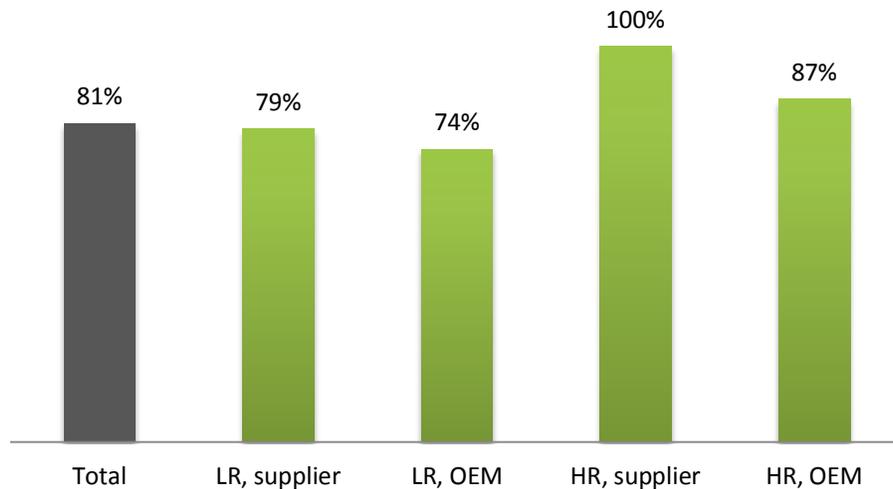


Figure 36: The amount of companies that will aim for more flexible production facilities for the movement of production until 2020

At 99 percent significance level, companies will aim at more flexible production units. As for the difference between segments, there was a significant difference between low revenue OEMs and suppliers (90 percent level). For the other segments, no differences⁴⁶ were found.

4.3.2 Purchasing organization- & supplier base localization strategies

In this subsection, data gathered concerning the supplier base and the purchasing organization localization strategies of 2020 is presented. Firstly, localization of the supplier base for items of high- and low-strategic importance will be presented. Secondly, the level of centralization of purchasing organization will be shown. Thirdly, placement of the centralized and decentralized organization will be presented.

Each purchasing manager was asked how they would like their supplier base to be designed for each region with a factory. This included whether sourcing would mainly be conducted from within or outside the region, and whether items would be sourced from a developed- or low cost country. Two questions were asked, one for items of high strategic importance and one for items of low strategic importance.

⁴³ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

⁴⁴ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁴⁵ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁴⁶ Segment 3 included too few responses to be compared to the remaining segments

For high strategic importance items, the following supplier base structure for 2020 was obtained (*Table 17*):

Table 17: Localization of the supplier base for items of high strategic importance based on factory locations 2020

	Mostly in developed country within region	Mostly in developed country outside region	Mostly in low cost country within region	Mostly in low cost country outside region	Total	No production	Respondents
Asia	34%	14%	46%	6%	100%	10%	39
Europe	46%	10%	38%	5%	100%	0%	39
North America	46%	21%	25%	7%	100%	28%	39
South America	52%	12%	36%	0%	100%	36%	39

It can be seen above that focus will on regional sourcing (sourcing from within region). This was found with a 99 percent significance level. However, no significance was found between developed- and low cost countries. In addition to information on the supplier base, note that this table also indicates in which regions the purchase manager expect to have factories 2020 (see the column named No production).

The corresponding data for low strategic importance items are shown below (*Table 18*):

Table 18: Localization of the supplier base for items of low strategic importance based on factory locations 2020

	Mostly in developed country within region	Mostly in developed country outside region	Mostly in low cost country within region	Mostly in low cost country outside region	Total	No production	Respondents
Asia	16%	0%	70%	14%	100%	5%	39
Europe	19%	0%	54%	27%	100%	5%	39
North America	20%	4%	48%	28%	100%	36%	39
South America	19%	4%	62%	15%	100%	33%	39

In this table (*Table 18*), it can be seen that focus is on regional sourcing for items of low strategic importance as well (99 percent significance level). Furthermore, companies believe they will source those articles mainly from low cost countries (95 percent significance level).

Production executives were also asked on the overall design on the supplier base (*Figure 37*). The question was whether sourcing to their factories in each region primarily should be from within or outside of the region. The question was asked to be able to connect expected factory structure to expected supplier base structure. Observe that they were not asked about whether to source from a developed or low cost country nor if there were any difference between high- and low strategic importance items.



Figure 37: Regional sourcing (by production executives)

Significantly more production executives think that the supplier base should mainly be regional 2020 (99 percent significance level). There were no differences between segments (90 percent significance level).

Going back to subjects aimed at purchasing managers, a topic covered was the level of centralization of the purchase organization for strategic work. The following distribution ranging from centralized to decentralized was obtained (*Figure 38*):

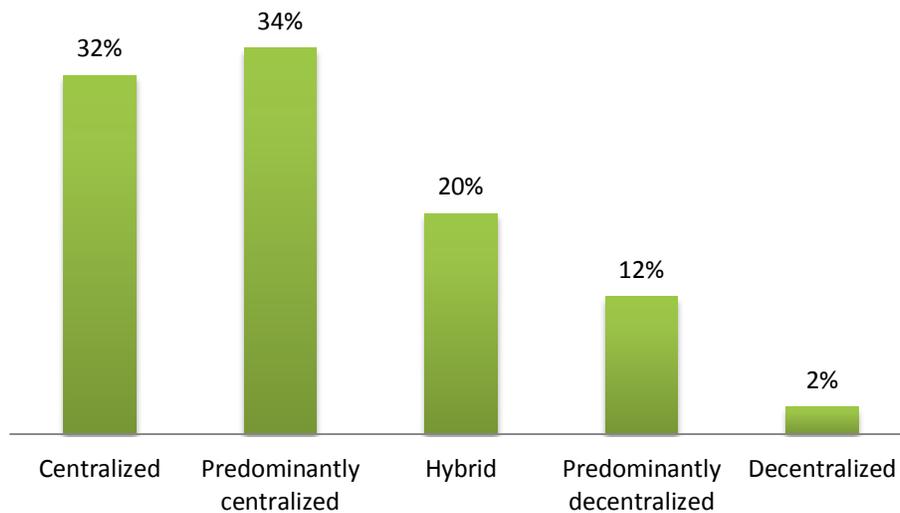


Figure 38: Level of centralization of purchase organization

The average answer obtained was predominantly centralized, and no differences were found between segments (90 percent significance level).

The closeness of the central purchasing organization compared to headquarters, the supplier base, the market and the production was mapped (*Figure 39*). Each respondent could answer to one alternative only.

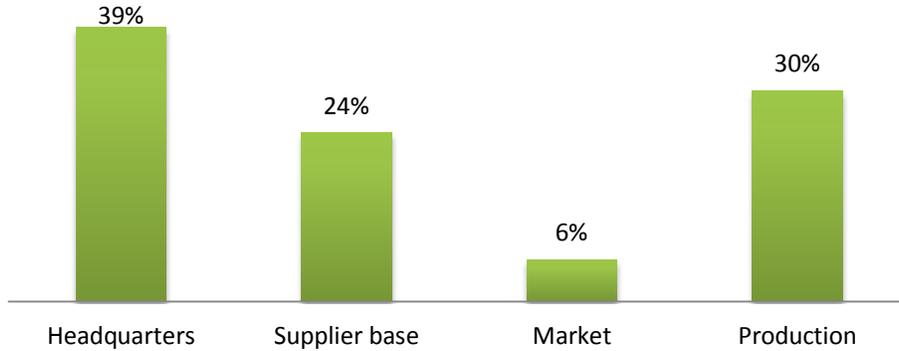


Figure 39: Placement of central purchasing organization

There are no differences between the segments. However, the importance of placing the central purchasing organization close to the headquarters is significantly higher than close to the market (99 percent significance level), so as production versus market (95 percent significance level). The closeness to the supplier base is more important at 89 percent significance level than is closeness to market. No significant differences between headquarters, supplier base and production were found.

4.3.3 Logistics organization & activities structure

In this subsection, all relevant data gathered regarding logistics is presented. It starts off with distribution setup per region, followed by outsourcing, ways of meeting flexibility and speed requirements and ends with risk identification and mitigation strategies.

The respondents were asked to state how they mainly reach their customer in every region. Options were through direct delivery, regional and central (global) warehouse (*Table 19*).

Table 19: Distribution setup per region 2020

	Direct delivery	Through regional WH (only supplying own region)	Through global WH (supplying more than own region)	Total	No market	Respondents
Asia	44%	32%	24%	100%	7%	27
Europe	56%	19%	26%	100%	0%	27
North America	35%	52%	13%	100%	12%	26
South America	27%	50%	23%	100%	15%	26

Europe uses more direct delivery than do North America (95 percent significance level) and South America (99 percent significance level). For regional warehouse setups, North America's level is higher than Europe's (90 percent significance level). No significances were found between OEMs and suppliers.

A summary of the average delivery structure of Swedish AIE companies comprising of direct deliveries as well as supply through regional and central warehouse can be seen in *Figure 40* below:

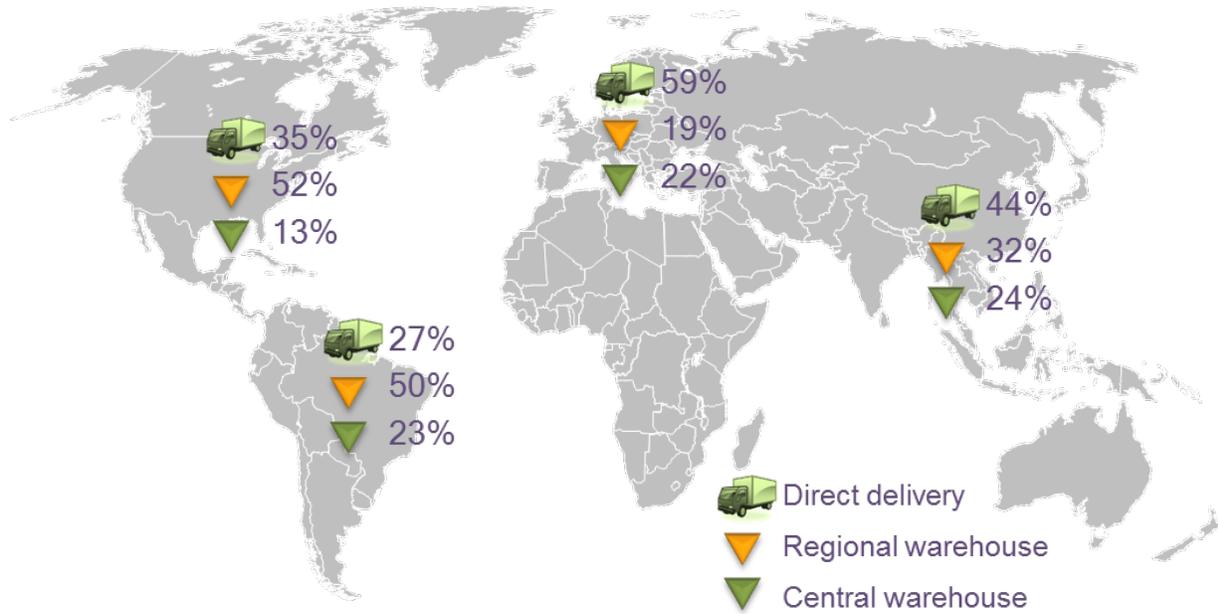


Figure 40: Delivery supply structure 2020

Today many companies outsource a large chunk of their operations to external actors, as mentioned in the theoretical framework. Outsourcing has major effects on many dimensions such as risk and cost, and it was therefore of interest to see which activities companies want to outsource until 2020. Respondents were asked whether they liked to outsource transportation, customs handling, warehousing, collection of customer data, sales or if nothing were to be outsourced. As mentioned in *section 3.4.3*, the outsourcing of activities such as production, purchasing or similar is not included in this study.

The results as follows (*Figure 41*):

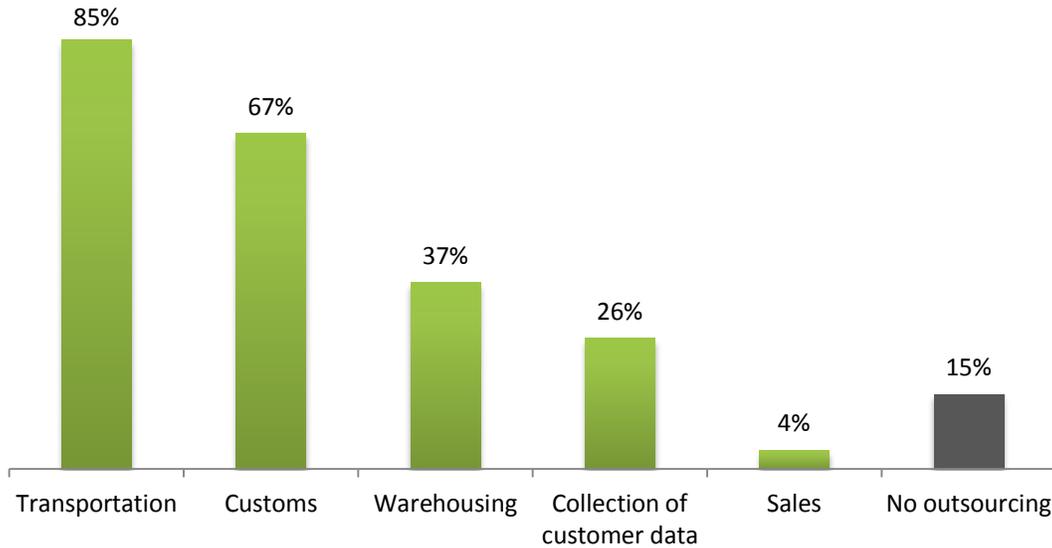


Figure 41: Outsourced activities 2020

Transportation is the activity that most companies will outsource 2020 (90 percent significance level). Sales is the significantly smallest (90 percent level). Interestingly, 26 percent of the companies within the sample want help from external actors to collect customer data.

As pointed out both in *section 3.3.1* and *section 3.4.3*, flexibility and speed is considered the most important factor of localization and is on top of managers' minds. The respondents from logistics were asked if, in addition to regionalizing, any of building inventories close to customers, postponing assembly, using faster freight modes or coordinating better with suppliers and distributors were possible solutions to meet the flexibility requirements. The following results were obtained (*Figure 42*):

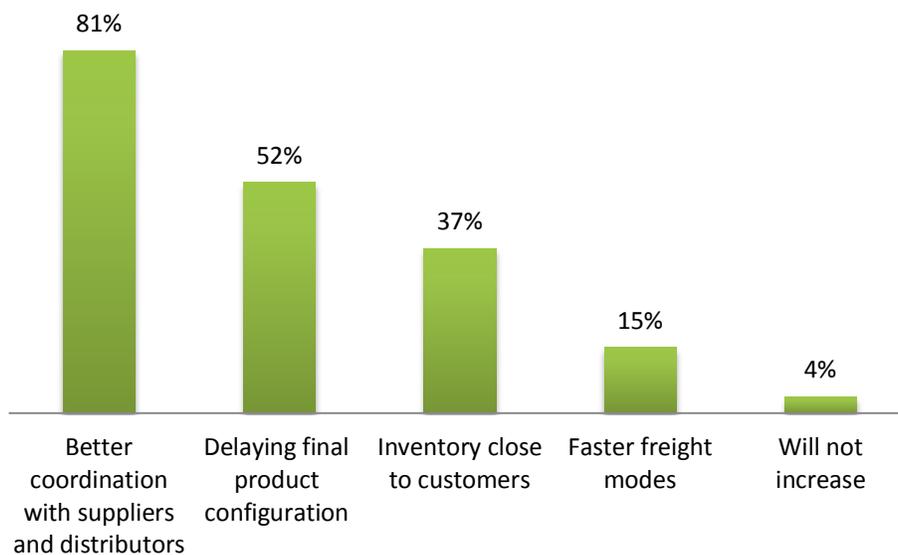


Figure 42: Methods to meet higher demands on flexibility & speed

96 percent believes that the customer demands for fast and flexible transport will increase. In addition to regionalizing, companies favor better coordination with supply chain members to meet increasing demands (90 percent significance level). Only 15 percent of the respondents believe that faster modes of transportation is a solution (95 percent significance level). 100 percent believe that they will be able to meet the increasing demand.

Another subject identified as important for localization in the theoretical framework (*section 3.3.2*) was risk. Global companies are more exposed to risk compared to local or regional ones⁴⁷. The logistics managers were asked which methods they considered to be feasible to mitigate risks (*Figure 43*):



Figure 43: Risk mitigation strategies

The two top scoring factors, dispersed production and supplier base, are significantly more important than the other external factors (95 percent level). The bottom two factors, forward buying and building inventory are significantly smaller than all other factors except the use of contingent suppliers and formal risk teams, which is probably explained by the fact that there were few respondents in those groups. Interestingly, 100 percent of the companies will actively work with risk.

4.3.4 R&D localization strategies

In this subsection, all relevant data gathered regarding research and development is presented. The product offering is first presented followed by the placement of the R&D organization, including data on requirements on closeness to other functions.

The way in which products are offered to customers will put high demands on localization decisions. As pointed out in *section 3.2*, more than ever, customers require products adapted to their needs. The product offering of the sample companies were divided into “same in all regions”, “same base but adapted” and “unique per market”. The results as follows (*Figure 44*):

⁴⁷ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

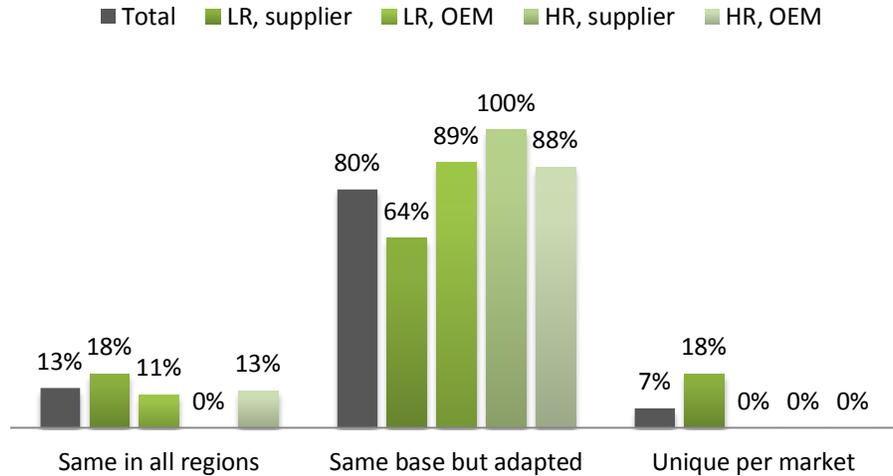


Figure 44: Product offering 2012

The degree to which products are adapted to market needs or completely different products are used varies between the segments. As can be seen above, OEMs do more adaptations locally than do suppliers (99 percent significance level). Suppliers have to a higher degree the same product offering in all regions (99 percent significance level). Overall 81 percent adapt to some extent or provide unique product offerings to the different markets (99 percent significance level). In addition to offering various functionality to the different customer markets, differentiating material specifications can have impact on both performance and price, which facilitates the fulfilling of customers' needs. By defining lower material specifications for some markets the price can be reduced^{48,49}.

For the automotive industry, including both cars and trucks, customer and market unique products are used^{50,51,52} and as a consequence, the companies are able to make more money and increase their margins^{53,54}. Supplier companies are to an increasing extent facing customer unique products^{55,56} and JIT requirements⁵⁷. As a way to capture more market share and to avoid over-specification and unnecessarily expensive products, many companies (OEMs and suppliers) are-, or are aiming at adapting their specifications^{58,59} to different markets. An alternative solution used by Husqvarna is to use older models in developing markets instead of adapting the products⁶⁰.

⁴⁸ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

⁴⁹ Anonymous, VP Manufacturing Company A

⁵⁰ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁵¹ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

⁵² Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

⁵³ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁵⁴ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

⁵⁵ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

⁵⁶ Peter Cedergårdh, Supply Chain Manager SKF, Interviewed 16th of April 2012

⁵⁷ Peter Cedergårdh, Supply Chain Manager SKF, Interviewed 16th of April 2012

⁵⁸ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

⁵⁹ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

⁶⁰ Niklas Broberg, VP Manufacturing & Logistics Husqvarna, Interviewed 3rd of April 2012

The same question asked to manufacturing executives regarding their product offering 2012 was also asked for 2020. The results for the future differed somewhat from those of 2012 (*Figure 45*):

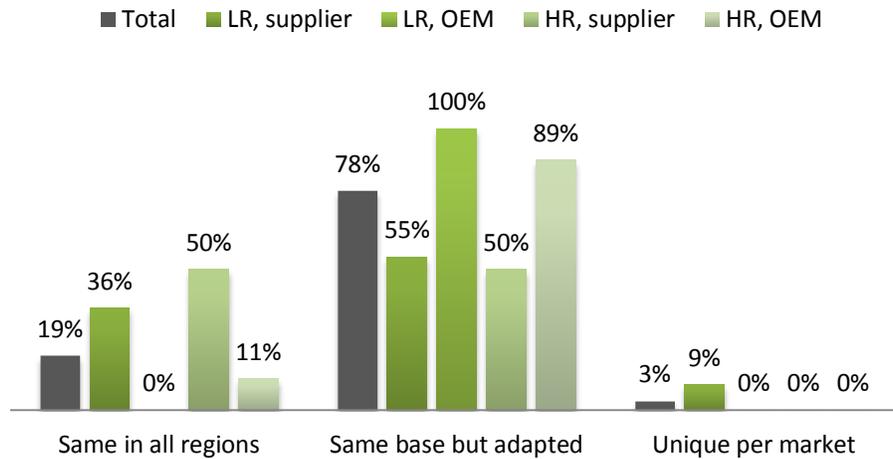


Figure 45: Product offering 2020

87 percent of the respondents think that products should be regionally adjusted or totally different for each market (99 percent significance level). It is important to be able to adapt to customers' different needs in different markets⁶¹⁶²⁶³⁶⁴⁶⁵. There is no significant difference between the segments.

Both the manufacturing executives and purchasing managers were asked if they thought that the R&D organization should be put in a developed or low cost country and whether it would be centralized, regionalized or a combination of the two (hybrid). The following was obtained (*Figure 46*):

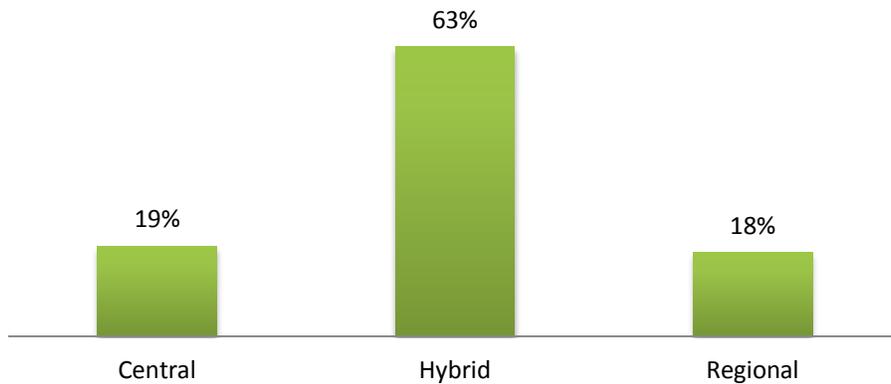


Figure 46: R&D placement 2020

⁶¹ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁶² Peter Cedergårdh, Supply Chain Manager SKF, Interviewed 16th of April 2012

⁶³ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

⁶⁴ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

⁶⁵ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

Zero percent wanted to have any R&D in a low cost country, why it is not visualized in the chart. 81 percent of the companies will be active in all regions (99 percent level), meaning that either all or parts of the R&D work is conducted regionally. Turning it around, 82 percent of the companies will have either a complete central or combined central and regional setup. The development of core functionality of the product is beneficial to conduct centrally since most of these parts are hidden from view and will therefore not be noticed by customers. Synergies between similar products can also be leveraged⁶⁶⁶⁷.

In addition to placing the organization either in a central, hybrid or regional setup, or in a developed or low cost country, the importance of the proximity to various functions were mapped. The respondents were asked how important they considered the closeness of the R&D organization to the production, market, supplier base and the headquarters to be (*Figure 47*):

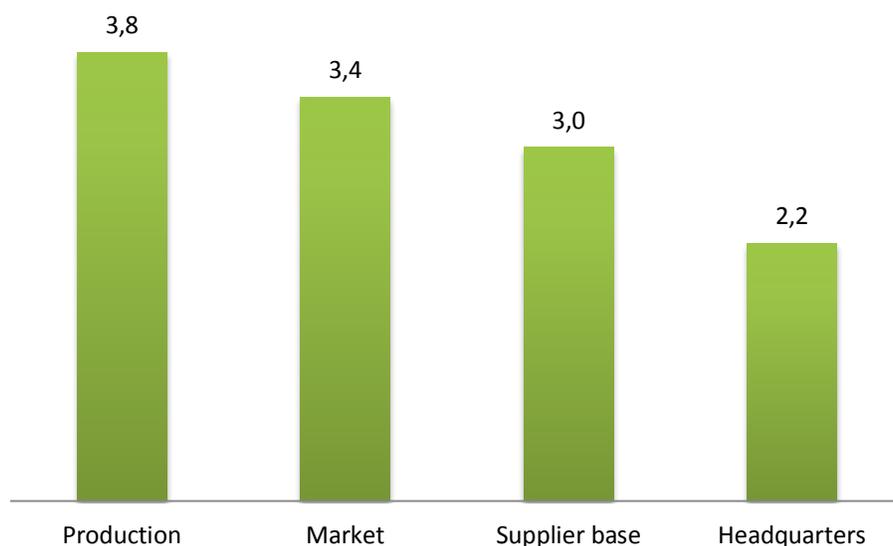


Figure 47: R&D closeness to production, market, supplier base and headquarters respectively

As seen above, when determining where to localize the R&D function, the localization of production facilities and market is considered to be the most important factors by the surveyed companies. Headquarters are considered to be the least important to localize R&D close to (99 percent significance level). No significant differences were found between the segments.

By localizing close to production the ease of implementing new products can be increased⁶⁸. Having R&D capabilities close to market allows for easy and flexible adaptation to customers' needs⁶⁹⁷⁰⁷¹. By having R&D close to the supplier base joint efforts to develop products can be used to increase the mutual competence and to lower the manufacturing price⁷²⁷³.

⁶⁶ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

⁶⁷ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

⁶⁸ Anonymous, VP Manufacturing Company A

⁶⁹ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

⁷⁰ Anonymous, VP Manufacturing Company A

⁷¹ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

⁷² Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

4.3.5 Restructurings needed to meet 2020 localization goals

Each survey respondent was asked how much restructurings were needed on a scale from 1-5 to reach their future localization strategy goals. This was mapped to try to understand not only how much that companies have to go through to meet their goals, but also to get a sense of their present state.

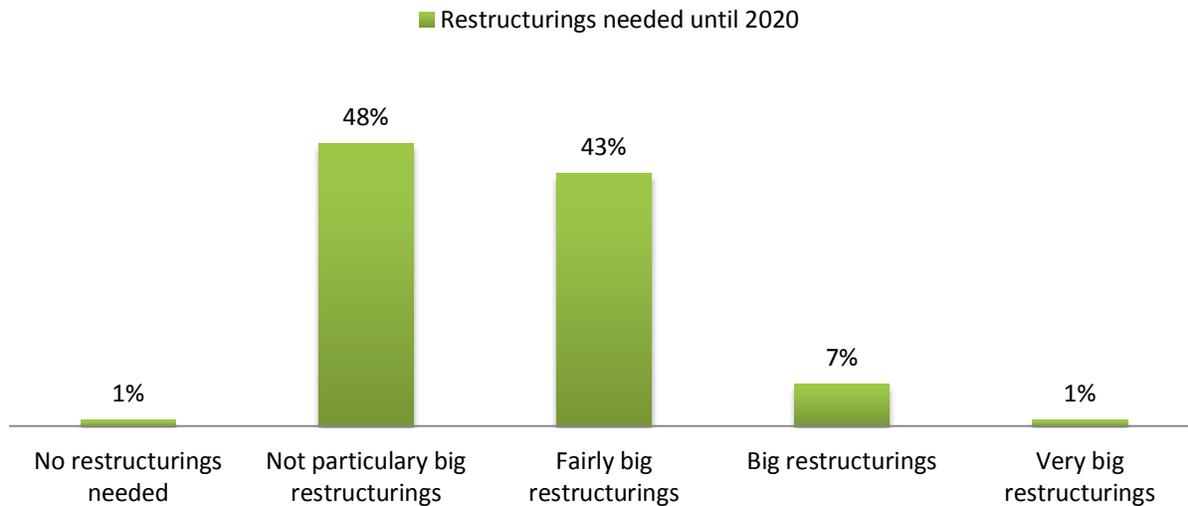


Figure 48: The amount of restructurings needed to reach localization goals until 2020

As seen in *Figure 48*, a peak is found between two and three leaving an average of 2.59.

⁷³ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

5 Analysis & Discussion

In this section the empirical findings from the survey and interviews are combined and analyzed with the theory from the theoretical framework. The chapter starts off with discussions regarding the sample and internal factors followed by the external factors. It wraps up with discussion regarding localization strategies and recommendations.

5.1 Internal Factors

This subsection presents all analysis regarding the sample and the internal factors of the surveyed and interviewed companies. It starts with outlining the present and future company specific market of Swedish AIE companies followed by the analysis of internal factors.

5.1.1 Company specific market

The importance of Asia and South America will increase drastically until 2020. 51 and 33 percent of the current players in Asia and South America respectively will increase their market split in these regions (99 percent significance level; *see Figure 27*). This can be done either by expanding their current market presence or by entering the market from scratch. North America's importance is increasing (90 percent significance level) somewhat while Europe's importance is reduced (99 percent significance level).

The market shift which was outlined in *section 1.1* does thus affect Swedish AIE companies. Market shift was also determined to be one of the most important external factors which to a high degree affect Swedish AIE companies in their localization decisions. In *Figure 28* and *Figure 29* these changes can also be seen. Swedish companies are in Asia and South America considered to be premium brands⁷⁴. One of the key things that Swedish companies are competing on is service (*see Figure 32*) and it is therefore important to be present on a market to be able to deliver the required levels⁷⁵. One example is Asia where it is important to be present due to the fact that the relationship focus there makes it very hard to compete with local companies when not present in the market⁷⁶. The most preferred countries to enter are China, India and Brazil, all of which have a considerable market growth (CIA, 2012).

5.1.2 Internal factors

The internal factors discussed below are product size and point of departure, both analyzed versus regionalization. Further, the amount of current adaptations is analyzed as well as the development of those until 2020. The entire sample is used as basis for the analysis in all but the last part, where only the production executives' opinions are used.

The most important internal factors in terms of localization were those chosen as segmentation parameters (*see section 2.5*). It was found that the size of the company in terms of revenue as well as the position in the supply chain (OEM or not) affected localization the most. For further analysis and methodology regarding the segmentation process and the most important internal factors, refer to *section 2.5 and 5.3* respectively.

The amount of companies that aims to use a Regional Supply Chain Hub based on product size is outlined in *Figure 49* below.

⁷⁴ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

⁷⁵ Anonymous, VP Manufacturing Company A

⁷⁶ Manik Karn, Head of Deli Operations Swedish Trade Council, Interviewed 21st of March 2012

⁷⁷ Srikant Illuri, Executive director & country head Invest Sweden, Interviewed 21st of March 2012

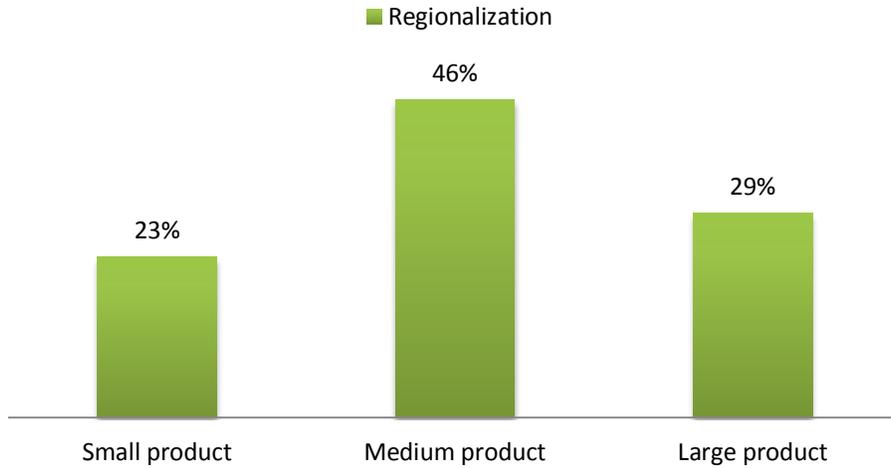


Figure 49: The proportion of companies aspiring for regionalization per product size

Companies with medium sized products are going to be significantly (99 percent level) more regionalized than companies with small or large products. There are however no significant difference between companies with small and large products. A reason for the difference between small and medium products could be that small products are easier and less expensive to transport around the world⁷⁸. OEMs within the automotive industry are examples of companies that have products that fall into the large product category. For them the heavy investments required into tooling sometimes prevents a completely regionalized supply chain setup^{79,80}. The fact that companies with smaller products have less focus on regionalization is in line with the theory presented in *section 3.2*.

⁷⁸ Anonymous, VP Manufacturing Company A

⁷⁹ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

⁸⁰ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

For some companies the cost associated with duplicating factories depends on the basis of production. This can be due to different tooling costs depending on whether raw material or components are used. *Figure 50* shows the proportion of companies that are aiming to be completely regionalized by 2020, split by basis of production.

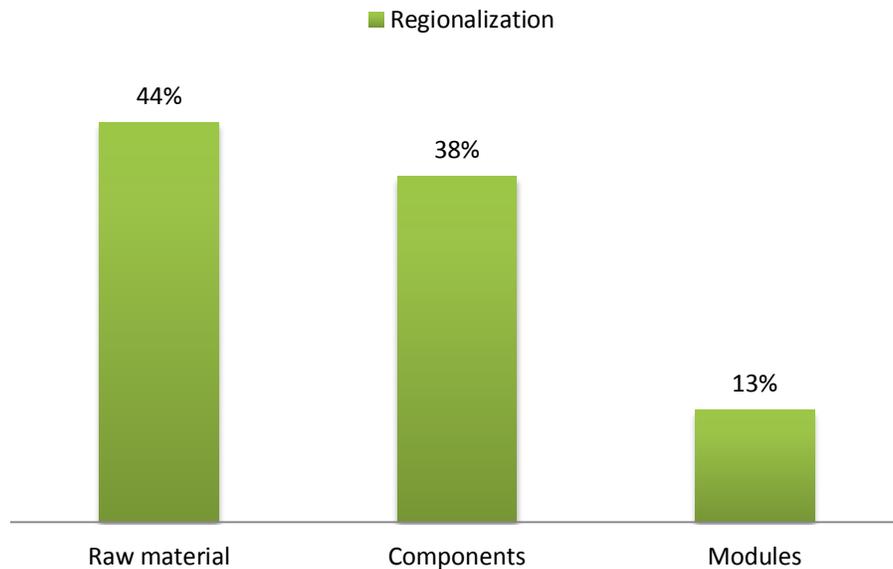


Figure 50: Point of departure vs. regionalization

As was seen in *section 4.1.2* the point of departure that is most commonly used is components followed by raw material and finally modules. In *Figure 50* the degree of regionalization for companies using the above factors as point of departure is shown. Due to modules having to few respondents it is not possible to do statistical tests on them. There are no significant differences between raw material and components. The conclusion is that point of departure does not affect ability to regionalize. The impact of modules is however unclear.

5.1.3 Summary of findings

The internal factors were identified as one of the inputs for a localization factory (*Figure 21*). In addition to the segmentation procedures outlined in *section 2.5*, the company specific market stands out in terms of importance for localization. Market was identified as the starting point of localization decisions. The importance of market was further highlighted when it was shown that a large proportion of the companies will change their market presence significantly until 2020. Emphasize was primarily on Asia and South America with China, India and Brazil being the most preferred countries to enter.

5.2 External Factors of Localization

The first research question of the thesis was: *What external factors affect supply chain localization decisions and which are most important?* In this section the answer to that question will be discussed and derived. First an overview is provided after which each group of external factors will be analyzed further. Focus is on the most important external factors.

The importance of each external factor of localization and the differences between them are outlined in *Figure 51* below. The external factors are sorted according to their importance as stated by the respondents in the survey (for the rank calculation, refer to *Appendix A*). Speed and flexible deliveries was the highest scoring factors and was thus given the 100 percent level while natural disasters scored the lowest and was therefore given the lowest score of 0 percent. All other external factors were given a score in between, according to their importance.

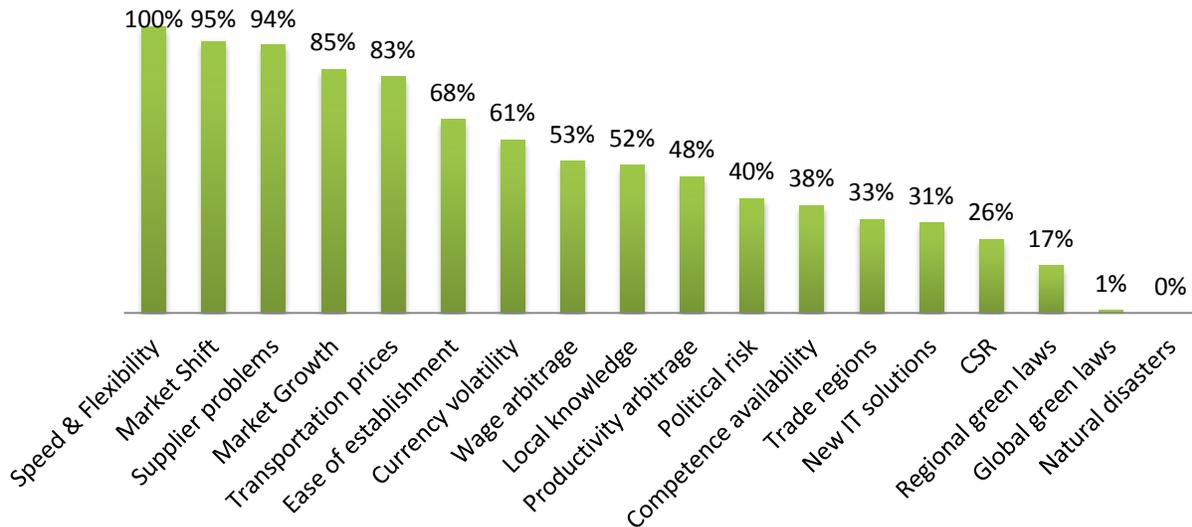


Figure 51: The importance of each external factor, ranked from most important (100 percent) to least important (0 percent)

Factor number five, i.e. increasing transportation prices, is significantly higher than factor number six, i.e. ease of establishing new factories/supplier relations (90 percent level). It can thus be said that the top five factors are significantly more important than the remaining ones.

The top five external factors are the most important in three out of four segments. The only exception is high revenue suppliers, where three out of five top factors are the top factors for the entire sample as well (*see appendix D*). There is thus an agreement between the segments regarding what external factors that are the most important for localization.

5.2.1 External market factors

The external market factors were the most important group, which can be seen in *Figure 33* (99 percent significance level). The most important factors were fast and flexible deliveries and the growth and shift of the market.

Fast and flexible deliveries are especially important for premium brands that compete on service^{81,82}. As was seen in *section 4.2*, Swedish AIE companies fall into that segment. This is the reason why it also was the highest scoring external factor as well. As was seen in *section 4.2*, fast and flexible deliveries was the most discussed external factor in the interviews. The demands from customers are increasing and in order to achieve faster and more flexible deliveries it is important to reduce the distances, both inbound and

⁸¹ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

⁸² Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

outbound⁸³⁸⁴⁸⁵⁸⁶ (Christopher, 2011; Lumsden, 2007). By using a regional factory- and supplier base setup these distances can be reduced and customer demands can to a higher extent be met.

The growth and shift of the market in each region is very important. A larger overall market means increased opportunities for economies of scale in all four studied functions. When volumes increase, factories that were previously unprofitable to build becomes profitable. For purchasing, an increased opportunity to source regionally is possible when volumes increase, because a sufficient bargaining power can be reached within each region. The benefits are even higher when trade barriers are high⁸⁷ (van Weele, 2010). The same logic is of course true for R&D as well where increased volume means that new R&D adaptation center may be profitable to open up⁸⁸.

Trade regions are considered to be one of the most important external factors of localization by the interviewees⁸⁹⁹⁰⁹¹⁹²⁹³, this view is however not shared for the surveyed sample. Big trade regions such as ASEAN and EU have increased in size over the past decades (ASEAN, 2012; European Union, 2012). In addition to this, trade agreements between the regions and other big players are being implemented. As an example, the ASEAN-China trade agreement started after years of discussion in January 2010 (ASEAN, 2012). The overall implication is that bigger markets can be reached today than yesterday by being present in the same trade region. It is thereby easier to pass the threshold of economies of scale within a region and the incentive to be regionalized should therefore increase. In addition to bigger market this is due to increasing costs advantage for regionalized companies.

5.2.2 External risk factors

The external risk factors are the second most important group of external factors (99 percent significance level) with supplier problems and transportation prices as the most important factors. High revenue suppliers consider external risk factors to be significantly more important than do the other segments (90, 90, 89 percent significance level respectively). A possible reason is that big companies have a higher risk exposure due to them having more markets and more facilities. It could also be that suppliers have higher demands from their customers in terms of delivery reliability wherefore they consider possible disruptions to be more important than do OEMs.

As was seen in *section 3.3.2*, supplier problems can range from issues with product quality to on time delivery. Problems with suppliers are the most important external risk factors identified in the survey and one of the most important external factors overall. If a supplier's operations break down and single sourcing is used, then the problems can be severe, leading to a complete stop in production.

⁸³ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

⁸⁴ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

⁸⁵ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

⁸⁶ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

⁸⁷ Mikael Davidsson, Senior Manager Accenture, Interviewed 9th of February 2012

⁸⁸ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

⁸⁹ Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

⁹⁰ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

⁹¹ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

⁹² Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

⁹³ Anonymous, VP Manufacturing Company A

The importance of transportation prices depends on the characteristics of the product. Bigger and heavier products are more expensive to transport and are therefore affected to a higher degree from an increase in transportation prices⁹⁴. Cheaper products are also affected more by transportation price than are expensive products. This is due to the fact that cost of moving the product is a bigger part of the product's total cost. Transportation prices drive regionalization more for companies with big and cheap products than for companies with small and expensive products. This is in line with the findings presented in *Figure 49*.

5.2.3 External demography factors

The external demography related factors were the third most important external factor group (90 percent significance level), which can be seen in *Figure 33*. OEMs find external demography factors to be significantly more important than do suppliers. A reason for this could be that the labor intensity of the production is higher for OEMs which often use more assembly compared to components manufacturing than do suppliers.

Wage and productivity arbitrage are only considered to be of average importance, scoring 53 and 48 percent of the most important external factor respectively. This is interesting considering the fact that a lot of outsourcing to low cost countries were in the past, and sometime still is, motivated by cost benefits, e.g. the combination between wage and productivity differences (Fredriksson & Jonsson, 2009). The importance of wage arbitrage depends on how labor intense the production is⁹⁵. Naturally, in industries which require heavy investments in the machine park, the benefit of a large wage arbitrage is more limited than in a labor intense company. On the other hand, the importance is in line with the study presented by BCG, who believes that the wage arbitrage will soon be diminished (The Economist, 2009). Also, the wages vary extensively between local areas in some countries. For example in China, some heavily industrialized areas such as Shanghai have now a couple of multiples higher wages than areas in western China⁹⁶.

The availability of competence affects the localization decision, especially for the R&D function where highly educated people are needed in most positions⁹⁷. The preparatory training that is required can differ widely between different regions and countries. It takes much longer to train a low cost country worker than a western worker, both depending on knowledge level but also cultural aspects and ability to conduct independent work⁹⁸⁹⁹. There are however more engineers available in low cost countries than in developed ones, and a Swedish company is generally an attractive employer¹⁰⁰. Metso Paper is an example of a company which often considers it easier to find competence abroad than in Sweden. They believe this is due to the fact that few students study programs related to the paper business in Sweden compared to Asia where lots of engineers receive their degree each year. SKF instead points out that in many places they have problems with getting an acceptable competence level of the employees. Many are applying, but the problems mentioned above ensure that few that meet the requirements.

⁹⁴ Anonymous, VP Manufacturing Company A

⁹⁵ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

⁹⁶ Johan Karlberg, Senior Executive Accenture, Interviewed 9th of February 2012

⁹⁷ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

⁹⁸ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

⁹⁹ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹⁰⁰ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

5.2.4 Other external factors

Other external factors was the least important group (90 percent significance level) with an average score of 2.8 out of 5 (*see Figure 33*). High revenue companies find the “Other external factors” group to be significantly more important for localization than do companies with low revenue. High revenue companies are present in more markets and they may therefore have done more establishments and do thus know possible problems that may arise. Therefore factors such as ease of establishments and local knowledge should be considered very important.

The ease of establishing factories and supplier base is considered to be the most important external factor in the “Other external factors” group. As was seen in *section 3.3.4*, it includes factors such as getting permits and enforcing contracts. This will of course affect the cost and time of setting up a new factory or establishing a new supplier base. In countries with low score on ease of doing business, but which still is attractive to enter, the use of a firm specialized in setting up new operations in that country can be very beneficial in terms of cost and time spent¹⁰¹¹⁰².

Local knowledge can help reduce the uncertainties of establishing new operations within a region and therefore help ensure success (Stopford & Wells, 1973; Lord & Ranft, 2000). A lot of the most common problems can be avoided and the overall startup can be conducted much smoother and faster¹⁰³. Understanding the culture and language as well as having some local contacts can help a lot when trying to establish operations¹⁰⁴. Another way to reduce the uncertainties involved when establishing a new factory is a joint venture where two companies can share experiences. A drawback is that the profit needs to be split as well.

IT is often seen as an enabler rather than a driver of localization which could be a reason for it to score such a low rank¹⁰⁵. This necessarily not wise since IT sometimes can be used as a driver of localization. In rare cases, IT can be a substitute for physical closeness between two parties. One example can be to use IT to reduce the number of visits to control production at new suppliers¹⁰⁶.

Even though they are heavily debated subjects in the media, environmental regulations and Corporate Social Responsibility are considered to be among the least important external factor (99 percent significance level). Several interviewees state that it is important to fulfill the minimum level that the law requires but not much more¹⁰⁷¹⁰⁸¹⁰⁹.

5.2.5 Summary of findings

The first research question and the second input to the localization strategy in the conceptual model were the external factors (*section 1.2* and *figure 21* respectively). Out of the four groups of external factors, market factors were identified as the most important ones, followed by risk, demography and finally other external factors. Apart from the market, customer demands for fast and flexible deliveries, supplier

¹⁰¹ Anonymous, VP Manufacturing Company A

¹⁰² Srikant Illuri, Executive director & country head Invest Sweden, Interviewed 21st of March 2012

¹⁰³ Anonymous, VP Manufacturing Company A

¹⁰⁴ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁰⁵ Tobias Althed, Business Analyst Accenture, Interviewed 18th of May 2012

¹⁰⁶ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁰⁷ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

¹⁰⁸ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

¹⁰⁹ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

problems and trade regions were in the survey and interviews identified as important for localization. Wage arbitrage was identified to be of medium importance which is surprising considering that a lot of low cost sourcing used to gain cost advantages. Contradictory to the media attention it receives, environmental factors and CSR was considered to be among the least important factors of regionalization.

5.3 Strategies of Localization

The second research question was: *Which are the most probable supply chain localization strategies the year 2020 and how do they differ between various companies, industries and products.* The answer is outlined in the chapter below. First, a short benchmark study is presented followed by the regionalization of each function. The findings from the survey for each of the four functions are thereafter analyzed and discussed in turn.

5.3.1 Benchmark study

To benchmark companies that are currently prosperous with those which perform with moderate or questionable results, EBIT (Earnings Before Income Tax) was used and compared on several dimensions.

The first finding was that companies with EBIT above 10 percent do, with a significance of 89 percent, plan to regionalize more than companies with EBIT below 10 percent. The average EBIT for the entire sample was 6 percent. EBIT was analyzed versus number of markets, restructurings, factories and production flexibility in order to determine differences between high performing companies and others. The entire sample was used for all the benchmark analysis except for when analyzing the need for new factories for which only the production executives had given input.

The first test was EBIT versus the present number of markets per company. The following result was obtained (*Figure 52*):

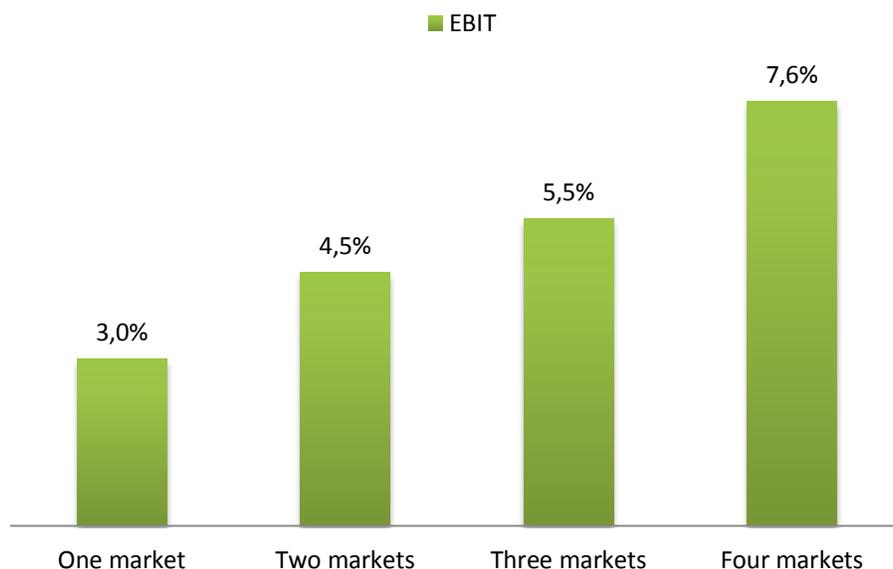


Figure 52: EBIT versus different number of markets

There is a correlation between the number of markets that a company is present in and EBIT. Companies that have more markets have a higher EBIT than companies with fewer markets (99 percent significance

level), this difference is illustrated in *Figure 52*. This difference could occur due to increased possibilities to gain economies of scale with increased number of markets.

Secondly EBIT was analyzed against the amount of restructurings needed to meet their 2020 localization goals. The result can be seen in *Figure 53* below.



Figure 53: EBIT versus need for high/low restructurings

A correlation can be seen between the amount of restructurings that a company needs to do until 2020 and their current EBIT (*see Figure 53*). There is however significance at just 89 percent level. The differences that exist might be due to the fact that companies with high EBIT continuously adapt to new conditions, and therefore aim at higher restructurings. It is then possible that their adapted setups allow them to be more effective and thus more profitable. It can also be that those with high EBIT

have more money to invest in restructurings, which they also do. If comparing *Figure 49* and *Figure 53*, another reason can be that companies with high EBIT is present in more markets, and restructuring of a company with that operations in many markets implies more restructurings than for those which are present in few.

The third test was EBIT versus the need for new factories and can be seen below (*Figure 54*):

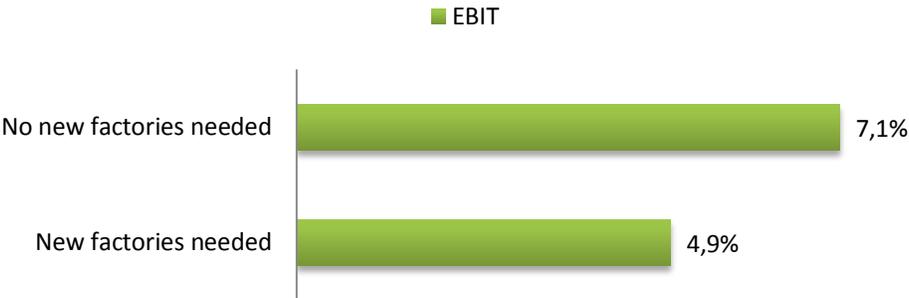


Figure 54: EBIT versus need for new factories

Closely related to the above is the need for new factories but for which no significant difference versus EBIT was attained (*see Figure 54*).

The fourth test was EBIT analyzed against the possibility to move production between different manufacturing facilities. The result is shown in *Figure 55*.

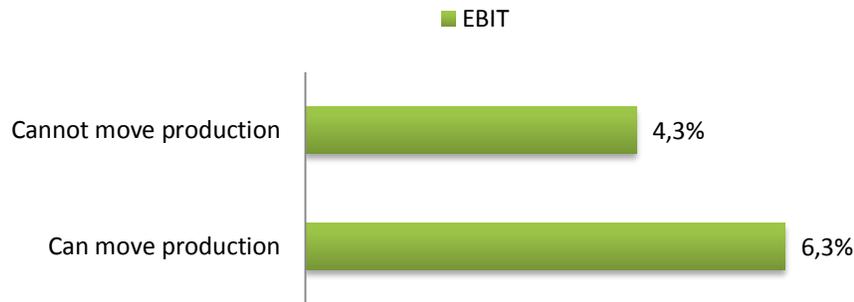


Figure 55: EBIT versus possibility to move production

Companies that have a higher possibility to move production earn more money (99 percent significance level), see Figure 55. This could be due to the fact that moving production between different facilities enables companies to optimize their production and minimize transportation distances and tariffs. The fact that companies that are able to move production have higher EBIT is in line with the theory presented in section 3.2, which states that those that can move production can easier adapt to a volatile market.

5.3.2 Regionalization

Regionalization can be divided into factory regionalization, supply base regionalization and R&D regionalization. These three aspects make up the total regionalization, or what is referred to as a “Regional Supply Chain Hub”. Total regionalization was also the basis for the segmentation. For more information on this study’s definition of regionalization (see section 2.4).

Advantages of regionalization

The benefits with using a regionalized supply chain setup are many. A regionalized company is close to the market and can therefore understand the customers’ needs better than a non-regionalized company can. It is also possible to satisfy customers’ requirements for fast and flexible deliveries to a higher degree since transportation distances are shorter and therefore the lead times are lower. The distances affect the cost and time required to transport, as well as the amount of safety stock and inventory required. In addition, by being regionalized a company would be inside many of the big trade regions which would reduce tariffs, resulting in an increased possibility to compete within these markets. Furthermore, currency fluctuations could be avoided since a bigger share of the products would be sourced and sold in the same currency. Currency fluctuations can have severe effects¹¹⁰¹¹¹, which became apparent when studying Figure 11. Not only will the currency risk be reduced through using a regional supply chain setup, but also region or country specific risks such as political risk can be reduced due to the fact that multiple setups are used.

Regional Supply Chain Hub

The total regionalization can for the entire sample and each segment be seen in Figure 56 below. Respondents from manufacturing and purchasing have given the input.

¹¹⁰ Peter Cedergårdh, Supply Chain Manager SKF, Interviewed 16th of April 2012

¹¹¹ Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

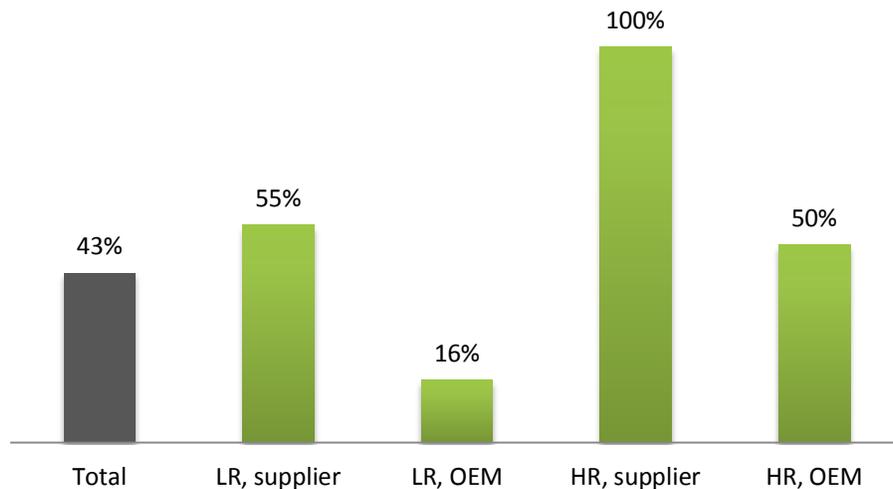


Figure 56: Total regionalization

Out of all the global companies included in the study 43 percent will be regionalized for all three functions at the same time in 2020, i.e. use a Regional Supply Chain Hub setup as outlined in the hypothesis. Companies with higher revenue as well as suppliers aim to be significantly more regionalized (95 percent significance level on both).

There were three main possible reasons identified why the difference between OEMs and suppliers was found. Firstly, suppliers have on average a higher internal value add than OEMs. That means that suppliers will benefit more from regionalizing, especially in regions with high local content requirements. Often, purchased material stands for around 50 and 70 percent of COGS¹¹² for suppliers and OEMs respectively¹¹³. Secondly, OEMs have up until now been the ones facing the high demands from the end customer on flexibility and speed. It was seen from the survey that 2012, OEMs adapt more than suppliers. For OEMs to cope with the increased adaptations, they have started to push a lot of their risk down to their suppliers who have to deliver with extreme precision, sometimes with just a few hours head's up. The high demands on precision often force the supplier to be close to its customer, i.e. the OEM¹¹⁴. In addition to this, the survey showed that in 2020, suppliers believe that the market adaptations will reach them to an even higher extent, which will even out the difference (see more about this later in *section 5.3.6*). If that will be the case 2020, that means that suppliers will not only have to cope with the high demands on precision and speed from the OEMs, but also be able to cope with higher levels of adaptation. Thirdly, suppliers often have fewer larger customers. This makes it easier for them to reach large volumes close to their customers, which of course is beneficial.

Revenue, the second difference found in *Figure 56*, indicate that high revenue companies will regionalize more than low revenue companies. The first identified reason is the financial strength of the companies. Many benefits are identified as outcomes of regionalizing, but doing so requires duplication of resources, which many small companies cannot afford. This is even more true for those with capital intensive

¹¹² COGS=Cost Of Goods Sold

¹¹³ Mikael Davidsson, Senior Manager Accenture, Interviewed 9th of February 2012

¹¹⁴ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

production. Secondly, and closely related, is that high revenue companies have high volumes. High volumes help reaching the economies of scale threshold even when the volume is split up on several production units. For those who do not reach a high level of economies of scale, there is a significant risk that their unit cost will not be competitive.

The arguments presented above motivate the findings of all large companies and all suppliers, but do not the small level of regionalization found for small OEMs (see *Figure 56*). The results from the survey indicate that small OEMs should not regionalize. One possible reason for this could be that their volumes and customer requirements are lower. There is little evidence that regionalization would be the most beneficial setup for them. The low volumes risks not being able to reach economies of scale in all regions, and if the customer demands on flexibility and speed is less, this is probably enough to discard regionalization for them. Additionally, their financial strength and therefore ability to disperse their operations is probably limited as well

Factory regionalization

The distribution of companies that want a regionalized factory setup can be seen below (*Figure 57*). The input is given from respondents from the manufacturing and purchasing position.

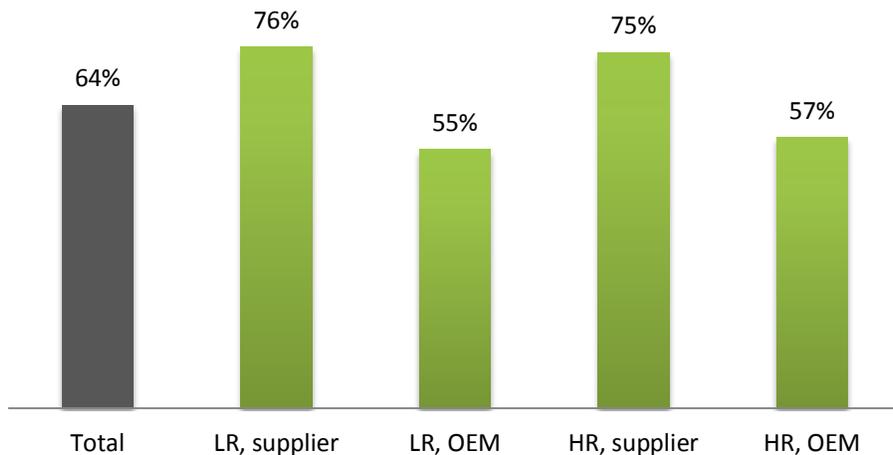


Figure 57: Factory regionalization

More Swedish AIE companies want to use a regional factory setup than a non-regional one, i.e. have a factory in each region where a market exists (95 percent significance level). Suppliers will have a significantly more regionalized factory setup in 2020 than OEMs will (99 percent significance level). A reason for this could be that suppliers to a higher extent need to follow their customers to be able to do business with them. The customers of suppliers are bigger than the customers of the OEMs and can therefore make more demands on the focal company. Suppliers are often required by their customers to be close to their customers’ production facilities. One example of this is Volvo Trucks which for certain components demand a delivery lead time of three hours from their suppliers¹¹⁵. No significant difference between high and low revenue companies can be discerned which is somewhat surprising since high

¹¹⁵ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

revenue companies should have more financial power and therefore have a higher possibility to regionalize. It could however be that the high revenue companies have to invest more money to regionalize due to demand on higher volumes on the facilities. The capital intensity could then be a limiting factor.

The benefits of using a regionalized factory setup range from increased production flexibility to reduced delivery lead times and inventory needs¹¹⁶¹¹⁷. Tariffs can of course also be avoided which will result in cheaper products for the customers¹¹⁸¹¹⁹.

Supply base regionalization

In *Figure 58* regionalization for items of high strategic importance can be seen and in *Figure 59* the corresponding data for items of low strategic items is shown. The input is given from respondents from the purchasing position.

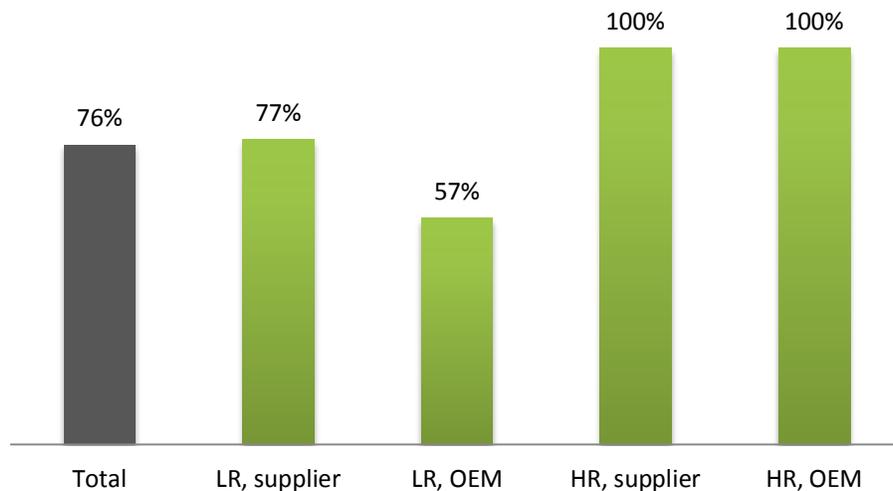


Figure 58: Supplier base regionalization for items of high strategic importance

¹¹⁶ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

¹¹⁷ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

¹¹⁸ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹¹⁹ Anonymous, VP Manufacturing Company A

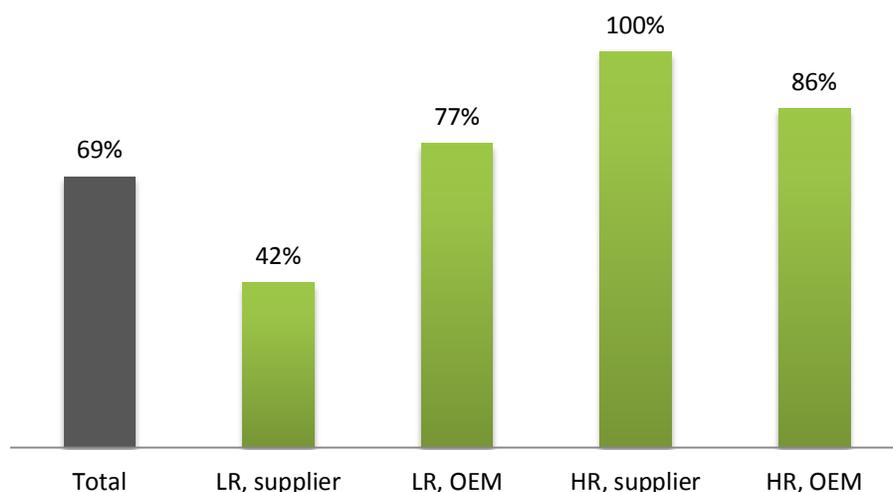


Figure 59: Supplier base regionalization for items of low strategic importance

For items of high strategic importance, 76 percent of the Swedish AIE companies want to use a regional supply base setup, i.e. primarily source from within the same region as the factory (99 percent significance level). The corresponding number for items of low strategic importance is 69 percent (95 percent significance level). The somewhat looser requirement for the supplier base, i.e. primarily within region, compared to the factory setup was due to the fact that most companies use hundreds of suppliers and it is therefore more or less impossible to use a 100 percent regional setup.

The high revenue companies want to use a more regional supplier base for both items of high and low strategic importance (90 percent significance level). Additionally, high revenue companies have higher volumes and can therefore get better prices even when splitting volume onto more suppliers. Between OEMs and suppliers there is however no significant difference in terms of regionalization for either of the two cases.

Using a regionalized supplier base setup can be beneficial in several ways. In *section 3.4.2*, decreased lead time and inventory levels were brought up. These benefits as well as increased transportation flexibility and decreased transportation costs were pointed out as important factors for supplier base localization in the company interviews¹²⁰¹²¹¹²². If these attitudes will settle in companies supply strategies, it is likely that we have seen the end of “traditional” global sourcing by 2020.

¹²⁰ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

¹²¹ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

¹²² Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

Regionalization of the R&D function

The amount of companies that strive for a regional R&D setup until 2020 can be seen in *Figure 60* below.

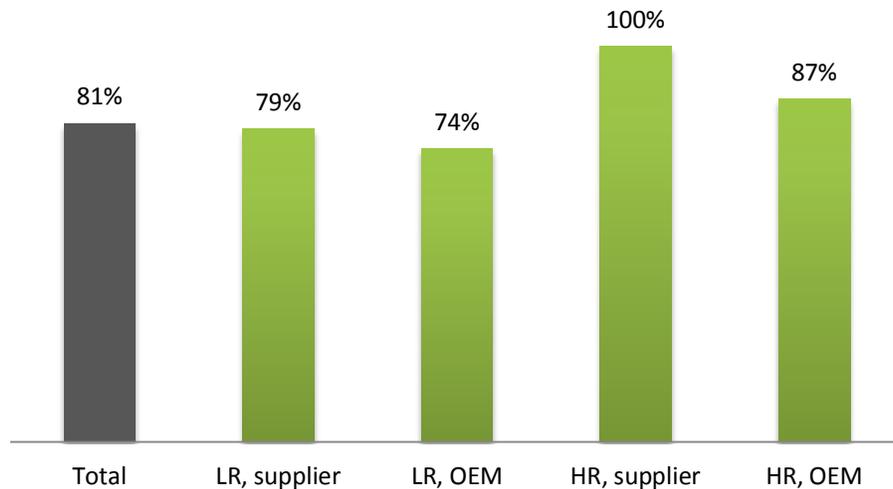


Figure 60: Regional R&D setup

81 percent of the companies want to have a somewhat or completely regional R&D function, i.e. some regional product adaptation (99 percent significance level). R&D is considered to be a core activity by many and is therefore important to have under company control¹²³¹²⁴. Companies that are having a hybrid R&D (combination of central and regional) structure are therefore considered to be regionalized when looking at total regionalization. The need for control is also seen in that 100 percent of the companies want to localize R&D in developed countries. The risk of copyright infringement is what makes companies reluctant to have a R&D office in low cost countries such as China¹²⁵¹²⁶. Results are in line with theory presented in *section 3.4.4* stating that products have to be regionally adapted in the future. There are no significant differences between the segments in terms of R&D regionalization.

There is no reason it should be any difference between OEMs and suppliers considering that all advanced customization are likely to involve adaptations both at the OEMs and at the suppliers. This is also supported by the survey results which states that both OEMs and suppliers will conduct products adaptations to a high degree in 2020. By working together with suppliers the R&D competence can be shared and the production costs of the components can be lowered¹²⁷¹²⁸ (Atkinson, 2008). It is somewhat surprising that there is no significant difference between the companies with high and low revenue since high revenue companies should have the volumes to back up a more regionalized approach. If the volume is too low then the economies of scale will consequently be low as well resulting in that the regionalized R&D setup should be more expensive for small companies than for bigger ones. Since low revenue

¹²³ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹²⁴ Peter Cedergårdh, Supply Chain Manager SKF, Interviewed 16th of April 2012

¹²⁵ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹²⁶ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

¹²⁷ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹²⁸ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

companies might have less money to spend, this should have hampered their regionalization efforts. The extent of the adaptations can however vary from small engineering changes to completely separated products. A possible explanation can thus be that high revenue companies which have higher volumes can do more advanced adaptations that also require more resources.

Customers are requiring faster deliveries even when buying customized products, which can be achieved through having regional R&D offices. Adaptation can then be made at a regional office, where the local needs are understood, while the core technology is developed at a central unit to keep the competence high and gain synergies¹²⁹. The look of the core technology is generally not an issue for customers since they will never see it themselves. There is thus no need to adapt it to local needs¹³⁰.

Restructurings needed for regionalization

The share of companies that need high level of restructurings is outlined given regionalization in *Figure 61* below.



Figure 61: The proportion of companies that need high levels of restructurings

Those companies that will be regional 2020 need more restructurings than non-regional companies do (89 percent significance level). The significance level of 89 percent is somewhat low but the result is also supported by the head of MP&L at Volvo Cars who states that the companies aspiring to be regional have more restructurings to do than companies that are not.¹³¹ When aiming at becoming truly regionalized as defined in this project each market entering requires lots of restructurings. The aim is after all to change the supply chain setup of the company. The score above indicates that many companies aspiring for regionalization is not regionalized today.

5.3.3 Manufacturing strategies of localization

Below the analysis of the results specific to the manufacturing function are presented. First companies that want new factories are analyzed, followed by the need for production flexibility and finally factory regionalization is analyzed versus the amount of restructurings that needs to be done.

The need for more factories

45 percent of the surveyed production executives think that their companies need more factories until 2020. There is no significant difference between the amount of companies requiring more factories and the ones that do not. Considering the time and resources involved in setting up a new factory the number

¹²⁹ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹³⁰ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹³¹ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

is higher than expected. As a result, one can expect to see extensive reconfigurations take place the coming eight years.

In *Figure 62* below, the amount of companies that want to build new factories are presented:



Figure 62: Factory regionalization vs. the need for new factories

There is no difference between the companies that are aspiring a regional factory setup compared to those which are not, in regards to their need for new factories. For both types of companies a considerable proportion do however need to build new factories. The implication is that a lot of the companies in the sample that aspire to have a regional factory setup do not currently have it but they are building factories to get there until 2020. Those which do not aspire for regionalization are probably aiming for expanding their current capacity in places where factories are already present. As discussed previously, these companies can have characteristics which do not make them able to fully leverage on the benefits of regionalization, e.g. the company might act in an industry where products are not customized and are cheap to transport.

Production flexibility

Production flexibility is defined as the possibility to move production between different production facilities. How this will change from now until 2020 is analyzed below, followed by examining whether the point of departure affect the production flexibility or not.

Figure 63 shows the amount of companies that want to increase their production flexibility, split between those that currently can and cannot move production (observe that the total columns should not add to 100 percent).

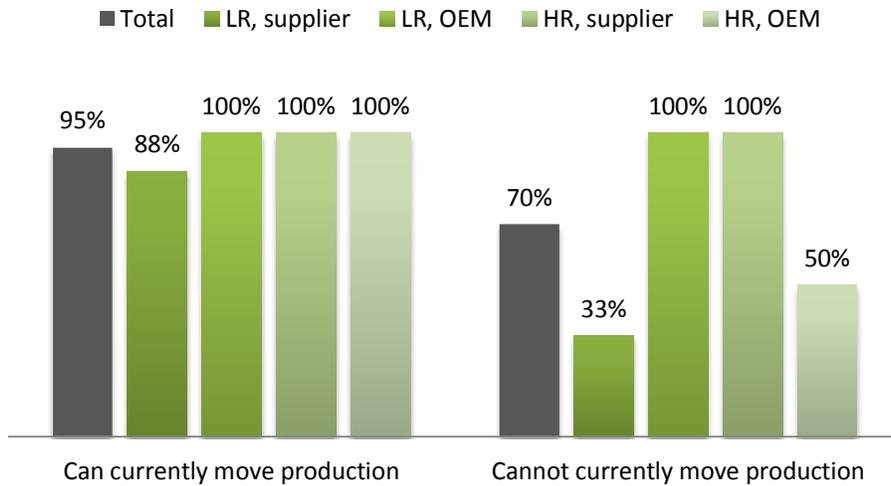


Figure 63: The proportion of companies that want to increase their production flexibility until 2020, given if they can or cannot move production today

In *section 4.3.1* it was seen that 87 percent of the surveyed sample wants to have an increased production flexibility in the future (99 percent significance level). Currently, 66 percent states that they can move production between different manufacturing facilities (99 percent significance level). The result of comparing these two metrics is seen above in *Figure 63* where it is shown that companies that currently have high production flexibility and thus can move their production still want to increase their flexibility even further. These results are quite surprising, since one can expect that the companies lacking flexibility today would like to close the gap between them and their flexible counterparts. A possible reason for the low score of large OEMs that currently cannot move production could be that many of them have very capital intensive production and assembly, often as result of high tooling costs. Therefore they might not find it feasible to incorporate movement ability which would require additional investments. Another reason could be that the companies that are flexible today are those that are early adopters and those that continuously improve their processes. They might also be more likely to improve even more.

In *Figure 64* below the production flexibility, i.e. possibility to move production, is analyzed versus the point of departure in production.

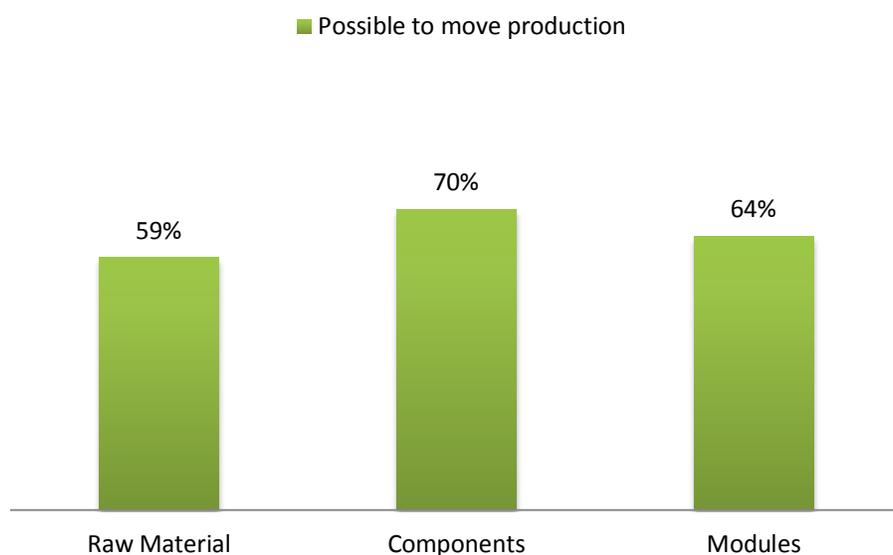


Figure 64: Point of departure for production vs. production flexibility

There are no significant differences between the different points of departure in production and the production flexibility of each of them. Even though interviewees have stated that assembly is easier than component manufacturing to move, this result is not substantiated in the survey¹³²¹³³¹³⁴¹³⁵.

Factory regionalization vs. restructurings

To understand companies' current state regarding factory setup it was important to analyze how much restructurings they had to go through to reach their end state. This was compared between those who aimed for a regional factory setup and those which did not. The results are shown in *Figure 65* (observe that the total columns should not add to 100 percent).

¹³² Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

¹³³ Anonymous, VP Manufacturing Company A

¹³⁴ Håkan Herbertsson, Director Industrial Strategies Husqvarna, Interviewed 3rd of April 2012

¹³⁵ Niklas Broberg, VP Manufacturing & Logistics Husqvarna, Interviewed 3rd of April 2012

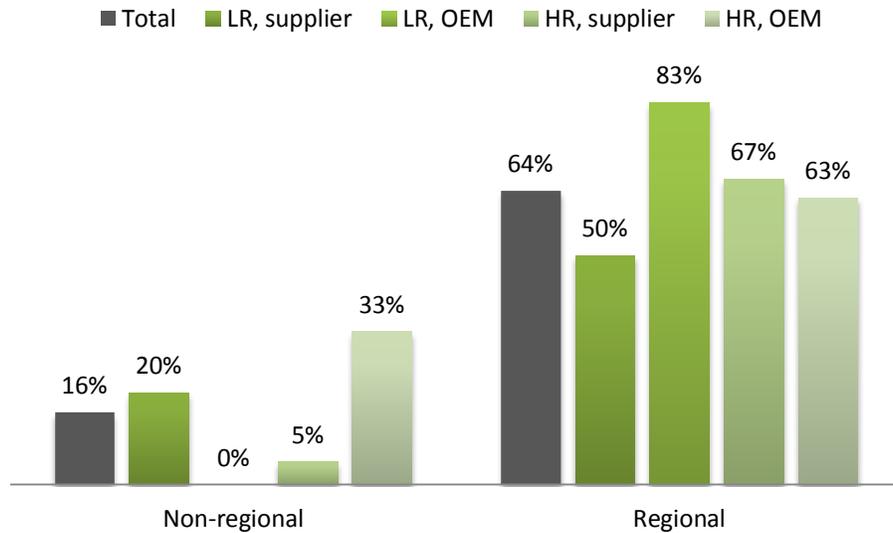


Figure 65: Percentage of regional and global companies in terms of their factory setup which need high restructurings

A significantly (99 percent level) higher proportion of Swedish AIE companies that will aim for a regional factory setup will need to do high restructurings until 2020. The conclusion is that regionalizing implies much effort and that a lot of companies are not regionalized today. It was previously discussed in this section that both companies not aspiring for regionalization and those which do, are aiming at building new factories to the same extent. The reason why these companies do consider their restructurings to be lower (16 versus 64 percent) is not surprising – building factories in new areas which are unknown for the company and at the same time fundamentally change the factory setup from global to regional is a much more demanding task than just expanding current capacity.

5.3.4 Purchasing organization- & supplier base localization strategies

In this chapter the purchasing specific strategies are discussed. It starts off by outlining the degree of centralization of the purchasing function followed by where to localize the organization. The origin of sourcing is discussed next followed by the restructurings needed to get to the desired end state in terms of purchasing localization, both of the organization and the supplier base.

Degree of centralization of the purchasing function

As can be seen in *section 4.3.2* the purchasing function should in terms of strategic decisions be predominantly centralized. Advantages of a centralized approach are more standardization of material and better prices (van Weele, (2010); Quintens et al., (2006)).

Even though the supplier base is widely spread out, the organization should primarily be centralized for strategic decisions. The importance of synergies which are possible to gain through a centralized approach were also pointed out in the interviews¹³⁶. There are however a number of respondents that want to use a somewhat decentralized purchasing organization even for strategic decision making. This approach is common when business units work as separate entities (van Weele, 2010).

¹³⁶ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

To summarize, the strategic decisions for purchasing should in most cases be taken in a centralized organization to gain advantages such as standardization of material and lower prices.

Placement of purchasing organization

Swedish AIE companies believe that it is more important to place the central strategic purchasing organization close to headquarters and production than it is to be close to the market (99 and 95 percent significance level respectively). The supplier base was favored in front of market as well, but no significance was found (89 percent significance level). There were no significant differences between the importance of headquarters, supplier base and production either.

As was seen in section 3.4.2, a reason for placing the central purchasing organization close to the headquarters is that it enables close interaction between purchasing and other central functions. This simplifies the creation and establishment of companywide strategies¹³⁷¹³⁸. Placing the strategic purchasing organization in proximity to the headquarters is also a statement of the growing importance of purchasing¹³⁹. In smaller companies, the closeness to the headquarters is probably not always as important since decisions require less people to align with¹⁴⁰.

The closeness to production facilitates the communication regarding material demands (van Weele, 2010). In the event of placing purchasing close to both production and R&D, benefits for companies with frequent changes to their products or that use build- or engineer to order can be enjoyed. Collaboration when developing or customizing products enables reduced costs of production and sourced materials¹⁴¹. Purchasing can also get direct inputs about the quality standards of their suppliers and also get a sense of the short term implications of the suppliers' actions¹⁴².

A reason for placing the central purchasing organization close to the supplier base is an increased possibility to work long term with suppliers. This allow for developing the suppliers to satisfactory levels¹⁴³. It facilitates the relations and open up for additional insights into the development of new components¹⁴⁴, which is often referred to as ESI (Early Supplier Involvement; see *section 3.4.4* An additional benefit is the reduction of linguistically and cultural problems related to strategic work with suppliers¹⁴⁵¹⁴⁶.

The closeness to market can be beneficial in order to know what the customer requires and expects from the product¹⁴⁷. Requirements and trends will also be sensed earlier¹⁴⁸. It is also beneficial when

¹³⁷ Mikael Davidsson, Senior Manager Accenture, Interviewed 9th of February 2012

¹³⁸ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹³⁹ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁴⁰ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁴¹ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹⁴² Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁴³ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁴⁴ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

¹⁴⁵ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁴⁶ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁴⁷ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁴⁸ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

development projects are run by marketing and sales, since it simplifies that a suitable cost target is reached for the purchased goods¹⁴⁹.

In most cases, the central unit is limited to one geographic destination only. For large regionalized company it is thus impossible to leverage on all the benefits above. Companies are therefore assumed to be best off if they use their competitive strategy to see which one of the above that is most beneficial and place the organization close to this function. If for example production is most beneficial, the organization should be put in the region which has most use of that function.

Origin of sourcing

This section treats whether sourcing primarily should be conducted from low cost or developed countries, in the cases of low cost sourcing whether it should be done regionally or globally, and the level of restructurings that is required for companies with a regional and global supply base setup.

The figures below show the share of companies that favor sourcing from low cost and developed countries or a combination thereof. *Figure 66* shows the result for articles of high strategic importance while *Figure 67* shows the result for items of low strategic importance.

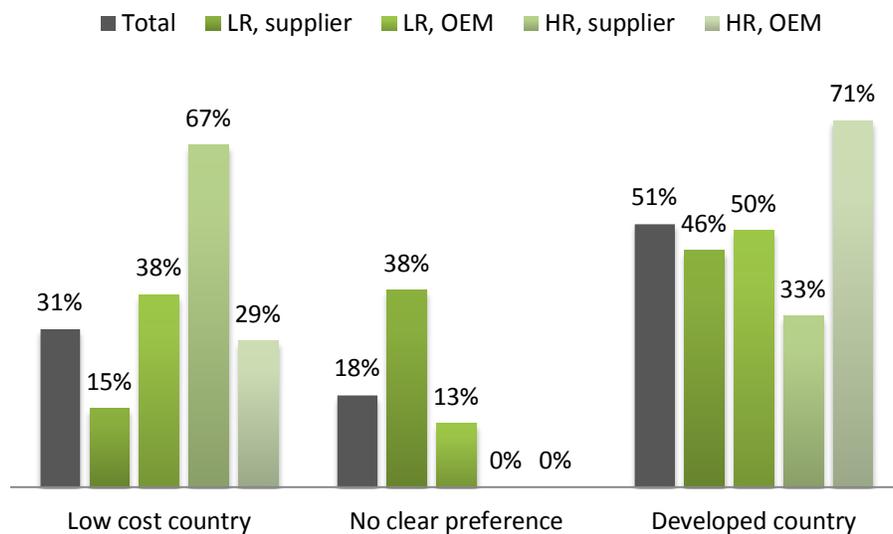


Figure 66: Sourcing articles of high strategic importance from a low cost, mixed and developed country respectively

¹⁴⁹ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

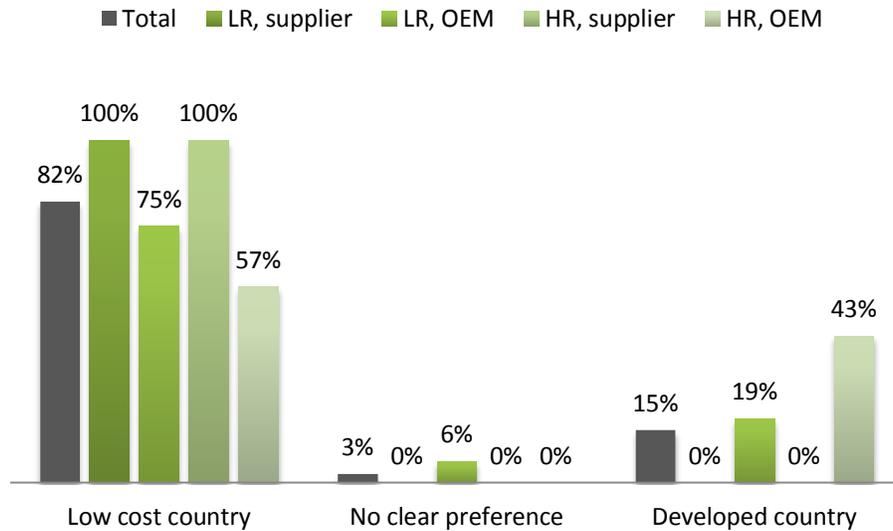


Figure 67: Sourcing articles of low strategic importance from a low cost, mixed and developed country respectively

As can be seen above, there is a clear difference between articles of high and low strategic importance. The items with high strategic importance are more frequently sourced from developed countries (99 percent significance level). Low cost sourcing is used more frequently for items of low strategic importance for which low cost sourcing is most commonly used (99 percent significance level). The no clear preference alternative between low cost and developed country sourcing in the figures above occurs when both types of sourcing are present but in different regions. 69 percent of the companies source part of or all articles of high importance from a developed country compared to only 18 percent for the low strategic importance articles. A reason for this difference pointed out in the interviews could be that there is a risk of copyright infringements in many low cost countries¹⁵⁰. It could be that many companies have factories in developed countries. By sourcing items of high strategic importance from developed countries a short lead time can be reached which would imply less risk and tied up capital. Since these factors are not as important for items of low strategic importance more low cost country sourcing are prioritized.

In the case of low cost sourcing being used, it can be done from within or outside of the region. In *Figure 68* the amount of companies that source from within the region are shown for items of high and low strategic importance.

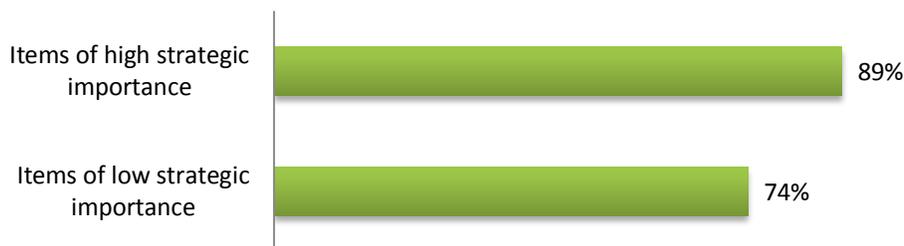


Figure 68: The proportion of companies that source items of high and low strategic importance from low cost countries within region

¹⁵⁰ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

China has been frequently mentioned as a low cost country from which a lot of worldwide sourcing should be done. This may have been true in the past but as can be seen above it is not correct in 2020 when the majority of purchased items should be procured from within the region. This is accurate both in the case of high strategic items as well as low strategic ones, even if the total score for the surveyed population is higher for high strategic items. The percentages of 89 and 74 for items of high and low strategic importance respectively are somewhat higher than for the supplier base as a whole, i.e. 76 and 69 percent respectively (*Figure 58* and *Figure 59*). Contrary to the trend in recent years of global low cost sourcing, it is more common to source items from low cost countries regionally.

The above presented results lead to the conclusion that companies aim for regional sourcing for both high- and low strategic importance items. For high strategic importance items, companies prefer developed countries and for low strategic importance items they prefer low cost sourcing. This implies that companies believe that in 2020, they are able to source from both low cost- and developed countries in all regions, including Europe and America.

Restructurings needed

The understanding of companies’ current- and future state in terms of supplier base design is of importance to analyze for companies aspiring for regionalization. Therefore levels of restructurings for regional and global supplier bases are tested. The results below are divided into items of high strategic importance in *Figure 69* and items of low strategic importance in *Figure 70*.

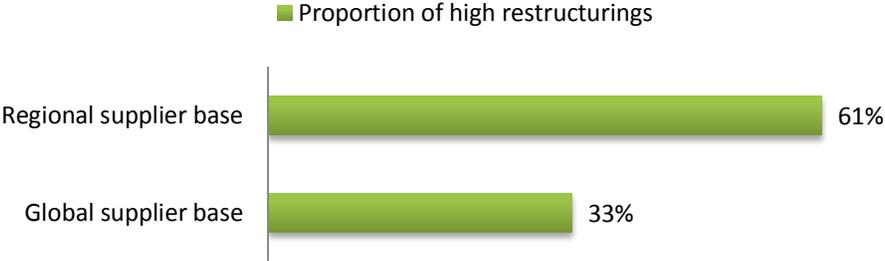


Figure 69: Sourcing of items of high strategic importance items vs. amount of restructurings needed

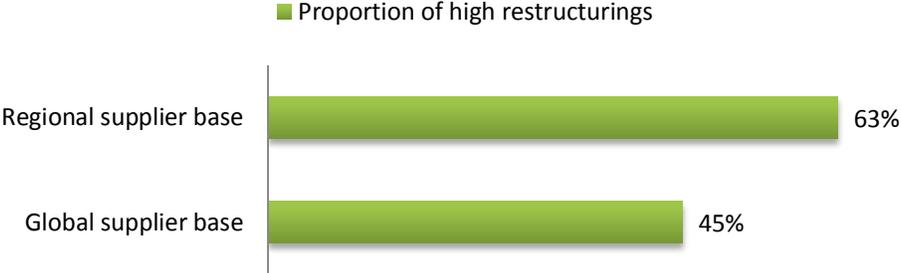


Figure 70: Sourcing of items of low strategic importance items vs. amount of restructurings needed

The sample show some difference between the amount of restructurings needed for companies aspiring to be regional until 2020 and the companies that do not, both for the items of high and low strategic

importance. There are however not any significant difference wherefore the result cannot be extrapolated to the entire population. The somewhat higher need for high restructurings for the companies in the sample aspiring to be regional indicates that they currently do not have a regional supplier base setup. There are no statistical differences between the segments.

5.3.5 Logistics organization & activities structure

Below the analysis of the results specific to the logistics function are presented. The following are analyzed in turn: delivery structure, outsourcing, flexibility and speed, and finally risk mitigation strategies.

Delivery structure

The means of which deliveries are made vary between markets. As was seen in *section 4.3.4*, Europe is more frequently supplied through direct delivery than North or South America (95 and 99 percent significance level respectively). Asia is supplied somewhat more through direct deliveries as well compared to North and South America, however no significant difference exist. A reason for more direct deliveries in Europe and Asia could be that Swedish companies have in general more manufacturing facilities in those regions than in the other continents which would mean that the distances are shorter (*Table 17* and *Table 18*). Direct deliveries can thus be used with acceptable lead times to a higher degree in Europe and Asia than in North or South America. The costs thereof will of course be less as well due to the shorter distances. Having a more regional supply chain setup thus enables companies to use direct delivery to a higher degree. This is beneficial due to the fact that the total inventory can be kept lower which positively affect flexibility (Feitzinger & Lee, 1997). Apart from large suppliers there are no clear differences between the segments.

Outsourcing

85 percent of the surveyed sample wants to use outsourcing. All of those think that transportation should be outsourced, which is also the activity that most companies will outsource year 2020 (90 percent significance level). Custom handling, that scored second, is probably tightly correlated with the outsourcing of transportation, which is natural since the receiving company seldom is close enough to the borders to be able to do it themselves. Sales is the activity that significantly (90 percent level) fewest of Swedish AIE companies want to outsource. However, 26 percent of the respondents want help from external actors to collect customer data. This data can later be used to enhance sales and to develop new products (Simchi-Levi et al., 2009). The conclusion is that distributors will be widely used, primarily for transportation and customs clearance. Their responsibilities will however often include more advanced things, such as collecting customer data, which points towards a reliance on distributors and that companies want to focus on other more important activities. Since the outsourcing of production does not fall into this study scope it is not covered in this report.

Flexibility and speed

In *section 3.4.3*, the increasing need for fast and flexible deliveries was pointed out (Christopher, 2011). The importance where further highlighted in the survey and interviews results where it was identified as the most important external factor. Furthermore, 96 percent of the logistics managers that got the question believe that the demands from customers will increase. The speed and flexibility of deliveries can physically be increased either through reducing distances between two points in the value chain, by transporting the goods faster over the same distances or by using inventory, thus decreasing the distances

between order location and end location. The first alternative, reducing distances, can be solved through using a regionalized supply chain setup. The second alternative, faster transportation, is the least favored alternative to meet customers increasing demands (95 percent significance level). It is only seen as an option by 15 percent of the logistics managers. As for the third alternative, using inventory, only 35 percent of the sample of logistics managers consider this to be an alternative.

In addition, better coordination with suppliers and distributors is the most favored way of meeting increasing demands (90 percent significance level). Increased coordination can be achieved by either being physically close to the suppliers and distributors or through having support from an IT-system¹⁵¹ (Lee, 2002). Being physically close means increased opportunities for meetings and discussions regarding how to optimize the supply chain while IT provides information for doing the same. The second most favored alternative by the sample respondents were to use postponement, i.e. making the last product modifications close to the final customer. Through using postponement, inventory levels can be decreased while flexibility is increased (Feitzinger & Lee, 1997). There is thus a need for either a facility where the postponement can take place or a more regionalized factory setup.

The conclusion is that from a logistics point of view a regionalized factory and supplier base setup is important in order to be able to meet the customers' increasing demands of fast and flexible deliveries. There are alternative ways to gain advantages as well, such as using an IT-solution or postponement.

Risk mitigation strategies

The most favored way to mitigate risks is to use a more regional supply chain setup when it comes to production and supplier base. This is shown in *Figure 43* where having dispersed production and supplier base are the most favored strategies to mitigate risks (99 and 90 percent significance level respectively). It is common to use multiple sourcing to reduce risks in the supplier base (van Weele, 2010). The same logic is true regarding factory setup where having multiple factories spread around the world reduces risk¹⁵². If one factory breaks down products can be sent from different factories instead. Using a more spread out factory- and supplier base setup is to have a more regionalized supply chain setup.

Risk is an important subject which is affirmed by the fact that companies focuses more and more of their effort into minimizing risk and that all respondents of the survey states that they will work with risk in some way¹⁵³. Increasing stock levels is not a considered solution, nor is using speculation strategies. Due to the limited number of answers in each segment it is not possible to do statistical tests per segments.

Accenture did in 2008 a study of risk for global companies (section 3.4.3) where one of the questions was the same one as in this study. The focus differs in that this study only contains Swedish companies. There are for some questions considerable differences in opinion between the respondents of the two studies. Dispersed production- and supplier base were a frequently favored option in the Accenture study as well. Great differences can however be seen in the use of sourcing from contingent suppliers, increasing inventory and safety stock, establishing a formal risk management team and finally the use of forward buying and hedging strategies. All of these factors scored higher in the Accenture study. The score ranged from 42 – 61 percent of the companies compared to 4-19 percent in this study. Since there is a time aspect

¹⁵¹ Bjarne Lindblad, VP Purchasing Haldex, Interviewed 10th of April 2012

¹⁵² Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

¹⁵³ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

as well as a different sample, it is somewhat hard to tell why the differences occur. It could be that being an American study, the risk awareness is higher in general, as a consequence of terrorist threats and for example lawsuits within the USA¹⁵⁴. The fact that the scores are lower mainly for the four factors mentioned above, but not for the others, indicates that this is not the entire reason. It is possible that over time the use of these four factors have decreased somewhat as well. Notable is that the use of inventory and safety stock is almost non-existent for Swedish AIE companies.

The conclusion is that Swedish AIE companies believe that the best way to reduce risk within the supply chain is to disperse the production and supplier base. This is done by using a regional setup.

5.3.6 R&D localization strategies

Below the localization of the R&D function will be discussed in terms of proximity to other functions and the necessary restructurings. This will be analyzed to determine how much work companies need to do with R&D localization until 2020.

Swedish AIE companies think that it is more important to localize R&D close to production, market and supplier base than it is to localize it close to headquarters (99 percent significance level). There are however no significant differences in terms of importance between the former three. By having a completely regional supply chain setup the R&D function will be close to all three factors.

Localizing the R&D function close to production ease the implementation of new products¹⁵⁵. Having R&D close to the market allows for easy and flexible adaptation to customers´ needs¹⁵⁶¹⁵⁷¹⁵⁸. By having R&D close to the supplier base, joint efforts to develop products can be used to increase the mutual competence and to lower the manufacturing price¹⁵⁹¹⁶⁰ (Atkinson, 2008).

¹⁵⁴ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁵⁵ Anonymous, VP Manufacturing Company A

¹⁵⁶ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹⁵⁷ Anonymous, VP Manufacturing Company A

¹⁵⁸ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

¹⁵⁹ Per-Erik Kronqvist, VP R&D Haldex, Interviewed 10th of April 2012

¹⁶⁰ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

In *Figure 71* below the share of companies that need high levels of restructurings are shown, split between those that have a central, hybrid and regional R&D setup.

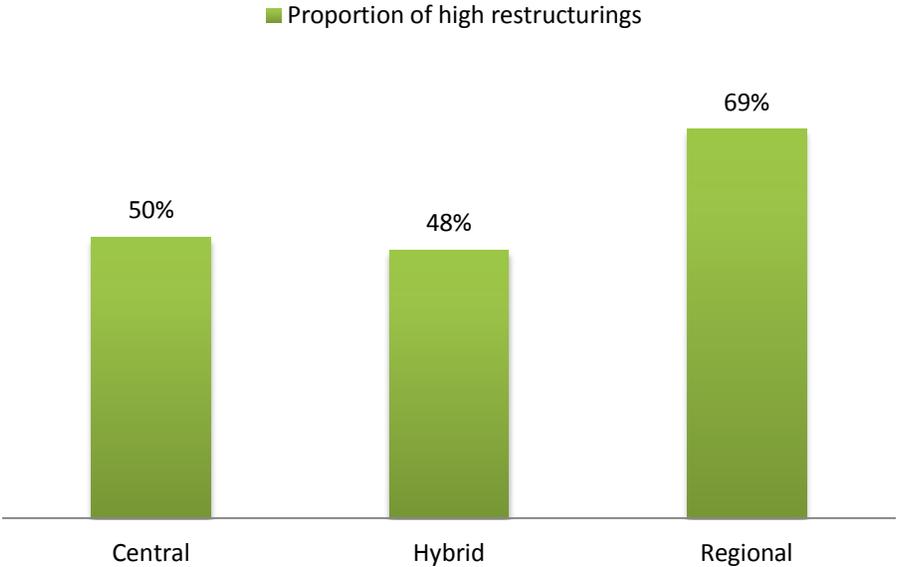


Figure 71: R&D placement vs. need of high restructurings

No significant difference could be found between the different setups. In the sample there did however seem to be more restructurings needed for the regional companies which should indicate that they do not currently use a regional R&D setup.

The figures below show the amount of adaptation to their products that OEMs and suppliers do for different markets. *Figure 72* shows the values for 2012 and *Figure 73* shows the values for 2020.

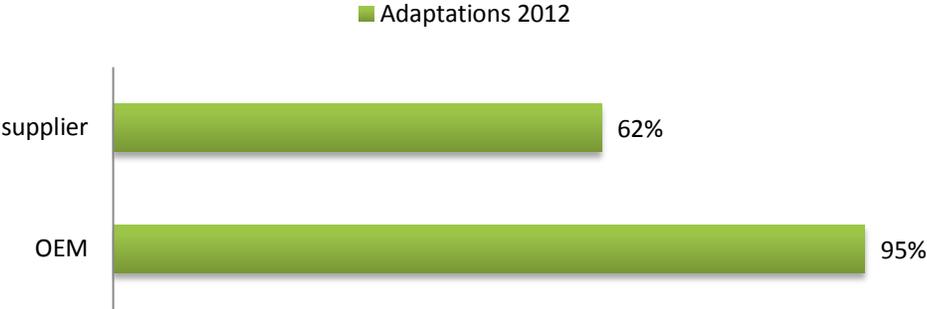


Figure 72: The amount of adaptations between OEMs and suppliers for 2012

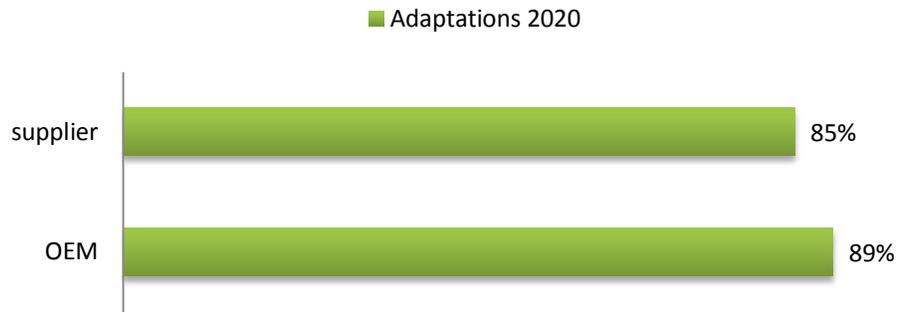


Figure 73: The amount of adaptations between OEMs and suppliers for 2020

OEMs do currently adapt their products more than suppliers (99 percent significance level; *see Figure 72*). This is probably explained by the fact that the OEMs are closer to the end customer and are therefore the ones to satisfy them.

The difference will diminish until 2020, meaning that no difference between OEMs and suppliers can be found (*see Figure 73*). One reason for this could be that the customers' increased demands on adaptations have spread upstream in the supply chain. The end result is that the OEMs put more demands on their suppliers to be able to provide what the customer demands. Adapting more in the future is in line with higher demands from customers on products that are specified according to their needs, not the needs of people in other regions than their own (*see section 3.4.4*). In addition, the higher demands put on R&D in developing countries should be possible considering the increasing trend of R&D effort conducted in developing countries (*see BERD; section 3.4.4*)

5.3.7 Summary of findings

The second research question and the output in the conceptual model concerned the localization strategies for 2020. The answer to the question is outlined below:

Companies want to regionalize the manufacturing facilities, supplier base and R&D function until 2020. 43 percent of the companies from the sample want to use a Regional Supply Chain Hub setup where all functions are regionalized simultaneously. The amount of restructurings required is higher for the companies aspiring to be regional than for companies that do not. Furthermore, close to half the companies require more factories until 2020. Items of high strategic importance should be sourced from developed countries while items of low strategic importance should be sourced from low cost countries. Of the sourcing from low cost countries, 89 and 74 percent of items of high and low strategic importance respectively should be sourced from within region. The demand for fast and flexible transport was identified as the most important external factor as outlined in *section 5.2*. The most preferred way to handle the increase was to coordinate more with suppliers and distributors while using faster freight modes was not a preferable solution. The most favored ways to mitigate risk were using dispersed production and supplier base. Increasing inventory or using forward buying was however not favored. OEMs do currently more product adaptations to specific markets than do suppliers; this difference will however disappear until 2020.

Several differences were identified depending on whether the companies have high or low EBIT. The companies with high EBIT are the companies that have: more markets, can currently move production, require more factories and need higher restructurings.

5.4 Recommendations

The third research question was: *In order to remain prosperous in year 2020, what supply chain localization strategies should companies pursue?* This question is answered in this section where localization recommendations were created to direct companies towards a supply chain structure to meet their future goals. This section thus summarizes the most important findings in the study.

This subsection starts off by discussing a plausible future based on the approach presented in the methodology chapter, followed by the actual recommendations based on that scenario. In addition to the recommendations, deviations from the derived scenario and the impact those might have on the supply chain structure is to be discussed. Internal factors outside the borders of the segments are studied before the section wraps up with a simple recommendations framework.

5.4.1 Scenario creation

As mentioned in the methodology (*see section 0*), a scenario based on the development of three scenario parameters was to be created and then used for making localization recommendations for Swedish AIE companies. This section presents the identification of those three parameters so as their likely and alternative developments.

The parameters that were chosen were based on the three most important external factors identified in the survey and interviews. The most important factor in the interviews and top ranked factor in the survey was increased demand on fast and flexible deliveries, which was therefore included. The second most important factor in the survey, and considered the starting point of all new establishments in many interviews was the market shift, i.e. the shift in buying power taking place. It was therefore included as well. The third and last factor was trade regions. Trade regions ranked lower than third in the survey, but were taken up as one of the most important external factors in most of the interviews. Some companies believed that their only reason for establishment in some regions in addition to a strong market development was trade barriers. The strong emphasis in the interviews made it natural to include the factor.

Development of scenario parameters

After identifying the three parameters, a probable but also an alternative development of the same was predicted. For fast and flexible deliveries, that implied that customers will maintain or even increase their demand for flexibility and speed. The interviewed and surveyed companies believed that this parameter and its increase was the most important external factor. In addition, researchers (e.g. Christopher (2011), Slack (2005)) also believe that the demand will increase. An increase of the demand for fast and flexible deliveries is therefore likely. For the market split, the continuous development implied an increase of GDP of around 10 percent in many developing nations, but just a few percentages on average in most developed countries (UN, 2011). For trade regions, the development implied that ASEAN will continue to extend their cooperation with internal and external nations. From 2010 the ACFTA¹⁶¹ was established and

¹⁶¹ ACFTA - ASEAN China Free Trade Agreement

by 2015 full implementation with the CLMV¹⁶² countries is expected (ASEAN, 2012). Furthermore, India has been developing their cooperation with ASEAN since their first sectorial dialogue partnership in 1992 (ASEAN, 2007). The ongoing discussion is whether India and ASEAN should build an AIFTA¹⁶³ to sustain and anchor the strategic alignment between the two parties.

To summarize, the scenario to be used for the recommendations work took the following form (Figure 74):

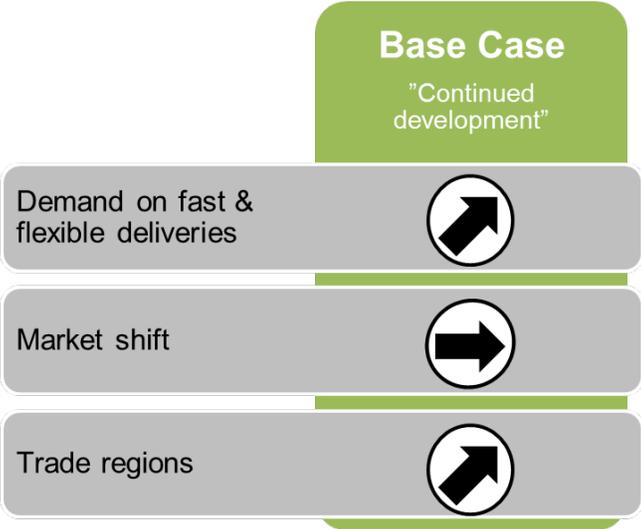


Figure 74: Future scenario

In addition to the likely development of the parameters, an alternative outcome per parameter was derived to estimate what risks were involved, i.e. what could be an alternate future. It was realized that it is unlikely that customers would abruptly start to demand less of their suppliers in terms of flexibility and speed. The market shift would not likely change direction, meaning that the shift in buying power would not all of a sudden move towards the western world. And that trade regions, such as the EU, would break down was also seen as highly unlikely. Therefore the alternative outcome was that the parameters instead of growing would slow down. Even though a long term slow-down was seen as unlikely, reasons that could make it happen was searched for.

An alternative outcome on the demand on fast and flexible deliveries would be that the customers’ needs would not increase. Instead the demands would be kept at today’s level while the demands on lower prices would rise instead. Since costs are increasing with faster speed of delivery there is a trade-off between faster and more flexible deliveries and the cost thereof. The result of the trade-off will in the end affect customers who will need to pay for an increased flexibility. Even though it is not likely, customers could choose to go for lower price.

The market shift between developed and developing countries could slow down in the future. Firstly, the market growth of many Asian countries has been debated substantially over the past years. China has grown at around 9 percent on average and India around 7 percent (World Bank, 2012). Even though

¹⁶² CLMV - Cambodia, Laos, Myanmar, Vietnam
¹⁶³ AIFTA - ASEAN India Free Trade Agreement

India’s levels have been high, they have dropped somewhat and were around 6 percent in the Q1, 2012. Whether China’s growth is sustainable can be questioned. The inflation levels have been moderate at around 4 percent which is good considering their tremendous growth. On the other hand, the low inflation can be explained by the fact that prices in China are heavily controlled (Yang, 2008). According to economic theory, GDP growth cannot sustainably be higher than the natural growth rate (Bernanke & Frank, 2009). In addition to the aggregated market, every company is affected by its own market. Advanced and high performance truck products like Volvo have sometimes problems to reach its full utilization potential in developing countries, due to poor infrastructure and inefficient load change systems in goods terminals. The high productivity is therefore not always needed by the customers and the somewhat higher price can thus limit the potential sales¹⁶⁴. It could have impact on the market for premium products, which most Swedish companies provide. All the above factors could mean that the market shift would slow down.

When it comes to trade regions, even though impressive agreements have been signed over the past two decades, it does take time. India and ASEAN have not been able to reach an agreement on free trade even though discussions have been going on for many years. It can thus be the case that trade regions will remain more or less the same in 2020, as compared to today.

5.4.2 Recommendations creation

The final output of the project was to provide localization recommendations for the Swedish AIE companies for 2020. The recommendations derived were based on the process described in *section 2.1.5*. The process used the scenario and segments previously described as well as the regionalization mapping conducted in *section 5.3.1*. as input.

During the focus group setting described in *section 2.2.4*, the final recommendations were derived. The results as follows:

Table 20: Recommendations matrix (SCH refers to “Supply Chain Hub”)

supplier	Regional SCH	Regional SCH
OEM	Regional SCH not necessary	Regional SCH
	<30 BSEK	≥30 BSEK

As seen above (*Table 20*), all suppliers and large OEMs are recommended to consider using a regional supply chain hub, while small OEMs are not recommended to do the same.

¹⁶⁴ Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

The following two subsections discuss the underlying logic of these recommendations based on a focus group meeting held at Accenture¹⁶⁵:

Implication of scenario parameters on localization

Starting off with the localization impacts of the scenario: As mentioned in the analysis section, 96 percent of the respondents believe that requirements on speed and flexibility will increase from today's high levels. Furthermore, it was considered the top external factor. To be able to become faster and more flexible, four ways were identified: be close to the customer (minimize distance), use faster transport modes, build inventory or coordinate better (e.g. postponement or increasing efficiency). The most natural solution is being close to the customers; no extra inventory needs to be built, risk exposure is low, transportation is minimized and the coordination is easy. Using faster modes of transportation was on the other hand not considered an option by the respondents (only 15 percent considered it to be a solution), and neither was building stock which probably is because of increased cost.

Considering that market shift was identified as the second most important external factor in the survey, and the most important external factor in the interviews, it is evident that companies feel forced to be present where the market is growing the most. It is not surprising since it is easier to capture a growing market than to steal market share in a mature one¹⁶⁶¹⁶⁷¹⁶⁸. Keeping that in mind and adding that customers in many developing markets, such as in India and China, require companies to be in proximity¹⁶⁹ companies should strive towards being as regionally present as possible. In addition, when having extensive activities taking place regionally, such as having a regional supplier base, there is a need to be regionally present to overcome cultural barriers and to solve daily deviations and problems¹⁷⁰¹⁷¹.

The third factor, trade regions, was the second most important external factor discussed in the interviews. Many of the interviewed companies stated that in some regions, they would never have built their factories if it was not for the trade barriers in those areas¹⁷²¹⁷³¹⁷⁴¹⁷⁵¹⁷⁶. The companies realized that they could not possibly have been competitive if they would have exported their products to markets inside the trade regions, simply because their products would have been too expensive. Considering that protectionism in many countries has increased, the complexity in handling trade barriers is not likely to

¹⁶⁵ **Focus group participants:**

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Mikael Håkansson, Senior Manager, Operations & Manufacturing & Logistics, Accenture Management Consulting

¹⁶⁶ Johan Karlberg, Senior Executive Accenture, Interviewed 9th of February 2012

¹⁶⁷ Anonymous, VP Manufacturing Company A

¹⁶⁸ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

¹⁶⁹ Manik Karn, Head of Deli Operations Swedish Trade Council, Interviewed 21st of March 2012

¹⁷⁰ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012

¹⁷¹ Per Segerberg, Senior Executive Accenture, Interviewed 11th of February 2012

¹⁷² Anders Lindström, Head of Manufacturing & Logistics Volvo Trucks, Interviewed 20th of March 2012

¹⁷³ Lars Hagström, Senior Advisor Scania, Interviewed 18th of April 2012

¹⁷⁴ Erik Uyttendaele, Vice President MP&L Volvo Cars, Interviewed 20th of March 2012

¹⁷⁵ Cecilia Carlsson, Logistics Development MP&L Volvo Cars, Interviewed 12th of April 2012

¹⁷⁶ Jan Klingberg, Purchasing Director Volvo Trucks, Interviewed 11th of April 2012

decrease significantly in near future. Using a regional supply chain setup is the a very efficient way to overcome these problems¹⁷⁷.

The three above paragraphs argue that the requirements on fast and flexible deliveries will increase, that the market shift will be sustained and that trade regions will increase in size and importance. There is of course a risk that these would not develop as expected. If the market would weaken drastically or if flexibility and speed requirements abruptly decrease, a total regional setup is probably not the most efficient one. On the other hand these changes are not likely to last in the long run, meaning that companies will most likely soon after any crisis be able to leverage on the regional setup once again. Additionally, all non-volume dependent benefits of regionalization will still be present. The risk exposure will be minimum since products are not transported long, high inventories are not needed and the company is close to its customers and can really understand their needs and wants. Additionally, the different regions will inherently work individually, meaning that if a region faces any problems, the others can still prolong.

To summarize the above, the impact of the three mentioned parameters is vast. If companies have the power and the support from strong markets, the benefits from being regionally present are evident. The benefits would though vary from company to company. Additionally, if the parameters would not develop as expected, regionalization is not necessarily the most efficient setup. Many of the clear benefits of regionalization would however still be present.

Implication of segmentation parameters on localization

In the last section it was argued that regionalization is very beneficial in terms of being flexible, meeting customer demands and overcoming trade barriers. Although it might sound as if regionalization is for all, it does require major duplication of resources and thus large volumes and financial strength to be profitable. With the above stated as reason, the implications of the segmentation parameters are discussed below:

In *section 5.3.2* it was seen that high revenue companies as well as suppliers aimed for regionalization. After being discussed thoroughly during the focus group setting (see *section 2.1.5*) it was decided that the recommendations would be the same: given that the company is large or supplier it is recommended to regionalize. Small OEMs however are not recommended to regionalize because of their likely limited financial strength, limited ability to reach economies of scale in all regions, and somewhat lower customer demands. Following are the main reasons covered for the large companies or suppliers to use a Regional Supply Chain Hub (for more information on each argument, refer to *section 5.3.2*)

Suppliers should regionalize because of three main reasons. One: they have higher value add and therefore benefit more from regionalization. Two: they are now increasingly required to do product adaptations and have in many cases extremely high demands on speed, precision and flexibility from the OEM. Three: suppliers often have few and large customers who make it easier for them to reach efficient large volumes close to their customers.

¹⁷⁷ Daniel Szirányi, Senior Manager Accenture, Interviewed 3rd of February 2012

High revenue companies should regionalize for two reasons: One: they have the financial strength to do it. Two: They have enough volumes to reach economies of scale and thus be able to profitably set up Regional Supply Chain Hubs.

Additional internal factor considerations

Naturally, basing recommendations merely on revenue, what tier a company is in and the three scenario parameters do not tell the complete truth. The recommendations are based on those two factors which seemed to have most impact on localization and therefore they were chosen to act as an initial guideline when localizing. In addition to these, companies must consider other factors as well. Below, examples are presented:

Product features. For example, if the product is very small, is of high value and is very complex, the benefits of regionalizing might be limited

Production features. If the production is extremely capital intensive, it might not be economically feasible to duplicate the production facilities

Input items features. If the purchased items have features similar to those mentioned above, regionalizing the supplier base might be hard.

Market features. If there is little market adaptations taking place in the market or if the competition is weak the benefits of regionalization might be limited. Similarly, if the market is weak or volatile, it might be too big a risk involved in duplicating all necessary resources, which a Regional Supply Chain Hub setup requires.

Company goals. If the goals of the company for some reason do not coincide with using a Regional Supply Chain Hub, the setup should not be used.

Additional external factor considerations

The scenario presented in the beginning of this chapter is based on those external factors which were considered most important by the companies themselves. Therefore, in most cases, these will be the factors considered by managers when developing localization business cases. Still, there will naturally be companies that are affected by other external factors to the extent that they are more important than those used in the scenario. One example could be companies with very large products. They are probably very dependent on transportation prices. Recall though, that in the event of rapid price increase, regionalization is still the solution. Another example is companies who rely on high levels of competence. This study has shown that the competence aspect varies from company to company. Some believe it is easier to find competence in other regions, while others consider it to be very hard¹⁷⁸¹⁷⁹. Considering these two examples, companies are recommended to sweep the external factors rank list found in the analysis section (*see section 5.1.3*) and control the importance of them all.

5.4.3 Regionalization & localization framework

Based on the aspects covered in section 1.1 and 1.2, companies revising their footprint strategy are recommended to follow this framework when localizing their supply chain functions (*Figure 75*):

¹⁷⁸ Göran Rydin, Project Manager Metso Paper, Interviewed 2nd of April 2012

¹⁷⁹ Lovisa Söderholm, CPO Direct Material SKF, Interviewed 16th of April 2012



Figure 75: Localization framework

Firstly, the decision makers should identify their position in the recommendations matrix (see *Table 20*). The recommendation should act as basis for the rest of the process. The second step consists of assessing the market, internal- and external factors. Is the market sufficient and showing strong future trends? Are there any internal aspects that could make the base setup invalid? Do any external aspects need to be taken into account? When any problems are solved, the next step is to develop a couple of business cases to assess the economic and competitive impact of the alternatives. When the winning alternative has been selected, the last step is implementation. When implementing, companies can normally chose from one of the following ways: Through a joint venture (most common¹⁸⁰), a merger, an acquisition or a start up from scratch. Since incorporating oneself require much local knowledge and is often very different in many developing countries, some kind of collaboration with a local partner is recommended¹⁸¹ (see *section 3.3.4* for more info on acquiring local knowledge).

To gain the full benefits of regionalization, the following should be in place:

Every region should have at least one factory in place. If there exists a need of more than one setup in one or several regions to meet demands on flexibility and speed, additional factories should be implemented (given that volumes are sufficient). All regional factory setups should strive for being able to produce all products for its specific market region. When this is not possible the market for each product should be assessed and the market with the highest demand should generally be used.

For the supplier base, items should predominantly be sourced from suppliers in the same regions as the various factories. This opens up for flexibility and minimizes risk. For some strategic items, tooling costs can sometimes be so high that multiple sourcing is not possible. In that particular case, one supplier should be used for that one item. Elsewise, high- and low strategic importance items supplier bases should be handled similarly, from a regionalization point of view, with the main difference that items of low strategic importance items should be sourced from inter-regional low cost countries while high strategic importance items should be sourced from developed countries within the region.

There should be R&D activities taking place in every region with a market. In general, core development should be conducted centrally to leverage on competences and protect patents while application development is handled regionally. For those markets which have unique products not supplied elsewhere, total R&D can be conducted regionally. For those companies acting in markets were needs and wants do not differ, and customization and adaptations is not taking place, R&D should be handled in a completely centralized way.

¹⁸⁰ Manik Karn, Head of Deli Operations Swedish Trade Council, Interviewed 21st of March 2012

¹⁸¹ Manik Karn, Head of Deli Operations Swedish Trade Council, Interviewed 21st of March 2012

6 Conclusion

In this section, the conclusions from the study are presented. It starts with discussing the fulfillment of the purpose and answering of the research questions followed by material on the contribution of the study and finally suggestion on future research within the area.

6.1 Conclusion from study

This subsection highlights the main findings and the fulfillment of the purpose and the answering of the research questions. Furthermore, some additional findings and considerations which are not directly related to the research questions are presented.

A broad base of data and considerations regarding the localization of factories, supplier bases, the purchasing organization, the R&D organization as well as the functions and activities of logistics has been provided throughout the study. The focus was on Swedish AIE companies with a global presence. It was found that companies are planning to drastically increase their presence in Asia and South America, increase somewhat in North America while decreasing their presence in Europe in terms of market split.

The data was, when appropriate, divided into segments to add value to the user of the study. All in all, the most prominent finding is that Swedish AIE companies are expecting to change their setups extensively until 2020 as a consequence of growing markets and changing needs.

The research questions presented in *section 1.2* were the following:

RQ1 *What external factors affect supply chain localization decisions and which are most important?*

RQ2 *Which are the most probable supply chain localization strategies the year 2020 and how do they differ between various companies, industries and products?*

RQ3 *In order to remain prosperous in year 2020, what supply chain localization strategies should companies pursue?*

To answer the first research question a set of 18 external factors of localization were identified. These were divided into four groups; market-, risk-, demography- and other factors sorted by importance. The individual factors were also ranked based on the respondents' opinions. The five most important factors found in the survey were fast and flexible deliveries, market shift, supplier problems, market growth and increasing transportation prices. In addition to those, trade regions were identified as the most important external factor in the interviews. Some differencing opinions were found between the segments. Firstly, large companies tended to score higher in total. Secondly, large companies tended to give more emphasis to factors such as ease of establishment and local knowledge compared to the smaller companies. Also, the large suppliers scored higher on external risk factors.

To answer the second research question a set of possible strategies of localization was derived for each function in the study. The main findings were that the functions of manufacturing, purchasing (supplier base) and R&D are expected to be significantly more regionalized than not in 2020. This is a huge finding since it implies major duplication, not only of factories but also suppliers. Correspondingly, the supplier base was found to be mostly regional. This indicates the end of global sourcing, which has been very

common the last decades. In addition, about half of all responding companies believe that they will need more factories until 2020. In total, about every second company believes that they will have a complete regional setup, what in this project is referred to as a Regional Supply Chain Hub.

To answer the third research question and to lead companies in the right localization direction a localization framework was designed. The output from the first two research questions was used as input for the recommendations. The framework concluded that as long as a company does not have products or purchased items of unique characteristics, too complex production or competing in a market with exceptional features, it should regionalize. This given that it is a supplier and/or has revenue above 30 billion SEK annually.

Market factors were as stated above highlighted as the most important external factors, and companies believed that they will have to be able to provide more flexibility and speed in the future. Actually, 96 percent believed that the demands will increase and about the same will improve their processes to meet those. Surprisingly, very few are willing to build inventory or use faster modes of transportation to achieve this. Rather they favor dispersed production and supplier bases which are exactly what regionalization implies.

Moreover, risk was identified as the second most important group of external factors, meaning that it is on top of decision makers' minds. To mitigate risk dispersed production and supplier base setups should be used. However, inventory building and speculation strategies are not considered as options.

The starting hypothesis of the project was: "*Global supply chains tend to move towards regional supply chain hubs*". The conclusion is that the hypothesis is true and companies do tend to move towards regional supply chain hubs. Until 2020, 43 percent of the companies in the sample will be there already. Many more will use a regional setup for one or two out of three possible functions.

To summarize, both suppliers and large companies are recommended to consider a regional localization approach. Furthermore, companies design their localization decisions to a large extent based on demands on flexibility, market characteristics and trade regions. When it comes to strategies, more companies will regionalize their functions than not and about half of will build one or more factories until 2020.

6.2 Summary of contributions

As mentioned in *section 1.1.1*, there existed a clear gap in the localization research. Few studies have been conducted taking all supply chain related functions into account. This has led to fragmented material, not taking interconnections into consideration. Furthermore, no studies have been conducted taking into consideration the context in which Swedish manufacturing companies act. Swedish companies are known for their high levels of innovation, quality and service, not for their low price, which sets requirements on the setups.

This study has contributed to the holistic view of localization for Swedish AIE companies that did not previously exist. The study will thus be able to guide companies in their strategic footprint work.

6.3 Future research

The holistic approach mentioned in the last subsection shows that this study helps connect the different functions of a producing company. It presents overall solutions to footprint design, but do not consider

any of them into depth. A suggestion on future research is therefore to take this framework and develop and add a more tactical and operational approach which can take the unique company's characteristics into account in a more thorough manner.

Furthermore the localization framework does not take the present state or the path to the future state into consideration. Therefore, an additional suggestion for future research is to create a transformation framework, to help companies reach their future, regional setup.

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Appendix A: Segmentation

A Chi-square test was used and the break point was in the cases of more than two parameters moved between them until the best significance was reached. For example: When having four factors on a scale the test was conducted as: factor one versus factor two to four and then factor one and two versus factor three and four and finally factor one to three versus factor four. For the exact phrasing and answer alternatives of the questions *see Appendix C*.

Question	Significance	Break point with best significance
Reporting to a higher officer within function?	0,504	N/A
PLC	0,594	Between 2 and 3 years
Number of current markets	0,516	Between 2 and 3 markets
Number of future markets	0,465	Between 2 and 3 markets
Are you able to move production?	0,679	N/A
Unique products for different markets?	0,819	Between alternative 1 and alternative 2
Base of production?	0,126	Between modules and components
Restructurings	0,208	Between small and fairly big restructurings
Revenue	0,029	30 BSEK
Automotive vs. Industrial Equipment	0,001	N/A
OEM vs. Supplier	0,021	N/A
EBIT	0,111	10%
Function (Manufacturing vs. Purchasing only)	0,591	N/A
Product size	0,247	Small vs. All

The three highlighted factors above are each tested against the others are found below. The number in each square corresponds to the significance found by comparing that particular segment with the remaining three. The goal was to find the combination that resulted in the lowest significance in all squares.

Automotive vs. Industrial Equipment tested against high and low revenue

Automotive	0.001	0.486
Industrial Equipment	0.000	0.044
	Revenue below 30 BSEK	Revenue above 30 BSEK

Supplier vs. OEM tested against high and low revenue

Supplier	0.178	0.020
OEM	0.001	0.252
	Revenue below 30 BSEK	Revenue above 30 BSEK

Automotive vs. Industrial Equipment tested against supplier vs. OEM

Automotive	0.000	0.731
Industrial Equipment	0.731	0.013
	Supplier	OEM

Appendix B: External factor normalization and calculation

$$\frac{\frac{\text{driver rank}}{\text{number of drivers within group}} * \text{group value} - \frac{1}{\text{number of drivers within group}}}{\text{number of drivers within group} - \frac{1}{\text{number of drivers within group}}} * 4 + 1$$

The external factor scores were transformed to a percentage scale in the following manner. The biggest external factor was given a value of 100 percent and the lowest ranking factor was given the value of 0 percent. The ones in between were given a score according to the formula below:

$$\text{External factor} = \frac{\text{External factor score} - \text{Min ranking factor score}}{\text{Max ranking factor score} - \text{Min ranking factor score}}$$

Appendix C: Survey questions

Survey page 1: “Internal Factors” (answered by all participants)

1. How long is the product life cycle for the majority of your company’s products (i.e. how long does it take before they are considered obsolete or major changes are made)?
 - a. <1 year
 - b. 1-2 years
 - c. 3-5 years
 - d. 6-10 years
 - e. >10 years
2. Where is currently the market of your company located in approximate numbers (based on revenue)?
 - a. 0-5%
 - b. 5-25%
 - c. 26-50%
 - d. 51-100%(For Asia, Europe, North- and South America respectively)
3. Where do you think your company’s market will be in the year 2020 in approximate numbers (based on revenue)?
 - a. 0-5%
 - b. 5-25%
 - c. 26-50%
 - d. 51-100%(For Asia, Europe, North- and South America respectively)
4. Can the manufacturing of your products currently be moved between different company-owned production facilities?
 - a. Yes
 - b. No
5. Are unique product groups currently being offered to different market regions (e.g. Europe and Asia)?
 - a. The same products are offered in the same design to all markets
 - b. The same products are offered but they are adapted to fit the needs of the local market
 - c. Completely different products are offered to the different markets
6. What is mainly the point of departure for the production for your company?
 - a. Raw material
 - b. Components
 - c. Modules
7. Through which of the following is your company creating value for its customers? (Select a maximum of 3):
 - a. Low price
 - b. Strong brand
 - c. Innovation
 - d. Design
 - e. High service (e.g. possibility to customize)

Survey page 2: External factors of localization (answered by all participants)

1. How is localization affected by the following market related factors? (please rank; 1 is most important)
 - a. Increased global market for your product
 - b. Relocation of the market size for your product (e.g. greater sales increase in Asia than in Europe)
 - c. Increased demand on fast and flexible deliveries
 - d. Stronger trade regions (lowered tariffs within the region but maintained tariffs towards the outside)
2. How is localization affected by the following risk related factors? (please rank; 1 is most important)
 - a. Increasing transportation prices
 - b. Currency fluctuations
 - c. Political risk
 - d. Natural disasters
 - e. Supplier problems (e.g. quality problems or supply disruption)
3. How is localization affected by the following demography related factors? (please rank; 1 is most important) (only answered by production- and purchase managers)
 - a. Decreased wage arbitrage
 - b. Decreased productivity arbitrage
 - c. Increased availability of specific competence in other parts of the world than today
4. How is localization affected by the following other factors? (please rank; 1 is most important)
 - a. Ease of establishment
 - b. Local knowledge
 - c. New IT solutions that enable easier information exchange
 - d. Increased focus on "Corporate Social Responsibility"
 - e. Regional environmental regulations (e.g. the environmental regulations of the European Union)
 - f. Global environmental regulations (e.g. the Kyoto protocol)
5. How important are the above mentioned factors for your company regarding localization?
 - a. Market related factors
 - b. Risk related factors
 - c. Demography related factors
 - d. Other factors(Scale from 1-5)

Survey page 3: Manufacturing related questions (only answered by production managers)

1. Do you think your company will need more factories 2020?
 - a. Yes
 - b. No
2. Which type of production place do you think your company should use for the following market respectively 2020?
 - a. No market
 - b. Predominantly in a developed country within region Europe
 - c. Predominantly in a developed country outside region North America
 - d. Predominantly in low cost country within region South America
 - e. Predominantly in low cost country outside region
(For Asia, Europe, North- and South America respectively)
3. Will your company strive for more flexible facilities to be able to increase the ability to move production between factories 2020?
 - a. Yes
 - b. No
4. Specify where you think the factories' supplier base should be placed in 2020 based on purchased value.
 - a. Predominantly within the factory's region
 - b. Predominantly outside of the factory's region
5. Will unique product groups be offered for different market regions (e.g. Europe or Asia) 2020?
 - a. The same products will be offered in the same design to all markets
 - b. The same products will be offered but are adapted to fit the needs of the local market
 - c. Completely different products will be offered to the different markets
6. Where do you think the R&D organization should be placed 2020?
 - a. Central R&D in a developed country
 - b. Central R&D in a developed country with some R&D regionally
 - c. Central R&D in a low cost country
 - d. Central R&D in a low cost country with some R&D regionally
 - e. Regional R&D
7. How important do you think it is to keep R&D 2020 close to the following?
 - a. Production
 - b. The market
 - c. Suppliers
 - d. Headquarters

(1-5 scale on each)
8. Considering your company's current set-up, how much restructuring would questions 1-7 above imply?

(scale from 1 to 5)

Survey page 3: Purchasing related questions (only answered by purchasing managers)

1. For purchased items of high strategic importance, where to you think the supplier base should mainly be placed for factories in the following regions 2020?
 - a. No production Asia
 - b. Predominantly in a developed country within region
 - c. Predominantly in a developed country outside region
 - d. Predominantly in low cost country within region
 - e. Predominantly in low cost country outside region
(For Asia, Europe, North- and South America respectively)
2. For purchased items of low strategic importance, where to you think the supplier base should mainly be placed for factories in the following regions 2020?
 - a. No production Asia
 - b. Predominantly in a developed country within region
 - c. Predominantly in a developed country outside region
 - d. Predominantly in low cost country within region
 - e. Predominantly in low cost country outside region
(For Asia, Europe, North- and South America respectively)
3. How do you think the purchasing organization should be designed 2020? (Centralized: strategic matters are handled centrally; Decentralized: Strategic matters are handled regionally)
(5 grade scale from centralized to decentralized)
4. If you in the last question stated that the purchasing organization should be at all centralized, which should be prioritized when placing the organization?
 - a. The headquarters
 - b. The supplier base
 - c. The market
 - d. The production
 - e. Other
5. If you in the last question stated that the purchasing organization should be at all decentralized, in which of the following regions do you think offices should be implemented? (observe that this concerns strategic matters, not call-offs or similar)
 - a. Asia
 - b. Europe
 - c. North America
 - d. South America
6. Where do you think the R&D organization should be placed 2020?
 - a. Central R&D in a developed country
 - b. Central R&D in a developed country with some R&D regionally
 - c. Central R&D in a low cost country
 - d. Central R&D in a low cost country with some R&D regionally
 - e. Regional R&D
7. How important do you think it is to keep R&D 2020 close to the following?
 - a. Production
 - b. The market

- c. Suppliers
 - d. Headquarters
(1-5 scale on each)
8. Considering your company's current set-up, how much restructuring would questions 1-7 above imply?
(scale from 1 to 5)

Survey page 3: Logistics related questions (only answered by logistics managers)

1. Please specify how you think the logistics flows should be optimized in your company year 2020.
(Central optimization = optimization of the logistics flow are handled centrally; Regional optimization = optimization of the logistics flow are handled regionally)
 - a. Transport optimization
 - b. Production optimization
 - c. Forecasting
(5 grade scale from Central- to regional optimization)
2. In the following regions, how do you think the deliveries from factory to customer should be handled year 2020?
 - a. No market
 - b. Direct delivery (factory to customer)
 - c. Through a regional warehouse that supply's its own region
 - d. Through a central warehouse that supply's more than one region
(For Asia, Europe, North- and South America respectively)
3. Which of the following activities do you think should be outsourced to external actors year 2020?
(several answers are possible):
 - a. Nothing should be outsourced
 - b. Inventory management
 - c. Sales
 - d. Transportation
 - e. Customs clearance
 - f. Gathering of customer data
4. How do you think your customers' need for faster and more flexible deliveries should be handled year 2020? (several answers are possible)
 - a. Inventory close to customers
 - b. Make final product modifications close to the customer
 - c. Use faster freight modes (e.g. air instead of sea)
 - d. Better coordination with suppliers and distributors
 - e. It is unfortunately not possible to meet the increasing demands
5. What activities should be used to identify and mitigate risks within the company's supply chain year 2020? (several answers are possible)
 - a. Bring home production (in-house)
 - b. Use both local and global production
 - c. Source from contingent suppliers and/or logistics providers

- d. Increase inventory levels and safety stock
 - e. Use a geographically dispersed production
 - f. Use a formal risk management team
 - g. Use forward buying/hedging strategies
 - h. Other strategies should be used
 - i. We will not explicitly work with risk
6. Considering your company's current set-up, how much restructuring would questions 1-5 above imply?
(scale from 1 to 5)

Appendix D: Segmented external factor importance

	Segment 1	Segment 2	Segment 3	Segment 4
Speed & flexibility	71%	66%	58%	73%
Market shift	63%	60%	100%	68%
Supplier problems	64%	63%	74%	68%
Market growth	59%	58%	68%	60%
Transportation prices	56%	58%	54%	63%
Ease of establishment	42%	51%	67%	52%
Currency volatility	42%	44%	54%	50%
Wage arbitrage	36%	40%	37%	50%
Local knowledge	36%	37%	56%	47%
Productivity arbitrage	41%	32%	31%	45%
Political risk	34%	34%	31%	31%
Competence availability	37%	28%	11%	37%
Trade regions	24%	32%	16%	33%
New IT solutions	26%	30%	28%	27%
CSR	26%	21%	52%	22%
Regional green laws	26%	15%	22%	18%
Global green laws	13%	9%	0%	11%
Natural disasters	12%	8%	5%	10%

Appendix E: Statistical tests

Test #	Group	Parameter	Data type	Sample type	Test type	Significance
1	Sample description	Reporting to higher officer	Categorical	One-sample	Binomial	0.237
2	Sample description	High rev. companies present in more regions	Interval	Independent	t-test	0.000
3	Sample description	OEM companies present in more regions	Interval	Independent	t-test	0.275
4	Sample description	Companies with large products are mainly OEM's	Categorical	Independent	Chi-Square	0.000
5	Sample description	Companies with medium products are mainly suppliers	Categorical	Independent	Chi-Square	0.014
6	Sample description	Medium sized products are most common for Swedish AIE companies	Categorical	Related	McNemar	
		Medium vs. Small				0.001
		Medium vs. Large				0.046
7	Sample description	More companies can move production between facilities than not	Categorical	One-sample	Binomial	0.002
8	Sample description	A product life cycle higher than 6 years is most common	Categorical	One-sample	Binomial	0.000
9	Internal factor	Market split will change in all markets	Interval	Related	t-test	0.000
		Market split will increase in Asia				0.000

		Market split will decrease in Europe				0.000
		Market split will increase in North America				0.078
10	Internal factor	Market split will increase in South America	Interval	Related	t-test	0.000
11	Internal factor	OEM companies have shorter PLC than supplier	Interval	Independent	t-test	0.342
12	Internal factor	Swedish AIE companies do not compete on price	Categorical	Related	McNemar	
		Price vs. Brand				0.000
		Price vs. Innovation				0.000
		Price vs. Design				0.000
		Price vs. Service				0.000
13	Internal factor	Components are the most common point of departure of production	Categorical	Related	McNemar	
		Components vs. Raw material				0.001
		Components vs. Modules				0.000
14	Internal factor	Modules are the least common point of departure of production	Categorical	Related	McNemar	
		Modules vs. Raw material				0.007
		Modules vs. Components				0.000
15	Internal factor	Companies do adapt their product to some extent more frequently than they do not	Categorical	One-sample	Binomial	0.000
16	Internal factor	OEM companies adapt more to	Categorical	Independent	Chi-square	0.000

		some extent than do supplier				
17	External factors	Differences found between segment 1 and segment 2	Interval	Independent	t-test	No differences found
18	External factors	Differences found between segment 1 and segment 3	Interval	Independent	t-test	
		Increased market higher for 3				0.072
		Supplier problems higher for 3				0.068
		Ease of establishment higher for 3				0.024
19	External factors	Differences found between segment 1 and segment 4 Natural disasters higher for 1	Interval	Independent	t-test	0.081
20	External factors	Differences found between segment 2 and segment 3	Interval	Independent	t-test	
		Increased market higher for 3				0.052
		Trade regions higher for 2				0.074
		Supplier problems higher for 3				0.072
		Wage arbitrage higher for 2				0.069
		Ease of establishment higher for 3				0.021
		IT higher for 2				0.075
21	External factors	Differences found between segment 2 and segment 4	Interval	Independent	t-test	No differences found
22	External factors	Differences found between segment 3 and segment 4	Interval	Independent	t-test	

		Increased market higher for 3				0.058
23	External factors	Trade regions higher for 4				0.071
		Difference with overall importance of external factors per segment	Interval	Independent	t-test	
		1 & 2				0.726
		1 & 3				0.382
		1 & 4				0.217
		2 & 3				0.343
		2 & 4				0.154
		3 & 4				0.990
		High- & low revenue higher for high rev				0.074
		OEM & supplier				0.663
24	External factors	Difference in importance of external market factors per segment	Interval	Independent	t-test	
		1 & 2 higher for 1				0.286
		1 & 3 higher for 3				0.613
		1 & 4 higher for 4				0.461
		2 & 3 higher for 3				0.210
		2 & 4 higher for 4				0.845
		3 & 4 higher for 4				0.291
		High- & low revenue higher for high rev				0.830

		OEM & supplier higher for OEM				0.158
25	External factors	Difference in importance of external risk factors per segment	Interval	Independent	t-test	
		1 & 2 higher for 1				0.475
		1 & 3 higher for 3				0.079
		1 & 4 higher for 4				0.832
		2 & 3 higher for 3				0.088
		2 & 4 higher for 4				0.419
		3 & 4 higher for 3				0.106
		High- & low revenue higher for high rev				0.205
		OEM & supplier higher for Supplier				0.365
26	External factors	Difference in importance of external demography factors per segment	Interval	Independent	t-test	
		1 & 2 higher for 1				0.113
		1 & 3 higher for 1				0.954
		1 & 4 higher for 4				0.167
		2 & 3 higher for 2				0.336
		2 & 4 higher for 4				0.784
		3 & 4 higher for 4				0.234
		High- & low revenue higher for high				0.617

		rev				
27	External factors	OEM & supplier Higher for OEM Difference in importance of other external factors per segment	Interval	Independent	t-test	0.049
		1 & 2 higher for 1				0.337
		1 & 3 higher for 3				0.589
		1 & 4 higher for 4				0.215
		2 & 3 higher for 3				0.348
		2 & 4 higher for 4				0.057
		3 & 4 higher for 3				0.752
		High- & low revenue higher for high rev				0.024
		OEM & supplier higher for Supplier				0.445
28	External factors	A significance is found between the fifth and sixth external factor	Interval	Related	t-test	0.084
29	External factors	Competence availability is lower than the fifth factor; increased transportation prices	Interval	Related	t-test	0.000
30	External factors	Local knowledge is lower than the fifth factor; increased transportation prices	Interval	Related	t-test	0.000
31	External factors	CSR is lower than the fifth factor; increased transportation prices	Interval	Related	t-test	0.000

32	External factors	Regional green laws is lower than the fifth factor; increased transportation prices	Interval	Related	t-test	0.000
33	External factors	Global green laws is lower than the fifth factor; increased transportation prices	Interval	Related	t-test	0.000
34	External factors	Purchasers consider risk to be more important of localization than production and logistics managers	Interval	Independent	t-test	0.852
35	External factors	Market factors are more important than risk factors	Interval	Related	t-test	0.000
36	External factors	Risk factors are more important than demography factors	Interval	Related	t-test	0.000
37	External factors	Demography factors are more important than other factors	Interval	Related	t-test	0.065
38	Strategies	More flexible units 2020	Categorical	Independent	Chi-square	
		1 & 2, higher for 2				0.074
		1 & 4, higher for 4				0.435
39	Strategies	More factories 2020	Categorical	Independent	Chi-square	
		1 & 2, higher for 2				0.123
		1 & 4, higher for 4				0.960
		2 & 4, higher for 2				0.168
		More for OEM				0.172

40	Strategies	Approximately 50% of companies consider themselves to require more factories 2020 compared to today	Categorical	One-sample	Binomial	0.719
41	Strategy	Low revenue OEM companies require more factories 2020 compared to other segments	Categorical	Independent	Chi-square	0.055
42	Strategy	Low revenue companies require more factories 2020 than do others	Categorical	Independent	Chi-square	0.242
43	Strategy	Approximately every second AIE company aims for market specific production	Categorical	One-sample	Binomial	0.544
44	Strategy	2020 regional manufacturing, sourcing and R&D will be the most common setup for factories for global companies	Categorical	One-sample	Binomial	
		Factory regionalization				0.041
		High strategy items supplier base				0.003
		Low strategy items supplier base				0.043
		R&D				0.000
45	Strategy	Companies will in general aim for more flexible manufacturing units in 2020 to be able to move production between facilities	Categorical	One-sample	Binomial	0.000
46	Strategy	Companies will in 2020 aim for maintaining locally adapted and unique products	Categorical	One-sample	Binomial	0.000
47	Strategy	Companies will aim at higher levels of locally adapted or unique	Categorical	Independent	McNemar	0.625

products 2020 compared to 2012						
48	Strategy	Companies believe that 2020, it is less important to place R&D close to the headquarters compared to production facilities, the market and the suppliers	Interval	Related	t-test	
		R&D close to production				0.000
		R&D close to market				0.000
		R&D close to supplier				0.000
49	Strategy	More future regional companies will go through high restructurings to meet their localization goals than those which will not	Categorical	Independent	Chi-square	0.105
50	Strategy	Companies consider the closeness or market and central purchase organization to be least important followed by the supplier base, production and headquarters	Categorical	Related	McNemar	
		Market vs. HQ				0.007
		Market vs. Supplier base				0.109
		Market vs. Production				0.039
51	Strategy	High strategic importance items are generally sourced from developed countries	Categorical	Related	McNemar	
		Developed vs. Low cost				0.216

		Developed vs. 50/50				0.021
52	Strategy	Portion of decentralized purchase offices per region	Categorical	Related	McNemar	
		Europe vs. Asia, higher Eur.				0.035
		Europe vs. North America, higher Eur.				0.000
		Europe vs. South America, higher Eur.				0.001
		Asia vs. North America, Asia higher				0.125
		Asia vs. South America, Asia higher				0.063
53	Strategy	Regional supplier base by manufacturers	Categorical	Independent	Chi-square	
		1 & 2, higher for 1				0.252
		1 & 4, higher for 4				0.671
		2 & 4, higher for 4				0.149
		High & low rev, higher for high rev				0.197
		OEM & Supplier, higher for supplier				0.430
54	Strategy	Regional supplier base is more favored than non-regional	Categorical	One-sample	Binomial	0.009
55	Strategy	High strategic importance items are generally sourced more frequently in developed countries than for low strategic importance items	Categorical	Related	McNemar	0.001
56	Strategy	Low strategic importance items are generally sourced from low cost	Categorical	Related	McNemar	

		countries				
		Low cost vs. 50/50				0.000
		Low cost vs. Developed				0.000
57	Strategy	Faster freight modes is the least favorable way to reach faster deliveries and more flexibility	Categorical	Related	McNemar	
		Faster transports vs. higher inventory levels				0.031
		Faster transports vs. better coordination between Suppliers and distributors				0.000
		Faster transports vs. postponement				0.006
58	Strategy	Better coordination is the most favorable was to reach faster and more flexible deliveries	Categorical	Related	McNemar	
		Better coordination between Suppliers and distributors vs. faster transports				0.000
		Better coordination between Suppliers and distributors vs. higher inventory levels				0.004
		Better coordination between Suppliers and distributors vs. postponement				0.077
59	Strategy	Dispersed production and supplier base is the most favorable option to identify and mitigate risks	Categorical	Related	McNemar	
		Dispersed production vs. In-house				0.008

		production				
		Dispersed production vs. contingent suppliers				0.001
		Dispersed production vs. increased inventory levels				0.000
		Dispersed production vs. formal risk management team				0.001
		Dispersed production vs. speculation				0.000
		Dispersed production vs. other strategies				0.008
		Dispersed supplier base vs. In-house production				0.096
		Dispersed supplier base vs. Contingent suppliers				0.021
		Dispersed supplier base vs. Increased inventory levels				0.000
		Dispersed supplier base vs. formal risk management team				0.021
		Dispersed supplier base vs. speculation				0.001
		Dispersed supplier base vs. other strategies				0.096
60	Strategy	Speculation and increased inventories are the least favorable ways to identify and mitigate risks	Categorical	Related	McNemar	
		Speculation vs. In house production				0.070

		Speculation vs. Dispersed production				0.000
		Speculation vs. Contingent suppliers				0.219
		Speculation vs. Dispersed supplier base				0.001
		Speculation vs. Formal risk management team				0.219
		Speculation vs. Other strategies				0.070
		Increased inventory levels vs. In-house production				0.070
		Increased inventory levels vs. Dispersed production				0.000
		Increased inventory levels vs. Contingent suppliers				0.219
		Increased inventory levels vs. Dispersed supplier base				0.000
		Increased inventory levels vs. Formal risk management team				0.219
		Increased inventory levels vs. Other strategies				0.070
61	Strategy	There is a difference between regionalizing the supplier base for high- and low strategic items	Categorical	Related	McNemar	0.388
62	Strategy	Those not needing new factories have higher EBIT	Interval	Independent	t-test	0.489

63	Strategy	Those with much markets have higher EBIT	Interval	Independent	t-test	
		1 vs. 2,3,4				0.011
		1+2 vs. 3+4				0.000
		1+2+3 vs. 4				0.009
64	Strategy	Those with high upcoming restructurings have higher EBIT	Interval	Independent	t-test	0.107
65	Strategy	Those that can move production have higher EBIT	Interval	Independent	t-test	0.012
66	Strategy	Companies with medium products will regionalize more	Categorical	Independent	Chi-square	0.000
67	Strategy	Those competing on service wants to regionalize more	Categorical	Independent	Chi-square	0.542
68	Strategy	OEM's adapt more 2012	Categorical	Independent	Chi-square	0.000
69	Strategy	OEM's adapt more 2020				0.773
70	Strategy	Companies using raw material as input will regionalize more	Categorical	Independent	Chi-square	0.437
71	Strategy	Companies using modules as input will regionalize less	Categorical	Independent	Chi-square	0.126
72	Strategy	Suppliers will regionalize their factory setup more than	Categorical	Independent	Chi-square	0.010
73	Strategy	High revenue companies will regionalize their factory setup more than	Categorical	Independent	Chi-square	0.766
74	Strategy	Suppliers will regionalize their R&D setup more than	Categorical	Independent	Chi-square	0.773

75	Strategy	High revenue companies will regionalize their R&D setup more than	Categorical	Independent	Chi-square	0.704
76	Strategy	For low strategic items and high revenue companies the supplier base is more regional	Categorical	Independent	Chi-square	0.094
77	Strategy	For low strategic items and suppliers the supplier base is more regional	Categorical	Independent	Chi-square	0.189
78	Strategy	For high strategic items and high revenue companies the supplier base is more regional	Categorical	Independent	Chi-square	0.071
79	Strategy	For high strategic items and OEM's the supplier base is more regional	Categorical	Independent	Chi-square	0.377
80	Strategies	Those aspiring for regionalization will need to add more factories than those which will not	Categorical	Independent	Chi-square	0.381
81	Strategies	Restructurings needed until 2020	Interval	Independent	t-test	
82	Strategies	Companies aspiring for factory regionalization need more restructurings than those who will not	Categorical	Independent	Chi-square	0.006
83	Strategies	Developed countries are used more for high strategic importance items than low cost countries	Categorical	Independent	Chi-square	0.088
84	Strategies	Low cost countries are used more for low strategic importance items than developed countries	Categorical	Independent	Chi-square	0.052

85	Strategies	Companies aspiring for a regional supplier base for low strategic importance items will need more restructurings than those which will not	Categorical	Independent	Chi-square	0.117
86	Strategies	Companies aspiring for a regional supplier base for high strategic importance items will need more restructurings than those which will not	Categorical	Independent	Chi-square	0.278
87	Strategies	Companies aspiring for regional adaptations and complete regional R&D will need more restructurings than those which will not	Categorical	Independent	Chi-square	0.316
88	Strategies	OEM's use components and modules more frequently as basis for production than supplier	Categorical	Independent	Chi-square	0.001
89	Strategies	Companies aspiring factory regionalization will need more factories than those which will not	Categorical	Independent	Chi-square	0.680
90	Strategies	Direct delivery differences between regions	Categorical	Related	McNemar	
		Eur. vs. Asia, Eur. higher				0.289
		Eur. vs. North America, Eur. higher				0.039
		Eur. vs. Asia, Eur. higher				0.004
		Asia vs. South America, Asia higher,				0.063
91	Strategies	Regional warehouse differences between regions	Categorical	Related	McNemar	

		Eur. vs. North America				0.065
92	Strategies	Outsourcing differences	Categorical	Related	McNemar	
		Trp. Vs. customs				0.063
		Trp. vs. warehousing				0.000
		Trp. vs. collection of customer data				0.000
		Trp vs. Sales				0.000
		Sales vs. customs				0.000
		Sales vs. warehousing				0.012
		Sales vs. collection of customer data				0.070
93	Strategies	Less than every second respondent consider building inventory as an option to meet flexibility.	Categorical	One-sample	Binomial	0.327
94	Strategies	Companies with regional R&D setup need more restructurings than do companies with hybrid R&D setup.	Categorical	Independent	Chi-square	0.172
95	Strategies	Companies with regional R&D setup need more restructurings than do companies with central R&D setup.	Categorical	Independent	Chi-square	0.310
96	Strategies	For items of high strategic importance, companies using a regional supplier base require more restructurings than do companies using a global supplier base	Categorical	Independent	Chi-square	0.152

97	Strategies	For items of high strategic importance, companies using a global supplier base and are in segment 2 require more restructurings than do companies in segment 1	Categorical	Independent	Chi-square	0.134
98	Strategies	For items of high strategic importance, companies using a global supplier base and are in segment 2 require more restructurings than do companies in segment 3	Categorical	Independent	Chi-square	0.134
99	Strategies	For items of high strategic importance, companies using a global supplier base and are in segment 2 require more restructurings than do companies in segment 4	Categorical	Independent	Chi-square	0.134
100	Strategies	For items of high strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 1	Categorical	Independent	Chi-square	0.502
101	Strategies	For items of high strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 3	Categorical	Independent	Chi-square	0.782
102	Strategies	For items of high strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 4	Categorical	Independent	Chi-square	0.205

103	Strategies	For items of low strategic importance, companies using a regional supplier base require more restructurings than do companies using a global supplier base	Categorical	Independent	Chi-square	0.344
104	Strategies	For items of low strategic importance, companies using a regional supplier base and have a high revenue require more restructurings than do companies with a low revenue	Categorical	Independent	Chi-square	0.338
105	Strategies	For items of low strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 1	Categorical	Independent	Chi-square	0.699
106	Strategies	For items of low strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 3	Categorical	Independent	Chi-square	0.913
107	Strategies	For items of low strategic importance, companies using a regional supplier base and are in segment 2 require more restructurings than do companies in segment 4	Categorical	Independent	Chi-square	0.424
108	Strategies	Factory setup	Categorical	One-sample	Binomial	
		Developed vs. LCC factories				0.013
		Within vs. outside region				0.000

109	Strategies	Supplier base setup	Categorical	One-sample	Binomial	
		For high strategic importance items, sourcing mainly take place from developed countries				0.361
		For high strategic importance items, sourcing mainly take place from suppliers within the region				0.000
		For low strategic importance items, sourcing mainly take place from developed countries				0.045
		For low strategic importance items, sourcing mainly take place from suppliers within the region				0.000
110	Methodology	The same amount of companies in the metal industry has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,146
		The same amount of companies in the machine manufacturing industry has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,224
		The same amount of companies in the automotive industry has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,767
		The same amount of companies in the electrical component industry has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,587
		The same amount of companies in	Categorical	Independent	Chi-square	0,226

		in other IE industries has responded to the survey as exist in the entire population				
111	Methodology	The same amount of companies with a revenue of 0,5-1BSEK has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0.709
		The same amount of companies with a revenue of 1-5BSEK has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,314
		The same amount of companies with a revenue of 5-50BSEK has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	0,804
		The same amount of companies with a revenue of above 50BSEK has responded to the survey as exist in the entire population	Categorical	Independent	Chi-square	1,000
112	Strategy	OEM's use more direct delivery than suppliers	Categorical	Independent	Chi-square	0.604