IT in Supplier Portfolio Management

Utilisation and Influence Case Studies in the Automotive Industry

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Abstract

The purpose of this study is to gain a better understanding of how IT is utilised in supplier portfolio management in the automotive industry and how SPM in influenced by IT. This study explains and describes how the management of suppliers that deliver parts that go directly in to the final product in the automotive industry can be characterised and how IT is used to support it. Furthermore, the influence of information technologies on the management of these suppliers in the automotive industry is investigated. Therefore, two case studies with two leading European car manufacturers were conducted. The main conclusion this study shows it that information technologies are in this context mainly used to support supplier management by automating processes and to make good communication and effective supply chain management possible.
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Acronyms:

ASP: Application Service Provider  
B2B: Business-to-Business  
CAD: Computer Aided Design  
CPM: Critical Path Method  
DSS: Decision Support System  
EBS: Enterprise Business System  
EDI: Electronic Data Interchange  
EFT: Electronic Fund Transfer  
ERP: Enterprise Resource Planning  
ESI: Early Supplier Involvement  
FMEA: Failure Mode Effect Analyse  
GIS: Global Information System  
MRO: Maintenance, Repair and Operation  
MRP: Material Planning System  
ICT: Information Communication Technology  
IOS: Inter-Organisational System  
ISP: Internet Service Provider  
IT: Information Technology  
JIT: Just In Time  
LOPA: Logistic Process Analysis  
LQS: Logistic Quality Specialist  
MPL: Material Planning Logistic  
OEM: Original Equipment Manufacturer  
PDM: Product Data Management  
PERT: Program Evaluation and Review Technique  
PFP: Parts for Final Product  
PSM: Purchase and Supply Management  
R&D: Research and Development  
RFQ: Request For Quota  
SC: Supply Chain  
SCM: Supply Chain Management  
SPM: Supplier Portfolio Management  
SPQM: Supplier Parts Quality Management  
SRM: Supplier Relationship Management  
e-SRM: Electronic Supplier Relationship Management  
SUMIS: Supplier Management Information System  
XES: eXtended Enterprise System
1 Chapter One: Introduction and Research Problem

In the first chapter the reader will be provided with the background of our study and introduced to the research area. We will furthermore discuss the problem area and finally present the research problem of this thesis.

1.1 Introduction and Background

According to Szejczewski and Goffin (2001) Supply Chain Management (SCM) has received a lot of attention during the last 20 years from both practitioners and academics. Furthermore, Ross (2003) states that SCM has risen to be perhaps today’s most critical business strategic paradigm.

Handfield and Nichols (1999) break the concept of Supply Chain Management down into two areas, namely Supply Chain and Supply Chain Management. They define the supply chain as “all activities associated with the flow and transformation of goods from the raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the supply chain.” Figure 1.1 gives an example of a supply chain. As shown in figure 1.1 there is one consumer (or end-customer) and at least one supplier in every supply chain. The goal is to proactively plan and coordinate the flow of products, services, and information among connected companies focusing on creating and delivering value to the end consumer (Scannel et al., 2000). To this end, all organisations in one supply chain work together to serve the consumer (end-customer) and are rather competing against other supply chains than other companies (Laumer, 2000).

![Supply Chain Diagram](image)

**Figure 1.1: Partly integrated supply chain, by Hill (2000), adapted by the authors**

The management discipline that belongs to the supply chain is called Supply Chain Management (SCM) and is defined (connected to the SC definition above) by Handfield and Nichols (1999) as “the integration of these activities through improved supply chain relationships to achieve a sustainable competitive advantage”. As it can be clearly seen from this definition SCM deals with maintaining and improving supply chain relationships. For a company an important aspect that lies under the SCM term is how to manage its suppliers and purchase function. A five percent reduction in procurement cost, for example, can contribute to as much as 50 percent improvements overall (Ross, 2003).

To have a well working Purchase and Supply Management (PSM) function can be necessary if a company’s goal is to develop and maintain an effective supply chain. As Zsidisin and Ellram (2001) state for companies to truly embrace a supply chain philosophy strong relationships with critical links are necessary. They believe that PSM serves as that boundary spanning bridge with the company’s suppliers. Successful supply chain management requires the effective and efficient management of a portfolio of relationships (Bensaou, 1999). Bensaou (1999) explains that the first step here is to match the optimal type of relationship to various product, market and supplier conditions. The author highlights the importance for companies to decide which governance structure or relationship design to choose under
different external contingencies, as this is a strategic decision due to the fact that it affects how a company defines its boundaries and core activities. According to Svensson (2004) supplier segmentation is one fundamental business activity to improve the outcome of a company’s efforts to maintain and enhance its position in the marketplace, as well as customer segmentation, market targeting and positioning. Bensaou (1999), moreover, explains that a company needs to find out what the appropriate way to manage each different type of relationship is. In this study, supplier segmentation and the activity of managing supplier segments will be referred to as supplier portfolio management (SPM) following Bensaou’s (1999) concept.

Technology has always been important for a company’s interactions and relationships with its suppliers. The introduction of the telephone, for instance, dramatically changed a company’s (and not only a company’s) ability to communicate. The last ten years have again seen a dramatic change in how technology can affect a company’s ability to work with its suppliers. The main reason for this change is the advent of powerful IT driven business tools (Ross, 2003).

It can not be highlighted enough how essential it is for a company to keep up with the IT development, especially to bridge the communication gap between different organisations (Zsidisin and Ellram, 2000). The authors state that “if firms cannot communicate real-time information on such fundamental activities as production cycles, customer demand requirements, bill of materials, and shipments, it will become difficult to form supplier alliances”.

According to Ross (2003) there are various kinds of information technologies that can support the management function within the area of SPM. As an example he states that the advent of Internet in the middle of the 90’s has forever changed the way companies are doing business. Another one is Electronic Data Interchange (EDI), that in 2003 was the most widely used IT-application within supply chain activities. Furthermore, he brings up Enterprise Business Systems (EBS) commonly recognised as Enterprise resource planning (ERP) systems that nowadays serve as the backbone in a company’s transaction and information management function. To summarise his standpoint he states that the IT development the last ten years transferred SCM into perhaps the most potent mechanism for competitive advantages.

1.2 Problem Discussion and Research Problem

As it can be clearly seen from the introduction above that in order for a company to be successful SCM becomes more and more important. Nowadays, for companies it is necessary to focus on the whole supply chain rather than on single functions within one organisation if they want to stay ahead of their competitors. This partly stems from the global nature of competition in today’s business markets (Dwyer and Tanner, 2002).

Configuration and Management of the supplier base is one core part of SCM (Szwejczewski and Goffin, 2001). An organisation purchases a large variety of goods and services, from production parts to transportation services to office supplies with all different kinds of relationships to their suppliers. According to Schmitz and Platts (2003) those kinds of relationships can range from arm’s length to vertical integration. Seeking out how important a supplier is to a company and defining what relationship to establish with that kind of supplier is of great strategic importance (Dwyer and Tanner, 2002). As mentioned before, this management activity in our study is referred to as supplier portfolio management (SPM) and is the main focus of our research.
The challenge is to find out how to actually manage and maintain those different kinds of relationships. A lot of research has been done on what different kinds of relationships between original equipment manufacturers and suppliers exist, but far less research can be found on how to manage them (Schmitz and Platts, 2003).

As Zsidisin and Ellram (2000) state information technologies help to bridge communication gaps between many companies. According to Ratnasingam (2001) through information technologies such as Electronic Data Interchange (EDI) relationships to suppliers can be strengthened as they help working together more closely. Furthermore, through information technologies as for example electronic marketplaces companies can gain greater access to more potential suppliers or buyers (Kaplan and Sawhney, 2000). This can, of course, also weaken existing supplier relations (Ryssel et al., 2004). But as mentioned earlier technology changes rapidly and what kinds of information technologies actually exist and how they are used becomes thus somehow blurred. Walton and Miller (1995) stated that how for instance incoming logistics are carried out continues to be redefined as technology provides more sophisticated methods for business interactions. In the previous section it has been demonstrated that the last ten year’s development in the IT field has had a major impact on businesses and as well that SPM is an important part of today’s management. Reasons that make it interesting to explore how today’s IT-tools are actually used in the field of SPM.

The purpose of this study is to gain a deeper understanding of how information technologies influence a company’s supplier management and how they are used to manage a company’s supplier portfolio. Hence, our research problem is formulated as follows:

**How can the use of information technologies in supplier portfolio management and their influence on it be characterised?**

The automotive industry is one of the most active industries when it comes to SCM, networks, and clusters of suppliers (Pérez and Sánchez, 2001). Inefficiency within any level or within the system managing material flow between tiers can threaten competitiveness of the whole supply chain, as the cost of waste in the system grows in proportion to the number of levels (Automotive Information Action Group, 1997). Furthermore, as stated by the Automotive Information Action Group (1997), at least 50 percent of the typical supplier’s costs are tied up in its supply base. According to Migliore (1998) 70 percent of the final product of the original equipment manufacturer in the automotive industry is outsourced. A car manufacturer only produces a few of the approximately over 15,000 components by himself. The majority is supplied by a network of specialist component manufacturers (Pérez and Sánchez, 2001). These figures reveal how important supplier management is especially to a car manufacturer.

Lauer (2000) states that the adoption of inter-organisational systems (IOS) is one approach to achieve efficiency in the automotive industry. Organisations in this industry are most experienced when it comes to adopting information technologies. Especially the Big 3 (Chrysler, Ford, and General Motors) have recognised the need of adapting information technologies with respect to the adaptation of EDI systems in their supplier base. (Ibid.)

The automotive industry has a well-developed supplier strategy and, for instance, has been using EDI since electronic data transmissions commenced in 1988 (Ratnasingam, 2001). It has more experience than other industries in developing trading partner relationships, where
information technologies are necessary (Helper, 1991). As highlighted in the discussion above the automotive industry is of great interest when it comes to both areas; SPM and IT. To this end, we will conduct our research in the automotive industry.

Our research problem can hence be narrowed down to:

**How can the use of information technologies in SPM in the automotive industry and their influence on it be characterised?**

Most of the studies about supplier management in the automotive industry and all the studies conducted by the authors mentioned in our introduction and problem discussion are focusing on vehicle manufacturers and their suppliers of manufacturing inputs.

According to Dwyer and Tanner (2002) suppliers who supply products and components that go directly into the final product are of significant importance to the vehicle manufacturers. As a vehicle manufacturer has its own customers with their own demand for quality, doing a superior job of buying products that become part of the final product can be a competitive advantage. (Ibid.)

Due to this significance of these vendors we will restrict our study on vehicle manufacturers and their suppliers delivering parts for the final product, which we will refer to as PFP (parts for final product) suppliers and further narrow down our research problem to:

**How can the use of information technologies in SPM regarding PFP suppliers of an automotive manufacturer in the automotive industry and their influence on it be characterised?**
1.3 Outline of the study

In the first chapter the reader is provided with an introduction and background of the research, followed by a discussion of the problem narrowed down to the research problem. In chapter two the reader is then provided with an overview of literature on the areas included in the research problem. At the end of chapter two the main areas of the research problem are identified and the research questions are built. In chapter three the concepts that are used to support the data collection are selected and the operational definition to each research questions is formulated. The methodology of this thesis is presented and discussed in chapter four followed by the empirical data presentation in chapter five. This data is then compared to the frame of reference and analysed cross case in chapter six. Chapter seven will present the findings and conclusions drawn from this study, implications for management and theory and suggestions for further research. The outline of this study is mapped in figure 1.2 below.

![Figure 1.2: Outline of the study](image-url)
Chapter Two: Overview of Literature

In the second chapter we will provide the reader with a literature overview. Firstly, we will review literature on Supplier Portfolio Management in the automotive industry. Secondly, we will present literature on information technologies. Finally, we will develop the research questions of this study.

2.1 Supplier Portfolio Management

As the purpose of our study is to investigate how the use of information technologies in SPM and their influence on it can be characterised we first need to get a clear picture of how SPM is applied in the automotive industry.

Bensaou (1999) is the only author we could find who explicitly defines the term “supplier portfolio management”. He based his model on a survey conducted in the automotive industry. Since this study is focusing on the same industry Bensaou’s (1999) model will be used as a base for the areas that need to be covered regarding SPM in our literature survey.

He defines Supplier Portfolio Management as “choosing a type of relationship appropriate to a product or market conditions and adapting management practices to that relationship”.

The first step, as it can be seen in this definition, consists of matching the optimal type of relationship to the certain suppliers. Also Svensson (2004) states that the competitive environment, especially in the automotive industry, forces vehicle manufacturers to improve their relationship strategies towards their suppliers by segmenting their supplier base in order to optimise current business activities. For this reason we will provide an overview of supplier segmentation to address the first part of Bensaou’s (1999) definition of SPM.

The second step according to the author is to adapt management practices to the chosen relationship. Here, he focuses on three parts, namely boundary spanner’s task characteristics and climate and process characteristics and information sharing mechanisms/practices.

Boundary spanner’s task characteristics address personnel that work very close with suppliers, such as engineers do in early supplier involvement (ESI) projects and their tasks. Climate and process characteristics involve climate issues such as trust and different processes such as the procurement process. In our search for literature we have found that these areas are mainly addressed as activities within supplier management, as these are the observable outcome of boundary spanner’s task characteristics and climate and process characteristics. Our literature section to cover these areas will therefore also be based on activities within SPM.

Bensaou (1999) describes the area information sharing mechanisms/practices as the way information is exchanged. Of course activities within SPM are also an outcome of the way information is exchanged. However, we decided to address this area by itself as it is observable and of major importance for our problem area, as we are investigating information technologies in SPM. Furthermore, a lot of literature on information exchange can be found.

2.1.1 Supplier Segmentation (Portfolio of Buyer-Supplier Relationships)

Various models of supplier segmentation can be found in the literature all using different dimensions of classification (e.g. Masella and Rangone, 2000; van Weele, 2000; Svensson, 2000; Kaufmann et al., 2000; Bensaou, 1999; Ford, 1998; Dyer et al., 1998; Olsen and

According to Svensson (2004) the different approaches of supplier segmentation stem from industry specific criteria such as the business environment in the marketplace and the relationship criteria involved in the supplier-buyer relationships.

Masella and Rangone (2000) for instance show four different supplier segmentation systems. These systems are dependent on the content, for example logistics versus strategic, and on the time frame, long-term versus short-term, of the relationship between buyer and supplier.

Van Weele (2000) also introduces a supplier segmentation portfolio based on the two dimensions “supplier’s impact on financial results” and “supply risk”. The author then identifies four different supplier strategies. These are:

- Partnership: those suppliers are strategic (i.e. market leaders or specific know-how)
- Competitive bidding: leverage suppliers (strong competition among suppliers, commodity products, a buyer dominated segment)
- Securing continuity of supply: those are bottleneck suppliers (only a few alternative suppliers, maybe even none, i.e. leaders in technology)
- Systems contracting: those are routine suppliers (i.e. large supply, many supplies with dependent position, and a reduction in the numbers of suppliers)

Dyer et al. (1998) conduct research on strategic supplier segmentation. The results of the research indicate that suppliers should be segmented into two primary groups. The first group of suppliers provide necessary, but non-strategic inputs, whereas the second group provides strategic inputs. Strategic inputs in their study are referred to as high-value inputs that are related to the core competence of the buying company and may be useful in differentiating the product of the buyer in the marketplace.

Another supplier segmentation matrix is introduced by Olsen and Ellram (1997). Their matrix is based on two dimensions to categorise suppliers. Following four categories of purchases are revealed:

- Non-critical
- Bottleneck
- Leverage
- Strategic

Through an action plan relationship is to be strengthened, the supplier attractiveness and performance to be improved, and the resources allocated to the relationship to be reduced.

Webster Jr. (1992) presented a model of supplier segmentation where he identified eight typologies of buyer-supplier relationships ranging from pure transactions to fully integrated hierarchical companies.

These are:

- Transactions
- Repeated Transactions
• Long-term Relationships
• Buyer-Seller Partnerships
• Strategic Alliances
• Joint Ventures
• Networks
• Fully hierarchical integrated firms

One early supplier segmentation model is provided by Kraljic (1983) who also uses two dimensions in order to create a portfolio model of suppliers. The two dimensions he uses are the “importance of purchasing” and the “complexity of the supply market”. His portfolio model then shows four categories of materials and components, namely:

• Non-critical items
• Leverage items
• Bottleneck items
• Strategic items

The action plan Kraljic (1983) brings up consists of exploiting, balancing or diversifying the situation.

We could also find models of supplier segmentation that are based on studies conducted in the automotive industry.

Bensaou (1999) developed a supplier segmentation model based on a survey he conducted with managers of three U.S. and eleven Japanese automobile manufacturers. He found that the level of specific investments made by buyer or supplier to a high degree correlate with practices commonly associated with strategic partnerships. Those investments are hard or expensive to transfer to another relationship. Bensaou (1999) believes that the mutual exchange of specific investments thus can be used as a criterion to compare relationships.

By dividing a company’s supplier portfolio after these two dimensions, “specific investments of the buyer” and “specific investments of the seller”, to either a high or a low degree Bensaou (1999) presents four different types of supplier relations, namely market exchange, captive buyer, captive supplier, and strategic partnership. He identified differences within those four relationships along three different sets of contextual factors. These are product characteristics, market characteristics, and supplier characteristics.

As shown in figure 2.1.1 the market exchange relationship is characterised by a low degree of both, supplier specific investments and buyer specific investments. The market exchange relationship is characterised by a highly standardised product, mature technology, little innovation, and only rare design changes. This buyer deals with a technically simple product or a well structured complex manufacturing process with no or only little customisation to the final product, a low engineering effort and expertise. Furthermore, only a small capital investment is required. When coming to the characteristics of the market the author states that it is a market with great competition with many capable suppliers and a stable or declining demand. Furthermore, he brings up that there is regarding supplier characteristics no bargaining power, low switching costs, and no proprietary technology.

The second type of relationship Bensaou (1999) identified with a low buyer specific investments and high supplier specific investments is the captive supplier. The product is
technically complex, based on new technology with important and frequent innovations. Furthermore, high capital investments and a great engineering and expertise are involved. There are only a few qualified suppliers in a high growth market segment. Bensaou (1999) mentions that the suppliers have strong financial capabilities, proprietary technology, and a low bargaining power. The author especially highlights the great dependency of the suppliers on the buyer.

The captive buyer identified through high buyer specific investments and low supplier specific investments involves a technical complex products based on mature and well known technology and only low level of innovation and improvements. On the slow growing market there is a stable demand with a few established suppliers and an internal manufacturing capability maintained by the buyer. The suppliers have a strong bargaining power where automakers often heavily depend on their proprietary technologies and skills.

Finally, there is the strategic partnership with both high supplier and buyer specific investments characterised by a product often based on new technology, innovation, frequent design changes, and high engineering expertise. The level of customisation is very high and buyer and supplier have to work closely together in the core processes. There is a strong demand on a concentrated market with a high level of competition as due to instability or a lack of dominant design and the buyer maintaining in-house design and testing capability competitors are frequently changed.

![Diagram of supplier relationships](image)

**Figure 2.1: Frequency of relationships by Bensaou (1999), adapted by authors**

Childerhouse *et al.* (2003:2) in their study on information flow in automotive supply chains refer to one model of supplier segmentation largely due to Gadde and Håkansson (2001) added with input from Tang (1999). The authors segment a company’s supplier base after a high or low level of the dimensions “requirement for continuity” and the “level of involvement”. This continuity-involvement matrix shows four different relationships towards suppliers (see figure 2.1.2). The simple relationships are towards preferred suppliers characterised by a high level of requirement for continuity and a low level of involvement. Complex relationships with exclusive suppliers show both a high level of requirement for continuity and of involvement. In comparison to the complex relationship a market exchange with a vendor involves a low level in both requirements of continuity and involvement. The
fourth type of relationship the authors could identify through a low level of requirement of continuity and a high level of involvement is complex buying from partners.

Figure 2.2: Continuity-involvement matrix by Childerhouse et al.(2003:2), based on Gadde and Håkansson (2001) with input from Tang (1999), adapted by authors

Svensson (2004) argued that supplier segmentation is one fundamental part of supplier management to improve the outcome of an organisation’s efforts to maintain and enhance its position in the marketplace. Supplier segmentation in the automotive industry is usually based on the interaction between a car manufacturing company and its suppliers. Both organisations have to be aware of the other organisation’s approach. Furthermore, the car manufacturer has to be clear of the business environment of its suppliers in order to select an appropriate relationship strategy towards their suppliers (Ibid.).

Svensson (2004) provides an empirical illustration of supplier segmentation in the automotive industry. His research was a qualitative case study based on a car manufacturer and his most important suppliers. With the empirical outcome he generated a generic model of supplier segmentation (see figure 2.1.1). His supplier segmentation model consists of two dimensions that have been revealed as the main variables in his case study company. Those two dimensions are:

- The supplier’s commitment to the car manufacturer; and
- The commodity’s importance to the car manufacturer

The two dimensions are divided into two categories referring to an either high or low degree of supplier’s commitment and commodity’s importance to the car manufacturer. As shown in
on base of the two dimensions with either a low or high degree, Svensson (2004) comes up with four different supplier strategies.

**Figure 2.3:** A generic model of supplier segmentation by Svensson (2004), adapted by the authors

<table>
<thead>
<tr>
<th>Commodity’s importance to VM</th>
<th>Supplier’s Commitment to VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
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<tr>
<td>Low</td>
<td>Low</td>
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<td>High</td>
<td>Family</td>
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<td>Low</td>
<td>Friendly</td>
</tr>
<tr>
<td></td>
<td>Business Partner</td>
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<tr>
<td></td>
<td>Transactional</td>
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</table>

- **Transactional relationship strategy:** This strategy is characterised by low importance of the commodity and low commitment of the supplier towards the car manufacturer. It signifies that the car manufacturer invests limited resources in the relationship to this supplier. Only simple and single components are delivered from this certain supplier. In this relationship often alternative supplier choices are available to the car manufacturer and only a low mutual commitment can be found. The relationship with this supplier is more about price-driven transactions.

- **Friendly relationship strategy:** Svensson’s second relationship strategy is characterised by low commodity importance and high commitment of the supplier towards the car manufacturer. In this relationship the car manufacturer continues to foster a strong relationship with the supplier and regards him more as a partner. In this case the supplier often is dependent to the car manufacturer, while he is not so innovative.

- **Business partner relationship:** Characterised by a high importance of the commodity to the manufacturer and a low commitment of the supplier, this strategy implies a high level of competition between this supplier and others. In this case the supplier is often a larger one, maybe even the market leader. Usually large buying amounts are involved and suppliers providing special products offerings.

- **Family relationship:** With a high level of the supplier’s commitment and a high importance of the commodity the relationship with this supplier is a strong corporate partnership. The car manufacturer invests a lot of resource in this relationship as the supplier is regarded as one of the principle ones. Here commitment to mutual success can be found. For the car manufacturer the supplier is key for technology advancement, critical for cost success and of great importance when coming to the company’s brand.
2.1.2 Activities within Supplier Portfolio Management

According to Ross (1995) a company’s purchase department is usually responsible for managing, planning and executing purchasing activities. The author states that there are various activities – purchasing responsibilities and processes – the purchase department needs to perform in order to ensure an effective communication of the inventory purchase requirements to suitable suppliers and to make sure that the right products meeting the purchase requirements are delivered on time and in the correct quantities. He identified nine responsibilities and processes of a company’s purchase function:

- Sourcing
- Value analysis
- Supplier development
- Internal integration
- Supplier scheduling
- Contracting
- Cost management
- Purchasing and receiving
- Performance measurement

The first activity he mentions is sourcing which includes the identification of sources of supply, ensuring stability of supply, and also to find alternative sources of supply.

He further mentions value analysis which consists of a set of functions helping to increase the value-added elements of the purchasing process. Components in the value analysis can for instance be price for quality received, financing, or delivery.

The next activity brought up by Ross (1995) is supplier development which is necessary for a company in order to be operational and economical successful.

Internal integration is necessary as the purchasing function needs to be integrated with other functions of the organisation such as marketing, sales, inventory planning, transportation, and quality management, instead of being a stand-alone enterprise. Linking the departments together facilitates synchronising individual company replenishment requirements with the overall capacities of the supply network through information sharing and streamlining the process of acquisition. On the other hand the purchaser should also take part in product market research, and engineering development teams in order to ensure best quality, delivery, and costs.

Supplier scheduling is listed as another purchasing activity by the author. This activity’s goal is to maximise the efficiency in the replenishment process through creating a valid inventory schedule. By doing this future requirements of the company’s partners in the supply chain can be forecasted which means that they can also plan their material and capacity resources to support the schedule.

Within contracting Ross (1995) sees supplier selection and monitoring of performance measurements as critical issues.

The goal of most companies to decrease administrative costs, purchasing prices, and inventory costs and to maintain them on a low level shows the necessity of the next
purchasing activity brought up by Ross (1995), namely cost management. Within cost management the author mentions cost reduction programmes, price change management programmes, volume and “stockless” purchasing contracts, cash-flow forecasting, and strategic planning.

_Purchasing and receiving_ as another activity within the purchasing department includes activities such as order preparation, order entry, order transmission, status reporting, order receiving, quantity checking and stock put-away, invoice and discount review, and order closeout.

Last but not least Ross (1995) lists performance measurement as a responsibility of the purchase department. The monitoring of the quality and delivery requirements over time is one major issue within supplier “benchmarking” and critical when evaluating the capabilities of a company’s vendors.

Another model of what different activities exist within the management of existing suppliers is introduced by Dobler and Burt (1996). The authors state that their so called postaward activities and management of supplier relations have been weak in many purchasing operations. They introduce eight activities that are necessary in order to ensure that suppliers deliver the required quality on time and to manage relationships to key suppliers carefully. These eight activities namely are:

- Ensuring understanding
- Preaward conference
- Monitoring and controlling project progress
- Monitoring and controlling total supplier performance
- Motivation
- Assistance
- Supplier surveys
- Partnerships

By comparing the two models of different activities towards suppliers shown above we can see that the second model presented by Dobler and Burt (1996) with their eight activities covers our research area more precisely as they are restricted to activities for managing existing suppliers. The model introduced by Ross (1995) indeed also deals with management activities but with an on one hand broader scope, as he presents activities and responsibilities of the purchase function which is for instance also including sourcing issues. On the other hand Ross’s (1995) perspective is also more restricted as there are according to Dobler and Burt (1996) activities of the management of suppliers that are performed by other departments than the purchasing department. For this reason we will base our further literature review on the postaward activities presented by Dobler and Burt (1996).

### 2.1.2.1 Ensuring Understanding

Dobler and Burt (1996) argue that in order to have a successful relationship towards a supplier the foremost prerequisite is to ensure that the buyer and the seller understand each other. Early supplier involvement (ESI) is an example of one tool that can enhance the understanding between the two parties. They moreover state that an early supplier involvement normally, but not always, leads to single sourcing. Dobler and Burt (1996) refer to a study conducted by Purchasing which shows that involving certain suppliers can through
their expertise improve the design process in the areas of material specification, tolerances, standardisation, order sizes, process changes in supplier’s manufacturing, packaging, inventory, transportation, and assembly changes in the buyer’s plants. In that article they highlight the importance of an early supplier involvement by saying that it is not only desirable – it is absolutely necessary for creating trust which is needed in long-term projects. They continue by providing four reasons for applying and early supplier involvement:

- Getting the suppliers suggestions before the design is fixed
- Capitalise on the latest technology
- Saving time through shorter design cycles
- Let the supplier feel to be part of the team

Liker et al. (1997) conducted a study on supplier involvement in design based on data from 145 Japanese, 189 US and 87 UK automotive component suppliers. The authors state that their regression analysis shows that an early supplier involvement and transfer of influence over design to the supplier is associated with higher contributions of the supplier to cost reduction, quality improvement and design for manufacturability. Based on their findings the authors introduce five factors that might lead a company to involve their suppliers in product development and that facilitate this involvement:

- The suppliers that should be involved in design in early stages are the ones of complex components or complete subsystems
- The suppliers that are highly involved are suppliers with high technical capabilities. When involving a supplier more in design it has to be ensured that the technical capabilities match the requirements
- Purchasing policies also play a role in supplier involvement
- In order to work together effectively on product development the quality of the technical connection is important
- Programmes like CAD (computer aided design) data exchange and STEP (…) can help within supplier involvement in design

Liker et al. (1997) state that there are different levels of supplier involvement in design which range from the most basic level, supplier representatives who make suggestions in the very early stages of design, over the middle level, where engineers of the supplying company are working together with engineers of the buyer and take part in the design, to the highest level, where the supplier has the freedom to develop product and process on his own based on performance specifications and space constraints provided by the buyer.

### 2.1.2.2 Preaward Conference

When a company has decided to contract a supplier Dobler and Burt (1996) suggest that a preaward conference is held first. This is a tool to ensure that all details in the contracts are understood and implemented as explained by Dobler and Burt (1996): “The preaward conference is the vehicle the professional buyer and his or her team use to ensure that theses-provisions are fully understood and implemented”.

Dobbler and Burt (1996) mention numerous issues that should be discussed during a preaward conference, including:

- All terms and conditions
• Delivery or operations schedule
• Staffing and supervision
• Site conditions, work rules, safety (if appropriate)

2.1.2.3 Monitoring and Controlling Project Progress

Even if a supplier has the responsibility to stay within the scheduled times, deliver the right quantities of products and manage other criteria’s stated in the contract Dobler and Burt (1996) state that a company should monitor and control parts of the supplier’s progress. The authors argue that even if the contract says that the supplier should for example deliver on time this isn’t always the case. Furthermore they suggest that the degree of monitoring and controlling of the supplier is depending on the importance that the items has on the scheduling of operations. In order to manage monitoring and controlling of project progress Dobler and Burt (1996) argue that a business can employ useful and economic management tools such as Gantt charts, CPM (Critical Path Method), PERT (Program Evaluation and Review Technique) and Closed Loop MRP (Material Requirement Planning) Systems.

2.1.2.4 Monitoring and Controlling total Supplier Performance

Not just monitoring and controlling project progress is of importance for a company but also the aggregated result for a supplier (Dobler and Burt, 1996). The authors argue that this activity is essential for two reasons. Firstly, in order to control a supplier’s contract performance and secondly, to use it as a base for future sourcing decisions. In the field of monitoring and controlling supplier performance Dobler and Burt (1996) especially discuss supplier performance evaluation.

According to Dobler and Burt (1996) the purpose of supplier performance evaluation is to “enhance the relationships and thereby control performance”. They furthermore discuss the importance of the time factor in the supplier performance evaluation suggesting a moving average form three to six months. From there viewpoint a supplier should neither be punished for bad performance a long time ago or be able to get off the hook too easy. To help companies with supplier performance evaluation there are according to Dobler and Burt (1996) various evaluation plans such as the categorical plan, the weighted point plan, the cost ratio plan, and cost-based supplier performance evaluation.

Ross (1996) refers to performance measurement as one critical activity within a company’s purchase function. Performance measurement can be seen as a part of supplier “benchmarking” through monitoring the quality and delivery performance of suppliers over time. This activity is especially critical when the buyer has to evaluate the capabilities of competing vendors and to assure that costs, quality, delivery and collaborative objectives are being achieved. (Ibid)

Simons (1999) defines performance measurement and control systems as the “…formal, information based routines and procedures that managers use to maintain or alter patterns in organisational activities”.

Handfield and Nichols (1999) argue that supplier performance measurement can support a purchasing company in many ways as for instance in the field of supplier selection and can also help the suppliers to adapt to the buyer’s expectations.
Schmitz and Platts (2003) distinguish between intra-organisational performance measurement, which deals with the measurement of input, processes and outcomes within one’s own organisation, and inter-organisational performance measurement, which deals with the measurement of incomes, processes and outcomes outside one’s organisation and also includes supplier performance measurement.

According to Schmitz and Platts (2003) there is a gap of literature about what performance measurement is applicable in the management of supplier relationships, as instruments and mechanism such as performance measurement originally haven’t been developed for these kinds of relationships.

With defining this gap in literature Schmitz and Platts (2003) conducted a study of five European companies of the automotive industry in order to investigate their practices of supplier performance measurement in the area of logistics. They have found that supplier performance measurement appears to be of importance for vehicle manufacturers. However, the authors stated that this tool is more used as a power instrument towards under performing suppliers than to inform decisions and to “manage” the whole supply base.

2.1.2.5 Motivation

Dobler and Burt (1996) state that there two ways of motivating suppliers to deliver the required performance, namely punishment and rewards, which are used either separately or in combination. The authors see the greatest punishment for a supplier in not awarding contract for future business. Another punishment, but less drastic, is the “bill back” approach which means that incremental costs coming from a delivery delay or quality problems are billed back to the responsible supplier. According to Dobler and Burt (1996) the biggest reward a buyer can give to the supplier in order to motivate is, in comparison to not awarding future contracts as a means of punishment, follow-on business. Furthermore, recognition also is a powerful means of motivation and helps to improve the future performance of suppliers. (Ibid)

Liker et al. (1997) in there study about ESI in design argue that “the motivation of the supplier to be involved will depend on the qualities of the relationship with the customer”. They also state that it is a difference in motivation between American and Japanese automotive manufacture, American companies’ suppliers are in general less motivated compared to the Japanese.

2.1.2.6 Assistance

Dobler and Burt (1996) state that there are two types of providing assistance to suppliers which are, discovered by progressive companies, very effective. These are training and problem solving. The authors mention companies like Xerox, Texas Instruments, GE, and Tennant who have been very successful regarding their supplier training. Due to a high interdependence of companies with their suppliers, buying companies are also becoming more proactive in ensuring that the quality systems and procurement systems of their suppliers operate effectively, as the supplier’s quality, cost, technology, and dependability all depends on its procurement system. (Ibid.)

Genna (1998) argues that training programmes, if to be successful require bringing in a company’s supplier. He continues stating that the top priority with supplier training is to give suppliers understanding and reasons why to carry out a training programme. In some cases a supplier can act as the initiator of a training program as explained by Anderson (1996). He
brings up the case of Dürr, a producer of paint to the automotive industry. The process to achieve a first-class paint job is not just about the paint, but also how to apply it, the paint temperature, air pressure and so on. For this reason Dürr decided to offer the buying companies training on- or off-site in order to get satisfied customers. (Ibid)

The other type of assistance mentioned by Dobler and Burt (1996) is problem solving. Here most companies provide technical and managerial assistance to the supplier when problems regarding quality or related areas occur. This willingness to assist the supplier when needed stems from the fact that many companies have realised that their success is also depending on the performance of their suppliers.

Working together closely with suppliers is necessary if companies want to stay competitive (Ross, 2003). Collaborating with certain suppliers of strategic importance requires knowledge of the buyer about their supplier’s capacities, resources, product lines, and delivery and information system capabilities. One main issue in order to strengthen these partnerships is the development of pricing, technology, and information sharing agreements that link supplier and buyer together and provide for a stable “win-win” environment (Ross, 1996).

Krause and Ellram (1997) define supplier development as “any effort of a buying firm with a supplier to increase its performance and/or capabilities and meet the buying firm’s short and/or long-term supply needs”. They argue that supplier development is a very important issue within supplier management as buying companies must ensure that their supplier’s meet the required performance and show the required capabilities and responsiveness in order for the buyer to stay competitive. Through active supplier development companies are able to improve their supplier’s performance and capabilities. Supplier development in practice ranges from limited efforts of the buying company, such as an informal evaluation of the supplier and a request for improvement, to extensive efforts including training of the vendor’s personnel and investment in supplier’s operations (Krause and Ellram, 1997).

2.1.2.7 Supplier Surveys

Dobler and Burt (1996) highlight the importance for buying companies to gather supplier feedback. The authors refer to Crosby (1984) who said that it is very important to show the supplier that you are also willing to look at your own organisation and are willing to change in order to improve before you ask your supplier to change and improve his organisation. Crosby (1984) suggests that following questions should be answered by the suppliers:

- How knowledgeable are your buyers?
- How accurate are our engineering specifications?
- How clearly do we state our quality requirements?
- How timely are our payments?

Bossert (1994) discusses supplier surveys as a means of receiving more information about the supplier. The author argues that there are almost always several goals with conducting a supplier survey. In comparison to writing a report, a survey at least involves two individuals from two organisations. Bossert (1994) points out that while conducting a supplier survey the aims of the suppliers evaluated also have to be kept in mind. The supplier also wants to present its organisation in the best light. Furthermore, the emotional interplay of the individuals involved in the survey must be considered. The way the company who conducts the survey acts toward the supplier also has a great influence on how the individual or individuals of the supplier handle the survey. They might rush through the survey when they
fell like the buyer is predisposed against them and they are wasting time or they might believe you are a pushover and thus not go too much into detail about the quality system. (Ibid)

2.1.2.8 Partnerships

Dobler and Burt (1996) state that there are only a few suppliers with strategic importance to the buyer within a company’s supplier base, but these relationships require special ministration. According to the authors the management of partnerships and strategic alliances should include following activities:

- Training for the members of the cross-functional team from both buyer and seller
- An interfirrn team which consists of personnel from buyer and seller must also be trained in cross-functional team skills
- An integrated communication system must be created in order to fulfil the needs for cooperating from both seller and buyer
- The two organisations must develop and implement plans for building trust
- The two organisations must also develop and implement plans for co-location of key technical personnel and for periodic visits to each other’s facilities
- Arrangements for co-location of key technical personnel and for periodic visits to each other’s facilities must be developed and implemented
- The two organisations must furthermore develop and implement plans for training on issues, including the designing of variance out of products and processes, quality, procurement, value analysis and engineering, strategic cost analysis, activity-based management etc.
- In areas including quality, cost, time, technology, etc the organisations must develop measurable quantifiable objectives
- Monitoring and reporting to appropriate management of the results of those improvement efforts necessary

2.1.3 Information Exchange

As Bensaou (1999) mentions sharing information in the buyer supplier interaction is a major issue in SPM. Various other authors also discuss the importance of information flows between buyer and supplier. Zsidisin and Ellram (2001) for example state that if companies cannot share information on, for example, customer demand requirement and production cycles it will be very hard to have a well functioning supplier alliance. They continue arguing that information sharing is one of the critical factors in SCM. Another example is presented by Krause and Ellram (1997) pointing out that in order for a buyer-supplier relationship to become successful the relationship needs effective communication among the two parties. Finally, Childerhouse et al. (2003:1) also highlight the importance of this issue, stating that uncertainty between companies is extremely costly and information sharing is a way to reduce this uncertainty.

Childerhouse et al. (2003:1) bring up two key points that are causing problems in a buyer-supplier interaction, namely the “not looking forward” issue and the “trust” issue. The authors describe the “not looking forward” issue as the fact that companies have a tendency to look only at their own and their supplier’s processes and forget to also consider the customer. This is a lack of transparent information flow at the front end (upstream). The authors state that COVISINT (the e-procurement market-hub in the automotive industry), for instance, is a perfect example of a lack of “looking forward”. (Ibid.)
The trust issue is according to Childerhouse et al. (2003:1) a major concern in order to manage an effective buyer-seller relationship. They argue that trust is even more a problem in markets showing a volatile ordering pattern, because of the fact that companies perception of requirements are different many times in these markets, causing mistrust among players. However the authors suggest that the trust issue can be less of a problem if businesses try to communicate transparent information among each other. This suggestion is further strengthened by Zsidisin and Ellram (2001) and Hammer (2001).

According to Childerhouse et al. (2003:2) information flows can be divided into demand information and fulfilment information. Demand information as stated by the author is information flowing upstream and is usually associated with eliminating problems as for example, poor scheduling. Fulfilment information on the other hand as explained by the authors is flowing downstream and are, for example, delivery dates. In order to manage a successful supply chain both of these information flows are of importance, as also Zsidisin and Ellram (2001) highlight. To further explain the different information flows imagine a first tier supplier to an automotive manufacturer. Demand information from the automotive manufacturer is received by the supplier in the form of, for instance, number of parts ordered, RFQ (Request For Proposal) and predicted sales of cars. The first tier supplier on the other hand sends fulfilment information such as delivery dates, parts of order produced and price of parts information back to the manufacturer. Childerhouse et al. (2003:2) also categorise information into pure and transparent, where pure information has high fidelity and transparent information is available to all. According to the authors information should be both pure and transparent in an effective supply chain.

As stated before from various authors, exchange of information is of importance in a supplier relationship. Despite there are according to Childerhouse et al. (2003:2) four barriers to share information among companies, namely a technological, a culture, a financial and an organisational that are of special interest within SPM.

The technology barrier deals with overcoming problems such as “multiple standards, inflexibility, and the absence of tailored data flows to the information needs of the supply chain” (Childerhouse et al., 2003:2). Cultural barriers are found in the win-lose attitude found within companies. Even if it is recognized that organisations of the same supply chain should work together, companies with important information tend to keep it as a way to gain power over other businesses in the supply chain. Financial barriers mainly deal with the costs for the implementation of a system for efficient information exchange among players and concerns companies that are going to pay for it. (Ibid)

The organisational barriers are according to Childerhouse et al. (2003:2) closely related to issues about co-ordination and governance of the supply chain, especially in cases where there is a discussion about strategic priorities that can result in members withholding information to protect their status. They argue that the issue of governance and co-ordination is complex as supply networks usually consist of many various businesses with different goals, making it very hard in reality to align various business goals and priorities. Companies also experience, especially in high volatility markets, that it is difficult to know with “whom we work” and “how we fit”. This lack of a stable point of reference is arguing against formulating common goals and forming strong relationships (Popp, 2000).

As brought up earlier in the overview of supplier segmentation models we saw that Childerhouse et al. (2003:2) segment relationships after two dimensions, namely the level of
involvement and requirement for continuity. The authors segment the supplier in order to highlight to what degree companies cooperate with different suppliers (see figure 2.2) suggesting that different relationships demand different types of information exchange. According to the authors three types of relationships are especially relevant in the automotive industry, namely the market exchange (low level of involvement), the simple relationship (initially high later on lower level involvement), and complex relationships (constantly high level of involvement).

Also Bensaou (1999) discusses information exchange on hand of a segmented supplier base. The author refers to it as information-sharing mechanisms or information-sharing practises.

- For market-exchange relationships most of the information sharing is during negotiating and contracting, the organisation coordination are made by proven organisational routines.
- In the captive-Buyer Management relationship there is a lot of detailed information exchanged, because the parties need to exchange information on areas as; manufacturing, quality and design, in order to handle the intense information flow a broadband connection of some sort is usually implemented, furthermore there is regular and frequent mutual visits.
- Captive supplier relationships represent the lowest level of information exchanged. Communication is usually focused on complex coordination tasks.
- In the case of strategic partnership relationships information exchanged is both frequent and rich. These relationship exchange information using reports, standardised rules and operating procedures, electronic transfer of schedules, and face-to-face contact. There is as well information exchange during practise of guest engineers.

To succeed with creating an effective supply chain Childerhouse et al. (2003:2) argue that it is crucial to develop realistic understanding among buyers and sellers about concepts such as trust and cooperation. They argue that information sharing is the most effective way to achieve this understanding. Hammer (2001) furthermore states that you have to “communicate relentlessly” to build openness and trust.

IT plays an important role in exchanging information as stated by Zsidisin and Ellram (2001). The authors argue that new information technologies such as the Internet and ERP systems support building information flow bridges between buyer and suppliers. Ross and Rockart (2002) furthermore bring up that with an increased demand of sharing information it is a prerequisite to have a powerful IT infrastructure in order to stay competitive. However, IT can also decrease the level of interaction between supplier and buyer when players too much rely on a new technology as the communication channel and neglect traditional ways (Westberg, 2003). To replace a meeting concerning a shared buyer-seller activity demanding rich information exchange with email correspondence for instance would be damaging for a company. This is as well suggested by Ryssel et al (2004).

### 2.2 Utilisation of Information Technology

In this section we will provide an overview of literature on IT. In order to find an answer to how the use of IT in SPM can be characterised we will begin with presenting literature on the definition of IT and what IT consists of. Furthermore, we will present various IT tools related to SPM that are utilised in today’s business environment. Finally, in order to investigate the influence of IT on SPM we will provide an overview of literature concerning how IT has influenced relationships.
Numerous of authors discuss the importance that IT has had on today’s businesses (Ross (2003), Jap (2001), Simchi-Levi et al. (2003), Handfield and Nichols (1999). Ryssel et al. (2004) argue that the importance of IT has increased significantly over the previous years and define IT as follows:

“Information technology is a term that encompasses all forms of technology utilised to create, capture manipulate, communicate, exchange, present, and use information in its various forms (business data, voice conversations, still images, motion pictures, multimedia presentations, and other forms, including those not yet conceived.”

Rysdel et al. (2004) divide IT into internal and shared IT. Internal according to the authors is IT utilised only within one organisation whereas external IT covers IT that supports business between organisations and their environment outside the organisation’s boundaries. IT can as well be segmented into software and hardware (Handfield and Nichols, 1999). Handfield and Nichols (1999) provide another classification and segment IT into electronic communication, bar coding/scanning, data warehousing, and decision support systems (DSS).

2.2.1 IT tools related to SPM

The development of IT over the last years has dramatically changed the way a company is doing business with its suppliers (Ross, 2003). With the introduction of the internet, companies have the opportunity to work with their suppliers in a closer and more collaborative way than ever before. Especially the introduction of the internet has lead to a new type of supplier relationship management (SRM), e-SRM. The “e” before the term “SRM” does not reflect a new philosophy of SRM. It rather stands for an emphasis on the IT application tools used within SRM. (Ibid)

In the book “Introduction to e-supply management” Ross (2003) introduces a model of the e-SRM landscape, where he presents a picture of IT utilisation in SRM.

Bensaou’s (1999) definition of SPM is “choosing a type of relationship appropriate to a product or market conditions and adapting management practices to that relationship”. Now we compare that definition with the definition of SRM according to Ross (2003).

Ross (2003) defines SRM as follows: “SRM is the nurturing of continuously evolving, value-enriching relationships between supply chain buyers and sellers that requires a firms commitment on the part of all trading parties to a mutually agreed upon set of goals and is manifested in the collaborative sharing and timely and cost-effective execution of sourcing and procurement competencies to facilitate the entire material replenishment lifecycle from concept to delivery.”

We recognise that both SPM and SRM are dealing with relationships to suppliers and the management of those relationships. For this reason, models of IT utilisation in the field of SRM are also to a high degree applicable for IT utilisation in SPM. Furthermore, due to the extensive picture of IT tool utilisation in the area of SRM we will use Ross’s (2003) framework as a base for the literature overview regarding the utilisation of IT in SPM.

E-SRM consists according to Ross (2003) of two broad parts, e-procurement and e-sourcing. “E-procurement deals with the utilisation of Web-toolsets to automate the activities associated with purchase order generating, order management and procurement statistic and
e-sourcing, with the utilisation of the Web to develop long-term supplier relationships...” (Ross, 2003). To get a better understanding of the activities related to e-SRM, Ross (2003) states that e-SRM can be divided into four other parts. Ross (2003) is referring to these four parts as the EBS-Backbone, e-SRM Services, e-SRM Technology Services and e-Processing (figure 2.4). The EBS-backbone can be seen as the company’s ERP system. E-SRM Services cover the traditional buyer function that has been enhanced with the utilisation of IT applications, for example product- and supplier search. E-processing is dealing with new ways to handle the transactional process. The last part, e-SRM Technology Services, handles the technological architecture that is needed to effectively connect the company’s backbone and front-end functions. (Ibid.)

Figure 2.4: E-SRM B2B e-marketplace functions by Ross (2003), adapted by the authors

2.2.1.1 EBS-backbone function

Commonly an EBS (Enterprise business system) is referred to as an ERP (Enterprise resource planning) system. Ross (2003), however, argues that it should nowadays be referred to as an EBS, as it is more of a business system than a resource system. In this literature overview we will refer to Ross’s (2003) definition as other authors such as Shield (2001) as well states that the acronym ERP does not encompass the whole picture.

The EBS system is computer software that “…provides a single solution from a single supplier with integrated functions for major business functions from across the value chain
such as production, distribution, sales, finance and human resources management” (Bocij et al., 2003).

Ross (2003) suggests that the main role of an EBS is to provide the purchase function with a database of useful information that facilitates work. He divides EBS into four subcategories, namely Procurement history, Accounting, Purchasing Planning and Performance measurement.

- **Procurement History**: In order to make the right decisions regarding, for example, the supplier it is important to have information on past transactions and available suppliers.

- **Accounting**: An EBS-system should have an accounting function so that, for example, transactions can be recorded automatically.

- **Purchasing planning**: When planning future sales the EBS-system can help the company by, for instance, automatically generating MRO (Material requirement planning) schemes.

- **Performance measurement**: With the help of performance measurement a company can analyse its performance of changes in work routines or the degree of value a certain supplier relationship has.

Shields (2001) presents another acronym for EBS, namely XES (eXtended Enterprise System). Even if Ross (2003) and Shields (2001) are using different acronyms they both point out that the acronym ERP is not showing the total use of an EBS.

The main reason for implementing an EBS is according to Bocij et al. (2003) that previously isolated functions (e.g. manufacturing and finance) can be integrated. They argue that without an EBS different functions sometimes purchase a mixture of applications with poor inter-function information flow as the result. Additionally, as the main reasons for implementing an EBS Bocij et al., (2003) list following other major benefits:

- Integration of all internal and external value-chain processes, resulting in increased customer value.
- Better sharing of information within the organisation since all modules of the systems are compatible.
- Reduced cost of buying from a single supplier
- Use of best-of-breed solutions applied by other companies.
Bocij et al. (2003) also discuss problems of EBS. They argue that the main disadvantage of an EBS is the cost charged by the EBS vendors. Furthermore, an implementation of an EBS usually demands changes in the company’s processes, where people also have to adapt and get used to first. Finally, because of the big changes required to implement an EBS companies almost always need the support of consultants which is increasing the costs even more.

2.2.1.2 e-SRM services functions

Ross (2003) mentions that with the advent of new technologies several of the purchase function’s traditional activities have been enhanced and made more effective. He divides e-SRM services into Supplier Search, Product Search, Strategic Sourcing and Value-added Services.

- **Supplier Search**: A big problem in the past was that this activity was very hard to perform due to a lack of reliable and rich information. With the utilisation of web based tools such as for instance B2B marketplaces, the process of gathering information regarding suppliers is done in a far more effective way.

- **Product Search**: The new IT applications, especially web-based tools, have provided companies with the opportunity to search for products in a far more effective way than in the past. Especially with the help of different kinds of e-marketplaces, for example on-line catalogues.

- **Strategic Sourcing**: “Strategic sourcing can be defined as a systematic, cross-functional, and cross-enterprise process that seek to optimise the performance of purchase goods and services through reductions in total cost, sourcing cycle time and assets” (Mitchell, 2001). Utilising new IT applications offer companies to manage this
activity in a far more effective way. The IT applications are in general separated into two categories; decision support tools and negotiation tools. (Ibid.)

- **Value-added Services:** With the help of new IT-applications such as financial and billing services, comparison shopping functions, collaborative design, advertising, promotions, and dynamic pricing, just to name a few, companies are able to improve several value-added services. Utilising these new value-added services also enable the buyer and seller to go beyond just transactional interaction and can, for instance, help the buyer and seller to develop common strategic goals.

### 2.2.1.3 e-SRM Processing

Ross (2003) states that the introduction of new IT applications provides companies with new ways of handling the transactional process in the buying function. According to the author this part of e-SRM can be further divided into product catalogue management, requisitioning, RFQ, shopping tools, auctions, purchase order generation and tracking and Logistic.

- **Product catalogue management:** The main issue in the management of a product catalogue on-line is to leverage the fact that it is dynamic. It is a seamless activity to add, remove or change content.

- **Requisitioning:** The goal of the IT application used in this type of activity is to be able to bring together a certain amount of e-hubs and display the right kind of information. When using the IT application a company searching for a product has access to a lot of various e-hubs even if for the company it looks like a one stop affair. The most difficult task for the IT application is to provide a company with the right information. This might not be that difficult when buying MRO (Maintenance, Repair, and Operations Supplies, further information can be found under e-hubs) products that are usually standardised products bought on price. However, products that are not MRO products usually require more information such as for instance customers care rating, service quality and performance history.

- **RFQ:** This activity is traditionally laboured intensive and expensive. With the utilisation of IT technologies in this area a company can cut cost, reduce lead times and get access to a greater supplier base. A company can, for instance, at an e-hub specify its needs and suppliers can right away send their suggestion back.

- **Shopping tools:** To automate the procurement process further a company can introduce shopping agents. A shopping agent is programmed software that performs shopping related activities by itself. When coming to for example the purchase of pens the shopping agent will be alerted when the inventory of pens reach a certain minimum level. The agent in turn starts looking for suppliers that are selling pens and matches the best offer according to certain criteria programmed into the software. The pens are then automatically ordered and paid by the shopping agent.

- **Auctions:** The main benefit from on-line auctions is that the buyer is able to reach out to a large supplier base and in this way increasing the competition between suppliers. This will in turn increase the pressure on competition especially on price. Because of auctions being price focused they are usually used for the purchase of MRO products. The use of auctions as a new way of handling the transaction process is as well supported by Jap (2001).
• **Purchase order generating and tracking**: Utilising IT-applications provides the ability to automate the purchase order generating. Furthermore, the purchase order generated can be used to track the order in manufacturing and distribution in order to highlight order critical criteria.

• **Logistics**: Nowadays, companies using IT applications are able to greatly increase the control and economy of the logistic aspect of the transaction process. Several logistic companies are offering product tracking services, carrier selection, freight bill payment and network planning only to mention some of the services provided.

Jap (2001) states that new IT tools can create new ways of doing business, referring to this area as relationships influencing IT, stating reverse auctions as an example.

### 2.2.1.4 e-SRM Technology Services

E-SRM technology services handle the technological architecture that is needed for a company to be able to perform e-SRM related activities (Ross, 2003). The author segments e-SRM technology services into *web processing, security, member services, content search and management* and *workflow*.

• **Web processing**: Utilising IT applications requires companies to have a technology infrastructure that is able to handle a maximum of data communication and transactions. This problem is usually solved by using a multiple of servers.

• **Security**: When doing business with the help of IT applications, it is crucial to have a good security system. A company does not want other people to get their hands on important information. With the use of for example authorisation, encryptions and validation keys, the security level of a company can greatly increase.

• **Member services**: One main advantage of e-business is that through e-business it is easier for companies to provide personalised service. IT applications provide the ability to better analyse customer behaviour and thus build a good base for personalising services.

• **Content search and management**: A company should offer other companies the ability to in an effective way search for content about their company. This is done in order to make the interaction between buyers and sellers as effective as possible.

• **Workflow**: Here, an IT application, for instance including a section in which a company can design its own specific workflow that guides a company across the procurement process is suggested. In general, this IT application consists of various templates of basic processes that can be customised after different business needs.

Simchi-Levi et al. (2003) present an optional view of the technology architecture in a context of information technology infrastructure. The authors differentiate between *interface/presentation devices* such as personal computers, bar-code scanners and terminals; *communication* involving IT tools such as LAN (Local Area Network), Internet, EDI and wireless communication; *databases*, such as legacy data bases, relation databases and object
databases support the organisation of data; and system architecture, which encompasses the way the above mentioned areas of information technology are configured.

### 2.2.1.5 E-marketplaces

E-marketplaces or e-hubs are discussed and its importance in today’s business environment is highlighted by several authors such as Ross (2003), Wise and Morrison (2000), and Kaplan and Sawhney (2000). By discussing the benefits of e-marketplaces Wise and Morrison (2000) state that e-hubs lead to “dramatically reduced costs, greater access to buyer and suppliers, improved marketplace liquidity, and a whole new array of efficient and flexible transaction methods”.

E-marketplaces as stated by Ross (2003) can be divided into public-, private- and consortium marketplaces. A public marketplace is a “many-to-many” marketplace (e.g. e-STEEL, Sci-Quest). A private marketplace is a “one-to-many” marketplace (Carpenter TECHNOLOGY Corp. has one for material purchases) and a consortium marketplace is a “some-to-many” marketplace such as for instance COVISINT (a consortium consisting of large automotive manufacturer and many suppliers). Ross (2003) as well segments marketplaces after their collaborative nature. At the lowest level the e-marketplaces only provide basic B2B commerce (B2B transaction and catalogue management). At the next level they offer supply chain management services (collaborative management and collaborative inventory management). Finally, at the highest level, e-marketplaces offer supply chain collaboration services as collaborative strategic planning, collaborative product commerce and collaborative forecasting and replenishment. According to the author one of the major trends in e-marketplaces is that they tend to provide more and more of these advanced services.

According to Kaplan and Sawhney (2000) a company can split its purchasing of goods and services up into two broad categories, manufacturing inputs and operating inputs. Manufacturing inputs are goods and services that are inputs into the main process, such as raw materials. Operating inputs, however (also referred as MRO) are goods and services that are purchased to support the main process, such as for example office equipment. Kaplan and Sawhney (2000) also argue that companies differentiate in purchasing of goods or services in the way of sourcing and refer to systematic sourcing and spot sourcing. Systematic sourcing are, as the name tells, repeated purchases that usually involve negotiating contracts. Spot sourcing on the other hand is purchasing goods or services at just one occasion. Figure 2.6 presents a graphical interpretation of Kaplan’s and Sawhney’s (2000) e-marketplace segmentation.
2.2.1.6 Electronic Data Interchange (EDI)

Ross (2003) states that EDI is an IT tool that is of interest for SRM. Furthermore, other authors as well discuss EDI as an important tool in inter-organisational relationships. (Handfield and Nichols (1999), Simichi-Levi et al. (2003), Kappelman et al. (1996).

An EDI system “makes use of standard protocols to share information among participant companies through computer-to-computer exchange of electronic documents relating to purchasing, selling, shipping, receiving, inventory, financial and other activities” (Archer and Yuan, 2000). Adapting EDI is a way of making the supply chain more efficient (Lauer, 2000).

EDI is identified as “inter-company computer-to-computer exchange of business documents in standard formats” (Bowersox and Closs, 1996).

There are various benefits for a company to utilise EDI. Bowersox and Closs (1996) list some direct benefits from the use of EDI technology:

1. Increased internal productivity
2. Improved channel relationship
3. Increased external productivity
4. Increased ability to compete internationally
5. Decreased operational cost

However, the authors highlight the necessity to consider that a successful implementation of EDI requires not just technological capabilities but also organisational commitment. The implementation process needs to include both technical and human components. According to Kappelman et al. (1996) “technology, however, cannot guarantee the success of a business, only facilitate it.”

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Figure 2.6: The B2B matrix by Kaplan and Sawhney (2000), adapted by the authors

<table>
<thead>
<tr>
<th>THE B2B MATRIX</th>
<th>What businesses buy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How businesses buy</strong></td>
<td><strong>operating input</strong></td>
</tr>
<tr>
<td>systematic sourcing</td>
<td>MRO Hubs</td>
</tr>
<tr>
<td>Ariba</td>
<td>Chemdex</td>
</tr>
<tr>
<td>W.W.Grainger</td>
<td>SciQuest.com</td>
</tr>
<tr>
<td>MRO.com</td>
<td>PlasticNEt.com</td>
</tr>
<tr>
<td>BizBuyer.com</td>
<td></td>
</tr>
<tr>
<td>spot sourcing</td>
<td>Yield Managers</td>
</tr>
<tr>
<td>Employeease</td>
<td>e-Steel</td>
</tr>
<tr>
<td>Adauction.com</td>
<td>PaperExchange.com</td>
</tr>
<tr>
<td>CapacityWeb.com</td>
<td>Altra Energy</td>
</tr>
<tr>
<td></td>
<td>IMX Exchange</td>
</tr>
</tbody>
</table>
In the automotive industry the big three (Chrysler, Ford and General Motors) introduce mandatory EDI for their suppliers suggesting that suppliers unable to adapt new technology will either go bankrupt or sell out (Lauer, 2000).

2.2.1.7 Internet

The last IT tool Ross (2003) discusses in the context of SRM is the internet - the IT technology that made business authors talking about a brand new world and a technology that would forever revolutionise the way of doing business (Kalakota and Robinson, 1999).

Chaston (2001) defines the Internet as “small area networks belonging to individual organisations (local area networks or LANs), networks spread across large geographic areas (wide area networks or WANs) and individual computers”. Bojic et al. (2003) describes the Internet as a large scaled client/server system. The client (PC’s) asks for a service from a server, usually a local ISP (Internet Server Provider). The ISP that holds on the information returns the asked service to the client. Furthermore, the local ISP is connected to a larger ISP that is linked to the national and international infrastructure. The exit and entry points to a country’s internet infrastructure can be seen as super highways and the local ISPs as country roads. (Ibid) the local ISPs as country roads. (Ibid)

Another way to describe the internet is suggested by Porter (2001) in the context of its usability: “an enabling technology – a powerful set of tools that can be used wisely or unwisely, in almost any industry and as a part of almost any strategy”. 

Porter (2001) suggests using the value chain as the base for understanding the impact the internet has on companies. The value chain is described by Porter (2001) as a framework to identify value creating activities.
Several other authors as well discuss the impact of the Internet on business, mainly putting it in the context of e-business as for example Kalakota and Robinson (1999), Chaston (2001) and Jelassi (2004).

2.2.2 IT and relationships

IT development has had a major impact on businesses relationships with suppliers. Ayers (2002) for example argues that IT has transformed arms length relationships into cooperative relationships and suggests that there seems to be no limit of relationship creativity with the help of different IT solutions. Goffin et al. (1997) continue by stating that IT development has made it much easier for companies to engage in close supplier relationships. This is also true for the automotive industry as argued by Stephens et al. (2002) who state that “the big three automakers strive to turn their suppliers into systems suppliers – not component makers, those SC reengineering efforts would be impossible without the utilisation of IT.”

Jap (2001) presents a framework on the interdependence between technology and a company’s relationships and discusses how they affect each other. According to her technology influences relationships and relationships influence technology: “they are reciprocal processes that may occur in both directions over time”. In order to make the discussion easier she splits the technology ↔ relationship interface up into three parts:
Relationship → Technology

Technology → Relationship

Relationship ↔ Technology

Relationship → Technology: According to Jap (2001) different kinds of relationships between companies will dictate to what degree the businesses can leverage inter-organisational technology investments. She states that it is vital and basic that companies understand the inter-organisational activities and processes in order to be able to improve the value between the businesses with the utilisation of new technology. In order to illustrate this, the author brings up numerous examples. ASP (Application Service Provider) provider Nordia Technologies, for instance, helps multinational manufacturers with coordinating issues. After studying several manufacturing companies Nordia found a need for real time communication and linkage between factory floor components (as purchasing and operations). The result is a floor-to-floor communication system that is able to communicate with other IT-systems, ending up with a possibility to improve the return of a company’s various activities. (Ibid)

There are, however, as argued by Jap (2001) three main pitfalls regarding the Relationship → Technology interface. Firstly, companies sometimes fail to carefully map the inter-organisational processes/activities. Without understanding these processes/activities it is very hard to support them with technology. Secondly, companies sometimes fail to educate and implement proper incentives for employees that are going to use the new technology. Thirdly, businesses sometimes fail to fully leverage the chance to enhance the inter-organisational processes/activities given by the Relationship → Technology interface. Usually this opportunity is lost because of poor follow through, as if for example the Relationship → Technology interface provides a company with a new IT application that in turn can be used in other areas of the company’s businesses, but is not. (Ibid)

Technology → Relationship: According to Jap (2001) this part concerns new technologies that fundamentally change some inter-organisational processes/activities. The author states that a reverse auction is a good example for this. A more concrete example is presented by the author regarding the reverse auction e-hub (see E-hubs) ECumulate.com. In order to get high order volume and in this way a discount from the suppliers the E-hub aggregates demand from small fragmented businesses with similar purchasing needs. ECumulate.com also takes the responsibility to coordinate with the distribution channel in order to deliver the purchased products. This kind of business is fundamentally changing the supply-chain structure and technology is influencing relationships (Technology → Relationship). She also mentions that this specific interface is hard to execute, especially because it means exploring the unknown; in other words to trying to create new business models. (Ibid)

As for the Relationship → Technology interface Jap (2001) also recognises pitfalls. First of all, businesses sometimes do not consider the long term effect of using for example a reverse auction e-hub such as ECumulate.com. The use of these types of e-hubs can in some cases lower the overall performance of the supplier relationship. Furthermore, there is a risk in not seeing the opportunity created by new technologies. The author’s research shows that using e-hubs increases the supplier’s willingness for dedicated investments towards the buyer. Finally, companies sometimes fail to properly investigate how the new technology will change the incentives of the different players. In order for a new technology to function in a
good way all the players affected by this new technology must understand the new value that the technology offers. (Ibid)

Figure 2.9: Interdependence between IT and Relationships, by Jap (2001)

*Relationships ↔ Technology:* Jap’s (2001) framework, as shown in figure 2.9, is working in both directions at the same time. Both directions should be discussed and explored from time to time within businesses. The author explains that this framework should be regarded as a never ending process, as relationships and technologies are changing over time. According to her, the Relationship-Technology interface is a path to create competitive advantage through non-appropriable and idiosyncratic investments. Non-appropriable assets concern intangible assets such as trust and loyalty; idiosyncratic investments are differentiated inputs such as customised technology offerings to support a certain supplier relationship. (Ibid)

“It is the creative intermingling or customization of the intangible aspects of relationships with emerging technologies that can enable the supply chain to achieve a unique market position and allows them an advantage over competing supply chains.”

Sandy Jap, (2001)

Bensaou (1997) argues that the technological unpredictability associated with the components exchanged between the buyer and its supplier, can affect the level of cooperation (for example in an environment with a rapid speed of IT innovation). This is according to the author especially true for the Japanese companies he studied. The Japanese companies were affected by technology unpredictability in a way that it in many cases strengthened the level of cooperation. This is explained by the fact that Japan has a culture of tight collaboration and even if not scientifically confirmed it is suggested that tight collaboration can work as a technology unpredictability absorber. However, according to Bensaou (1997) there is a difference between the American and the Japanese companies. For the American companies technology unpredictability did not have a significant effect. (Ibid)

In the same paper from 1997 Bensaou states that the scope of information technology used within the relationship can increase the level of collaboration between companies. This is again very true for the Japanese companies but it is not as certain for the American companies. The culture of tight relationships in Japan as a way of thinking naturally results in the fact that IT applications are used to strengthen relationships. However, the American companies are more concerned of using IT as a strategic tool instead of increasing the level of collaboration through IT. With for instance creating electronic marketplaces for components companies can get access to more suppliers than before and in this way increase market
competitiveness. As stated by Bensaou (1997) the American manufacturer’s policy is to develop an electronic platform to support an electronic marketplace for car components, whereas the Japanese manufacturers are engaged in an electronic partnership strategy.

According to Ryssel et al. (2004) using IT in a relationship is not a guarantee for creating additional value in that relationship, in the way trust and commitment are. Furthermore, they argue that IT utilisation in relationships is mostly a function of existing internal IT tools and not a function of the relationship atmosphere. However, they state that this can be an outcome of the newness of IT tools and will change when companies get more used to the IT applications. Finally, the authors found out that shared IT had a negative impact on the relationships value creation. This, they suggest, steams from the fact that IT tools can impersonalise relationships. They continue by stating that this is again due to the newness of the technology, which in some cases results in implementing IT tools in the wrong way and for the wrong reasons.

### 2.3 Summary

We based our second chapter – the literature overview – on the definition of Supplier Portfolio Management introduced by Bensaou (1999) who defines SPM as “choosing a type of relationship appropriate to a product or market conditions and adapting management practices to that relationship”. Based on this definition we identified two main parts of SPM, namely supplier segmentation and management practices adapted to types of relationships. Choosing a type of relationship, as Bensaou (1999) states, or supplier segmentation, as other authors such as Svensson (2004) refer to it, is a one-way activity. In order to adapt management practices to suppliers a company chooses a relationship it intends to have with this suppliers due to its understanding of the relationship. Leaning on this, we will in this study also refer to supplier segments and supplier relationships as the intended relationship of a car manufacturer to its supplier.

In the first part of the second chapter we have provided the reader with an overview of literature of different supplier segmentation models, which covers the first part of SPM according to Bensaou (1999). We could see that different authors use different dimensions of classification to segment a company’s supplier portfolio. The differences of segmentation models introduced by different authors stem from industry specific criteria such as the business environment in the marketplace and the relationship criteria involved in the supplier-buyer relationships (Svensson, 2004).

We then continued with literature on activities within SPM in order to address the second part of SPM. This has been done as no concrete literature could be found on all of the three parts of “management practices within SPM” identified by Bensaou (1999) (namely boundary spanner’s task characteristics, climate and process characteristics and information sharing) and as activities within SPM are the observable outcomes of it. In order to search for literature in the area of activities within SPM we based our research on Dobler and Burt (1996) who present eight postaward activities, namely ensuring understanding, the preaward conference, monitoring and controlling project progress, monitoring and controlling total supplier performance, motivation, assistance, supplier surveys, and partnerships. We introduced models and theories on these eight activities from Dobler and Burt (1996) and also brought up other opinions and concepts from different authors.

In the third part of the SPM overview we provided a brief overview of literature on information exchange due to its special importance in SPM. This part addressed the
importance of information exchange, the difference between information flowing upstream or downstream, barriers for information exchange and how companies exchange information in different types of relationships. We also presented literature on the influence IT has on information exchange.

In order to address the second area of our research problem apart from SPM – IT - we continued with literature on information technologies in the automotive industry and introduced different types of information technologies based on a model (figure 2.2) by Ross (2003).

Finally, we presented a literature overview on the influence of IT on relationships. Especially of interest were the differences in IT philosophy among companies. Furthermore, in this part we presented literature on the interdependence between IT and relationships and its value as a competitive advantage. Last but not least, also literature on the impact IT has on relationships was included in this overview.
2.4 Research Questions

Our research problem introduced in the first chapter of this thesis is “how can the use of information technologies in supplier portfolio management regarding PFP suppliers of an automotive manufacturer in the automotive industry and its influence on it be characterised? We now have to specify the different areas our research problem consists of to be able to address those areas separately by formulating research questions.

In the first chapter we presented a model of supplier portfolio management introduced by Bensaou (1999). According to the author SPM is defined as “choosing a type of relationship appropriate to a product or market conditions and adapting management practices to that relationship”. As Bensaou (1999) is the only author we could find who is explicitly defining SPM we used his model as a base for our literature survey. Based on what we have found we can divide SPM into three main areas, namely supplier segmentation, postaward activities in the management of supplier relations, and information exchange. These three areas guide us to three research questions concerning SPM that need to be answered:

1) How can the segmentation of PFP suppliers of an automotive manufacturer be characterised?
2) What types of activities are used within the management of PFP suppliers of an automotive manufacturer and why?
3) How can the information exchange with PFP suppliers of an automotive manufacturer be characterised?

In order investigate how the use of IT and its influence can be characterised we developed two more research questions. For these research question we will under the term information technologies consider both, information technologies (hardware and software) and IT applications.

4) What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?
5) How can the influence of information technologies on the management of PFP suppliers of an automotive manufacturer be characterised?

The interdependency of our five research questions is graphically mapped in figure 2.9 shown below. The first phenomenon that is to be studied is SPM, which we address with the first three research questions. We start with investigating how supplier segmentation is carried out in the automotive industry. After having identified the different supplier categories we will explore what activities exist within SPM and the different supplier segments. The next step then is to find how information is exchanged in the different supplier segments. The fourth and the fifth research question are addressing the second phenomena of our research problem – IT. With research question four we investigate what information technologies are used in SPM, by searching for IT in the three parts of SPM, supplier segmentation (what differences exist within the utilisation of IT in the different supplier segments, activities (how is IT applied in different activities) and information exchange (with help of what information technologies is information exchanged). Finally, in research question five we analyse what interdependency exists between IT and SPM. Our goal is to find out how SPM is or has been
influenced by IT and also what influence SPM has or had on the utilisation of IT. The arrows between research question one to four that go in both direction symbolise the influence the different areas have on each other. The activities carried out have an impact on the supplier segment. The information exchange affects the activities within SPM and in turn the supplier segments. Furthermore, supplier segmentation, the activities as well as the information exchange also affect the use of IT.

Figure 2.9: Interdependency of research questions
3 Chapter Three: Frame of Reference

In order to be able to find an answer to our research problem we will in this chapter select the concepts we are going to use for our study based on our literature overview presented in chapter two. The emerged frame of reference will enable us to collect and analyse data connected to each research question.

3.1 Introduction

According to Miles and Huberman (1994) a conceptual framework shows the main areas that are studied either in a graphical or a narrative form. Through developing a conceptual framework the main key factors, constructs or variables are identified, discussed and their interdependency is explained. (Ibid)

3.2 How can supplier segmentation of PFP suppliers of an automotive manufacturer be characterised?

A company has different goals in working together with different suppliers which means that different management practices and activities are required (Bensaou, 1999). A company needs to decide which relationship design to choose for the supplier under different external contingencies (Bensaou, 1999). Svensson (2004) sees car manufacturers forced to improve their relationship strategies towards their suppliers by segmenting their supplier base in order to optimise current business activities. As explained earlier this is a one-way activity as the company segments its supplier base due to its intentions and understanding of the relationship where the supplier’s intentions are not considered. In our literature overview we have seen that there are various models of supplier segmentation each using different criteria. As we are focusing on car manufacturers and their suppliers in this study we will use a model based on the automotive industry for our frame of reference.

We presented three models that are based on studies conducted with automobile manufactures, namely the buyer-supplier relationship portfolio of Bensaou (1999), the supplier segmentation model presented by Childerhouse et al. (2003:1-2) based on Gadde and Häkansson (2001) with input of Tang (1999), and the supplier segmentation model introduced by Svensson (2004). The frame of reference for our first research questions will be the concept of “Portfolios of Buyer-Supplier Relationships” presented by Bensaou (1999). We decided to use this framework as it is an extensive study based on companies in the automotive industry. Furthermore, we have used the definition of SPM presented by Bensaou (1999) and his concept to identify the important areas of SPM and based our literature survey on it.

Table 3.1: Conceptualisation RQ 1

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
</tr>
</thead>
</table>
| RQ 1              | Supplier Segmentation | Portfolio of Buyer-Supplier Relationships  
Bensaou (1999) |

The four types of relationships identified by the author are segmented due to the buyer’s specific investments and the supplier’s specific investments. As we have seen in our literature
overview various authors present different models of supplier segmentation with each using different segmentation criteria. Our goal is to find out after what criteria companies segment their supplier base and for what reasons. We will observe after what criteria a supplier base is segmented, what categories of suppliers a company then due to this segmentation has and how these different categories of suppliers can be characterised. The operational definition of this research questions is shown in Table 3.2 below.

### Table 3.2: Operational definition RQ 1

<table>
<thead>
<tr>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Segmentation</td>
<td>Portfolio of Buyer-Supplier Relationships</td>
<td>Criteria used for creating segments of suppliers, types of relationships as the outcome</td>
</tr>
</tbody>
</table>

#### 3.3 What types of activities are used within the management of PFP suppliers of an automotive manufacturer and why?

By dividing supplier management into activities that take place, we will later on be able to investigate how IT is utilised in order to support and optimise those activities and thus in turn the management of existing suppliers. In our second chapter we provided an overview of literature on what activities and responsibilities exist within purchasing and supplier relationship management.

As our research problem is handling the utilisation of IT in SPM we are only focusing on the management of existing suppliers not including sourcing issues. We based our literature overview on the post-award activities introduced by Dobler and Burt (1996) that are in comparison to the other model we have looked at, purchasing responsibilities by Ross (1996), addressing the research question in a better way. The model of Ross (1996) indeed also includes activities that are necessary for the management of a supplier but this author is focusing on the responsibilities of a company’s purchase department. This is on one hand a broader scope, as for instance sourcing issues are also included and on the other hand also too narrow as there can be SPM activities that are not performed by only the purchase function. For this reason we will use the post-award activities of Dobler and Burt (1996) as the base for our frame of reference for our second research question.

Dobler and Burt (1996) have identified eight post-award activities in supplier management, namely:

- Ensuring understanding
- Preaward conference
- Monitoring and controlling project progress
- Monitoring and controlling total supplier performance
- Motivation
- Assistance
- Supplier surveys
- Partnerships
In our literature overview we have included other authors that explained the activities brought up by Dobler and Burt (1996) more in detail and provided examples. As these authors, however, do not provide new conceptual areas we will use the eight post-award activities by Dobler and Burt (1996) for our frame of reference.

Table 3.3: Conceptualisation RQ 2

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 2</td>
<td>Activities within the management of existing suppliers</td>
<td>Post-award activities and the management of supplier relations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dobler and Burt, 1996</td>
</tr>
</tbody>
</table>

The operational definition of the frame of reference to our second research question is as mentioned above based on the eight post-award activities and management of supplier relations introduced by Dobler and Burt (1996). We will explore what activities are accomplished within the management of PFP suppliers.

Firstly, we will observe if there are any activities in order to ensure understanding as brought up by Dobler and Burt (1996). The authors discuss early supplier involvement as a way of communication and mutual understanding. We will investigate how mutual understanding is ensured.

The second post-award activity listed by Dobler and Burt (1996) is the pre-award conference. We will explore if such a conference or a similar event is held before the contract is awarded in order to discuss contract requirements.

The third activity brought up by the authors is the monitoring and controlling of the project progress. Here we will observe what activities are carried out and how in order to ensure project progress.

Controlling and Monitoring total supplier performance is another post-award activity mentioned by Dobler and Burt (1996). The authors state that the intention of supplier performance evaluation is to enhance the relationships and thereby control performance. We will investigate what activities are accomplished in order to control the supplier’s performance and how they are carried out.

Motivation, the fifth post-award activity in Dobler and Burt’s (1996) model, according to the authors can be achieved in two ways, by punishment and rewards. We will investigate what means are used and how in order to motivate suppliers.

Assistance is another post-award activity the authors mention. According to Dobler and Burt (1996) through assisting the supplier with training and problem solving the companies are able to optimise the relationship and the supplier’s and in turn their own performance. Our goal is to observe how companies assist their suppliers.

Furthermore, Dobler and Burt (1996) mention supplier surveys to be conducted within a company’s supplier management. This is done in order to get feedback from their suppliers.
and in this way optimising the relationship. We will investigate in this area by observing how companies gain feedback from their suppliers.

Last but not least, the authors bring up an activity named *partnerships*. The authors describe activities that need to be undertaken when dealing with a strategic supplier that can be seen as a partner. Such activities involve e.g. cross-organisational teams, additional training, integrated communication system, plans for cooperating, identifying common objectives and guest engineers. We will explore what activities are undertaken when it comes to the management of strategic partners.

The operational definition of research question two is shown in Table 3.4 on the next page.
### Table 3.4: Operational definition RQ 2

<table>
<thead>
<tr>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-award activities and the management of supplier relations&lt;br&gt;<strong>Dobler and Burt, 1996</strong></td>
<td>Activities accomplished in the management of existing PFP suppliers</td>
<td></td>
</tr>
<tr>
<td><strong>Ensuring Understanding</strong>&lt;br&gt;• Early supplier involvement</td>
<td>Activity/-ies performed in order to ensure understanding</td>
<td></td>
</tr>
<tr>
<td><strong>Preaward Conference</strong></td>
<td>Activity/event taking place before the contract is awarded in order to discuss contract requirements</td>
<td></td>
</tr>
<tr>
<td><strong>Monitoring and Controlling Project progress</strong></td>
<td>Activity/-ies performed in order to ensure project progress</td>
<td></td>
</tr>
<tr>
<td><strong>Supplier performance measurement</strong></td>
<td>Activity/-ies performed in order to control performance</td>
<td></td>
</tr>
<tr>
<td><strong>Motivation</strong>&lt;br&gt;• Rewards&lt;br&gt;• Punishment</td>
<td>Mean/-s used for Motivation</td>
<td></td>
</tr>
<tr>
<td><strong>Assistance</strong>&lt;br&gt;• Problem-solving&lt;br&gt;• Training</td>
<td>Activity/-ies performed in order to assist the supplier</td>
<td></td>
</tr>
<tr>
<td><strong>Supplier Surveys</strong></td>
<td>Activity/-ies performed in order to gain feedback from the supplier</td>
<td></td>
</tr>
<tr>
<td><strong>Additional activities in partnerships</strong>&lt;br&gt;• Cross-organisational teams&lt;br&gt;• Additional Training&lt;br&gt;• Integrated communication system&lt;br&gt;• Plans for cooperating&lt;br&gt;• Identify common objectives&lt;br&gt;• Guest engineers</td>
<td>Activities that are necessary when managing a supplier of strategic importance</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4 How can the information exchange with PFP suppliers of an automotive manufacturer be characterised?

As stated by Bensaou (1999) and other authors as Zsidisin and Ellram (2001) or Ross and Rockart (2002) information exchange is vital for a buyer and supplier. Childerhouse *et al.* (2003:a,b) state that the costly uncertainty in the value chain can be eliminated through information exchange. Furthermore, from our literature overview it can be seen that companies are exchanging information with each other in the form of continuous information
flows. These information flows can be at risk through players in the supply chain that do not trust each other or through companies that are only focusing on their own processes and their suppliers and not on their customers’ processes. Moreover, authors mention that different types of relationships require different information exchange, mainly due to an organisational information flow barrier.

Our main goals for this research question is to find out the character of the information that needs to be exchanged between buyers and suppliers; how the information flow between buyer and supplier can be characterised; with what tools the information is exchanged and if the character of the information is varying between different types of relationships.

In literature there are numerous concepts regarding information exchange between suppliers and buyers. However, we could only find two authors that focus on the areas we want to investigate in a detailed way, namely Bensaou (1999) and Childerhouse et al. (2003:a,b). Furthermore, both authors based their concepts on studies conducted in the automotive industry. We will therefore use both these concepts as our frame of reference for research question three.

Table 3.5: Conceptualisation RQ 3

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ 3</td>
<td>Information Exchange</td>
<td><strong>Information flow</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Childerhouse et al., 2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Up-/downstream information flows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Information-sharing practise</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bensaou, 1999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Richness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Frequency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Means for information exchange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Differences in relationships</td>
</tr>
</tbody>
</table>

The concept presented by Childerhouse et al. (2003a,b) is addressing the broad problem area of information flow, we will on the other hand focus on two parts of the concept that are of special interest for our research question. These parts are information flowing upstream/downstream and main issues that are experienced to be of a problem in the information exchange. Hence we will not go into detail about problems connected to information flow, the information flow barriers (except the organisational barrier) and what a company should do to avoid these problems. By using Childerhouse et al. (2003a,b) concept for our frame of reference we will be able to answer one of the goals for this research question, how the information flow between buyer and supplier can be characterised.

As stated earlier we will also use Bensaou’s (1999) for our frame of reference. By adding Bensaou’s (1999) concept we have enough information in order to take care of the last three goals for this research question. The character of the information that needs to be exchanged between buyers and suppliers (richness and frequency), with what tools the information is exchanged (means for information exchange) and if the character of the information is varying between different types of relationships (differences in relationships).
Our operational definition for research question three will be defined as; characteristics of information exchange. We choose this definition because it fits well with the research question and is also a broad definition. As it is broad it does not focus on a certain area of information exchange and thus it is not bias.

Table 3.6: Operational definition RQ 3

<table>
<thead>
<tr>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
<th>Operational definition</th>
</tr>
</thead>
</table>
| Information Exchange   | **Information flow**  
Childerhouse et al., 2003  
- Up-/downstream information flows  
- Problems  

**Information-sharing practise**  
Bensaou, 1999  
- Richness  
- Frequency  
- Means for information exchange  
- Differences in relationships | Characteristics of information exchange                                                               |

3.5 What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?

The IT development the last decades has dramatic changed the way companies are doing business with each other, as brought up in our literature overview. Some of the most important information technologies that have evolved are EBS, EDI and the Internet. In addition new information technologies have as well created several IT applications.

New information technologies have given companies the opportunity to manage their suppliers in new creative ways. However, information technologies are only tools and will not add any value to the business if they are not utilised in the right way. Regarding the management of suppliers there are various information technologies presented as important such as e-services, e-procurement, e-processing and data warehousing. We want to investigate what information technologies are used within the management of PFP suppliers in the automotive industry and why, in order to get an answer on how this area is characterised in the automotive industry.

Various authors discuss different types of hardware, software and IT applications used within the management of existing suppliers. However, none of these authors offers an overview, as a model of IT utilisation within the management of existing suppliers in the automotive industry. Kaplan and Sawhney (2000) for instance discuss the use of e-hubs, however, there are as well other information technologies within the management of existing suppliers. Due to this lack of an overview we based our literature survey regarding IT on a model of relevant information technologies in SRM according to Ross (2003). We then expanded that model and searched for other information technologies related to SPM. As there are numerous
information technologies available it was impossible to cover all of them in detail. However, all information technologies related to SPM we found in literature can be related to Ross’s (2003) model, as he focuses on the character of the information technologies and not on the technologies by themselves.

Ross (2003) presents compared to other models in literature the most extensive model of IT utilisation within the SPM area. In this model he presents a picture of relevant IT tools and applications within SRM calling it the *E-SRM B2B e-marketplace functions*. SRM is as well similar to the management of suppliers as SRM deals with the management of supplier relationships, relations that in turn are interactions with existing parties that demand management. (Gummesson, 2002). The concept selection for our frame of reference is further strengthened by the fact that the *E-SRM B2B e-marketplace functions* model is of the year 2003. As stated earlier when conducting research in the IT area it is important to have updated theories due to the rapid development in IT.

Even if Ross (2003) recognises the importance of the Internet in SRM he does not provide detailed information on how the Internet is utilised in SRM. For this reason, we will use one more concepts for our frame of reference presented by Porter (2001) in order to gain more detailed information on the utilisation of the Internet. We decided to use Porter’s (2001) concept as a complement to Ross (2003) model as it highlights the impact Internet has had on today’s businesses.

### Table 3.7: Conceptualisation RQ 4

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
</tr>
</thead>
</table>
| RQ 4              | Utilisation of IT| E-SRM B2B e-marketplace functions model  
|                   |                  | Ross, 2003                        |
|                   |                  | • EBS-backbone                    |
|                   |                  | • E-services                      |
|                   |                  | • E-processes                     |
|                   |                  | • E-technology services           |
|                   |                  | • EDI                             |
|                   |                  | • Internet                        |
|                   |                  | • E-marketplaces                   |
| Internet          | Internet’s impact on the value chain  
|                   |                  | Porter, 2001                      |

First of all, the e-SRM concept presented by Ross (2003) consists of four different types of separated but integrated areas, namely the EBS-Backbone, e-SRM Services, e-SRM Technology, and e-Processing. Each of these areas can in turn be subdivided into various functions. Secondly, the author addresses EDI, the Internet and B2B marketplaces in his model.

As Ross (2003) addresses not existing suppliers in his model, all the functions related to not existing suppliers, such as for example the function e-sourcing under the e-services area, will not be considered in our frame of reference.
To get more detailed information of the utilisation of the Internet related to SPM we will use Porter’s (2001) model of the Internet’s impact on the value chain (Figure 2.8). In that model there is however areas that are focusing on not existing supplier related issues. These areas will as for Ross (2003) model not be considered for our frame of reference.

For the operational definition we will observe what information technologies are used in the management of existing PFP suppliers and for what reasons. We choose this operational definition of the same reasons as for research question three.

Table 3.8: Operational definition RQ 4

<table>
<thead>
<tr>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
<th>Operational definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation of IT</td>
<td>E-SRM B2B e-marketplace functions model&lt;br&gt; Ross, 2003&lt;br&gt; • EBS-backbone&lt;br&gt; • E-services&lt;br&gt; • E-processes&lt;br&gt; • E-technology services&lt;br&gt; • EDI&lt;br&gt; • Internet&lt;br&gt; • E-marketplaces</td>
<td>Information technologies utilised in the management of suppliers</td>
</tr>
<tr>
<td>Internet utilisation</td>
<td>Internet’s impact on the value chain&lt;br&gt; Porter, 2001</td>
<td></td>
</tr>
</tbody>
</table>

3.6 How can the influence of information technologies on the management of PFP suppliers of an automotive manufacturer be characterised?

As stated in our literature survey the development of IT influences the way companies are doing business with each other. However, little discussion can be found on how IT as a phenomenon has influenced companies and also the management of existing suppliers. In order for businesses to utilise new information technologies in the management of suppliers it is important to be aware of the implications when implementing these new information technologies into the organisation. For this reason, we will investigate how the influence of information technologies on the management of PFP suppliers in the automotive industry can be characterised.

Several authors in the literature talk about information technologies and how they have influenced the management of existing suppliers. However, these discussions are mainly of a conceptual nature as Ross (2003) or Wise and Morrison’s (2000) discussion about the future of B2B commerce. Jap (2001), however, presents a framework more appropriate for our frame of reference. In her paper she discusses the interdependence between IT and relationships. We will furthermore use Bensaou’s (1997) discussion about different types of philosophic IT approaches shown in the difference between Japanese and American automotive manufacturers. Adding Bensaou’s (1997) discussion provides us with more in-depth information for our frame of reference. For the same reason we will as well add the concept presented by Rysell et al. (2004).
Jap (2001) states that new information technologies such as for instance e-marketplaces can fundamentally change companies’ inter-organisational processes/activities implying that IT is influencing relationships. On the other hand, she states that relationships can influence IT, by giving the example of an ASP provider (Application Service Provider) that makes use of IT to support inter-organisational processes/activities. As a conclusion, the author argues that in reality relationships and IT are influencing each other in both directions and if a company strives to continuously enhance this interdependence between relationships and IT, it is a good base for a competitive advantage.

The concept of Bensaou (1997) reveals one main conclusion, that there is a difference between American and Japanese automotive manufacturers regarding their IT philosophy. The American companies mainly use IT as a tool to create more efficient markets in comparison to the Japanese companies that utilise IT as a way to strengthen relationships. Apparently, according to Bensaou’s (1997) study, the influence that IT has on existing suppliers is in a high degree affected by the company’s IT philosophy.

Rysell et al. (2004) argue that IT can have a negative impact on the value creation in a relationship. They as well suggest that this can be because it takes time to utilise new information technologies in a value creation way.

For our operational definition we are going to investigate what influence IT has had on SPM. Again we choose this operational definition for the same reasons as for RQ3 and RQ4. It is a broad definition that fits well with the research question.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Theoretical Area</th>
<th>Selection of Models and References</th>
</tr>
</thead>
</table>
| RQ 2              | Influence of IT on SPM         | - The relationship-technology interface
  - Jap, 2001
    • IT influencing relationship
    • Relationship influencing IT
    • Interdependency of IT and relationship as a base for competitive advantage
  - IT in interorganisational cooperation
    - Bensaou, 1997
    • IT to strengthen partnerships
    • IT to create more efficient markets
  - The impact of information technology deployment on trust, commitment and value creation in business relationships
    - Rysell et al, 2004
    • Negative impact due to newness |
### Table 3.10: Operational definition RQ 5

<table>
<thead>
<tr>
<th>Theoretical Area</th>
<th>Selection of Concepts and References</th>
<th>Operational definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Influence of IT on SPM</strong></td>
<td><strong>The relationship-technology interface</strong>&lt;br&gt;Jap, 2001&lt;br&gt;• IT influencing relationship&lt;br&gt;• Relationship influencing IT&lt;br&gt;• Interdependency of IT and relationship as a base for competitive advantage</td>
<td><strong>Influence of IT on SPM</strong></td>
</tr>
<tr>
<td></td>
<td><strong>IT in interorganisational cooperation</strong>&lt;br&gt;Bensaou, 1997&lt;br&gt;• IT to strengthen partnerships&lt;br&gt;• IT to create more efficient markets</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>The impact of information technology deployment on trust, commitment and value creation in business relationships</strong>&lt;br&gt;Rysell et al, 2004&lt;br&gt;• Negative impact due to newness</td>
<td></td>
</tr>
</tbody>
</table>
3.7 Emerged Frame of Reference

In the introduction part of chapter three we have identified the main areas of our research problem and formulated research questions in order to be able to understand our research problem. We have then provided the reader with the concepts we will use for our research questions. Furthermore, we discussed the operational definition for each of our research question. In this last part of chapter three we will finally present the emerged frame of reference consisting of the main areas important in this study and there interdependence.

![Frame of reference diagram](image)

**Figure 3.1: Emerge frame of reference developed by the authors**
Chapter Four: Methodology

In this chapter we will present the procedure of our thesis and the methods we used for our research. According to Holme and Solvang (1997) a method is a tool that facilitates problem solving and reaching new knowledge. The disposition of our methodology chapter is shown below in figure 4.1 and is addressing the steps of methodology presented by Holme and Solvang (1997). At the end of this chapter we will discuss problems that can come with the methods we used and present what we have done in order to strengthen validity and reliability.

![Figure 4.1: Schematic Presentation of the Methodology](image)

4.1 Research Purpose

A research purpose can be formulated in certain ways depending on the objectives of the author as formulated in the research problem. The classification in terms of the purpose of a study most often used is to distinguish between exploratory, descriptive and explanatory research purpose (Saunders et al., 2000). The purpose of the study is connected to the research problem and depending on the objective and formulation of the problem, the purpose of the study varies. According to Saunders et al. (2000) the question of what research purpose to use is not a question of either/or – the three categories can be overlapping. The authors state that the purpose in the first place can for instance be exploratory and become more descriptive later on.

Saunders et al. (2000) explain that with an exploratory purpose the intention of the study is to find out “what is happening”. An exploratory purpose is to put a new light on a certain area in order to gain new insights (Robson, 1993:42). An exploratory approach is useful if the researcher wants to clarify the understanding of a problem. An advantage of exploratory research is that it is flexible and has to be flexible. The direction of the study can and will change as a result of new data which appears and new insights the author has gained. Adams and Schvaneveldt (1991) state this changing direction that can occur with an exploratory research does however not mean that there is not concrete direction of the enquiry. They explain that with an exploratory research the focus at the beginning is broader and becomes narrower and more specific with the progress of the research (Saunders et al., 2000).

Robson (1993:4) states that with a descriptive purpose the objective is to gain a precise profile of persons, events or situations. Saunders et al. (2000) further explain that descriptive research can be seen as an extension of a piece of exploratory research. With a descriptive purpose the researcher already needs to have a clear picture of the phenomena he will further investigate.
Last but not least a research purpose can also be *explanatory*. With an explanatory purpose the objective of the researcher is to find causal relationships between variables. The researcher of an explanatory study will collect data and investigate a situation in order to identify and explain the relationships between the different variables (Saunders *et al.*, 2000).

At the beginning our purpose is broader and becomes narrower and more specific over time. We are asking “what is happening” in SPM in the automotive industry regarding IT. Those issues are according to Saunders *et al.* (2000) characteristics of exploratory research. Furthermore, the subject of our study is not a topic that has in this way already been studied. For these reasons we will conduct an exploratory research. However, even though the research purpose of our thesis is exploratory we intend to describe the discovered patterns of our work. We have descriptive parts in our study in order to find an answer to smaller pieces that then together build the answer to our research problem.

### 4.2 Research Approach

Saunders *et al.* (2000) suggest that the research approach is an outcome of how the researcher wants to use theory. They argue that a research project can take on two different roads, a deductive approach or an inductive approach.

#### 4.2.1 Deductive vs. Inductive

The deductive approach develops theory and one to many hypothesise before testing these hypothesise, compared to an inductive approach that are collecting data first and then trying to develop a theory from the data (Saunders *et al.*, 2000). In other words, deductive approach is research based on theory; inductive approach is based on data. The choice of topic for the research is the main criteria when selecting the research approach. Discussing a topic with a lot of literature about the research area invites a deductive approach while little literature about the research area suggests an inductive approach. There are also other research approach selection criteria such as the level of risk, time available and the audience. Deductive research is usually, compared to an inductive approach, of low level of risk, less time consuming and the audience is generally more used to a deductive approach. Despite this it is impossible to say that one approach is better than the other; this depends of the area of research. Finally, the choice of approach isn’t necessarily an either-or choice. Most of the times the best way is to combine the two different approaches (Saunders *et al.*, 2000).

The research problem of this thesis is *how the use of IT in SPM and their influence on it in the automotive industry can be characterised?* Quite a lot of literature exists in our research area as presented in chapter two, suggesting a deductive approach. (Creswell, 1994). Furthermore Creswell (1994) suggest that a deductive approach is further strengthened if there is a lack of time for research; we argue that a master thesis rarely provides the researcher with the amount of time needed for an inductive approach. However, there is an inductive element in the study, the research problem does not aim to generalise suggesting that the problem area is complex and the data collected is of a qualitative nature. (Saunders *et al.*, 2000) Even if a lot of literature exists about the research area it is a lack of literature available on how the various components of the research area is linked to each other, thus also suggesting an inductive approach. With the named reasons in mind we choose a deductive research approach, but the study has an inductive component that derives from the research area.
4.2.2 Qualitative vs. Quantitative data

When you are collecting data for research projects the data can be either of qualitative or quantitative nature. In general, the question of what data collecting approach to pick is related to the research problem. If the research questions are “shallow” a quantitative approach is the best to pick but if the questions are “deep” a qualitative approach is better to use as also pointed out by Dey (1993) who states that “the more ambiguous and elastic our concepts, the less possible it is to quantify our data in a meaningful way”. In table 4.1 an overview of the main distinctions between quantitative and qualitative data is mapped (Saunders et al, 2000).

Table 4.1: Differences between quantitative and qualitative data, adapted from Saunders et al. (2000)

<table>
<thead>
<tr>
<th>Quantitative data</th>
<th>Qualitative data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Based on meanings derived from numbers</td>
<td>• Based on meanings expressed through words</td>
</tr>
<tr>
<td>• Collection results in numerical and standardised data</td>
<td>• Collection results in non-standardised data requiring classification into categories</td>
</tr>
<tr>
<td>• Analysis conducted through the use of diagrams and statistics</td>
<td>• Analysis conducted through the use of conceptualisation</td>
</tr>
</tbody>
</table>

When it became obvious for researcher that it was impossible to quantify human feelings and emotions new analytical methods were evolved which considered “soft” data, namely qualitative methods (Walliman, 2001). The core in qualitative data is that the data collected should provide the researcher with a deeper understanding of the research problem (Johansson, 2002). Quantitative data is numerical data or other sort of data that can be quantified. (Saunders et al, 2000). The data collected through a quantitative method is characterised by its distant to what is studied, rather than trying to understand a problem (Johansson, 2002). Walliman (2001) choose to refer to quantitative data as “hard” data.

Our research is qualitative. The lack of literature about the various links in the problem area force us to look for information that is of rich nature. Moreover, our main goal is to try to understand the problem area and not to generalise which again leads to a qualitative study. However, there are certain elements of quantified data in our study as with almost all studies (Saunders et al. 2000).

4.3 Research Strategy

A research project’s research strategy explains how the researcher collects and analyses empirical data (Yin, 1994). The research strategy works as a general plan where the researcher explains how he/she wants to carry out the project to answer the research questions (c.f. Saunders et al, 2000).

Yin (1994) states that the choice of the research strategy is not linked to the nature of the research purpose (explanatory, descriptive or explanatory). The research strategy to employ is instead in a high degree influenced by three other criteria’s, namely the type of research question posed, the extent of control an investigator has over actual behavioural events and the degree of focus on contemporary as opposed to historical events.

The type of research question posed is according to Yin (1994) the most important criterion. The author suggests that the type of research strategy to employ is linked to how the research
question is formulated, if it is a “who”, “what”, “how” or “why” question. An important remark to the “what” questions is that if the study is exploratory, any of the mentioned research strategies in figure 4.3, adapted from Yin (1994), is useable (Ibid).

The extent of control an investigator has over actual behavioural events / the degree of focus on contemporary as opposed to historical events: These criteria can be explained by two extremes. The first extreme is historical in which the researcher has no control over behavioural events, because the research study past events. The second extreme is experimental where a researcher for example wants to explore the effect of changing one factor keeping the other dependent factors constant and is focusing on contemporary events. (Ibid)

Table 4.2: Research strategies connected to criteria, adapted from Yin (1994)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of Research Question</th>
<th>Requires Control over Behavioural Events</th>
<th>Focuses on Contemporary Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, * where, how many, how much</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Archival analysis (e.g. economic study)</td>
<td>who, what, * where, how many, how much</td>
<td>no</td>
<td>yes/no</td>
</tr>
<tr>
<td>History</td>
<td>how, why</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Case study</td>
<td>how, why</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 4.2 proposes five different research strategies that are based on the different criteria, but that does not show the whole picture. Various authors suggest different frameworks of research strategies, for example Saunders et al (2000) or Walliman (2001). However, the main goal of selecting a research strategy is to avoid a misfit between the research purpose and the research strategy (Yin, 1994). Hence, knowing why a certain research strategy is employed is the real challenge. A strength of the Yin (1994) framework is that it can be found in other literature as well such as in Johansonn (2002) and Baptista and Forsberg (1997). Because of this reason we felt confident to also use Yin’s framework for our study. Even if we base our research strategy on Yin (1994) he never goes in detail about the various strategies so in order to provide our selves with a deeper understanding of the different alternatives we also took the aid from other authors addressing the specific strategies more in detail.

Experiment: This strategy has its roots in natural science and typically involves (Saunders et al, 2000):

- the definition of a theoretical hypothesis
- the selection of samples of individuals from known populations
- allocation of samples to different experimental conditions
- introduction of planned change on one or more of the variables
• measurement on a small number of the variables
• control of other variables

Survey: One of the most popular research strategies in business and management closely connected to a deductive quantitative research approach. The survey is usually conducted with a questionnaire. The benefits are that a researcher is able to do research on a large sample, in an economic way, with easy comparison between respondents (because they are usually standardised), with good control and to get authoritative results. As with all research strategies surveys, however also have its drawbacks. The main drawback is possibly that it is easy to design a bad questioner, they as well suffer problems with time consuming activities as questionnaire design and analyses and the information gathered is not as wide as from more qualitative methods and (Saunders et al, 2000).

Archival analysis: Data collection of secondary data that is analysed is referred to as an archival analysis approach (Johansson, 2002).

History: The history strategy covers studies of the past and issues that no one can report on, not even in a retrospectively way (e.g. an old war veteran describing his point of view about the war). This strategy implies collecting data from primary documents, secondary documents and ancient artefacts (Yin, 1994).

Case study: A case study is dealing with a single case or a small number of cases. Its main goal is to find rich information about the research area and the enacted processes (Saunders et al, 2000). A case study strategy is covering a small number of units with many variables (Johansson, 2002). In case study research the researcher can employ various kinds of data collection methods such as questionnaires, interviews, observations and documentary analysis. One of the risks with a case study strategy is that it can feel a little unscientific (Saunders et al, 2000). Yin (1994) further addresses the problem of case studies stating that conducting a good case study is hard and no one knows what kind of skills a researcher should posses to be able to carry out a good case study.

As mentioned before we choose our research strategy from Yin’s (1994) framework of different strategies that are based on three different criteria namely; the type of research question posed, the extent of control an investigator has over actual behavioural events and the degree of focus on contemporary as opposed to historical events. In order to find out the best fit for our research problem, we compared our research problem/questions with the criteria.

The type of research question posed: The research questions in this study are of “what” and “who” character. The “what” questions appear in an exploratory context.

The extent of control an investigator has over actual behavioural events: Our research problem does not only not require control over behavioural events; it is also impossible to gain control over actual behavioural events, ruling out an experiment strategy.

The degree of focus on contemporary as opposed to historical events: Our problem area is focusing on contemporary events, even if our last research question regarding the influence of IT on the SPM is addressing a process over time. However, the foundation for our research problem is in contemporary events.
After comparing the different criteria with our research problem we decided to use a case study strategy, mainly because we need rich and wide information in order to be able to find an answer to our research problem. Even if we use “what” (that doesn’t correspond to a case study strategy, according to Yin’s framework) in our research questions, this fact did not prevent us from employing a case study strategy as our research questions including a “what” are of an exploratory nature. According to Yin (1994) exploratory research questions of the “what” type are exceptions of the first criteria and can be employed for all strategies.

When selecting between a single and a multiple case study approach Yin (1994) argues that both approaches have its place, however, the choice is a function of the circumstances. If the case is a critical case (to test a theory), an extreme or unique case or a revelatory case (an investigator has the opportunity to investigate a phenomenon previously inaccessible) the author recommends a single case approach. For a multiple case study he states that the purpose behind this is to get more robust results. Yin (1994) states, that the number of cases in a multiple case study is a matter of judgement. According to de Vaus (2001) there is no correct number of cases that should be included in a multiple case study approach. Each case should either predict similar results or produce contrary results for predictable reasons (Yin, 1994). De Vaus (2001) continues by stating the number of case studies to be conducted in a multiple case study approach furthermore depends on the knowledge of the researcher of external factors that might affect results. If the researcher expects that the results will hold up under a wide range of external conditions fewer case studies might be appropriate. However, the cost in time and resources must always be considered so the study does not make use of resources for an insignificant increase in the study result (Yin, 1994).

For our research problem we will use a multiple case study approach, as we do not examine a case of the single-case types Yin (1994) describes and as well to provide us with more robust study results. Involving more case studies would be necessary if we would intent to generalise our results. However, we do not intend to generalise as this thesis is an exploratory study of the usage of IT in companies in the automotive industry and the purpose is to explore qualitative information. To this end, we decided to conduct two case studies as we do regard a multiple case design as appropriate. We limit the number of cases on two so that we are in consideration of the time and money restriction so that we can gather in-depth information on our research problem, but are at the same time still able to compare our findings.

4.4 Sample Selection

According to Miles and Huberman (1994) studying everyone everywhere is absolutely impossible which makes sampling crucial for researchers. Researchers conducting qualitative research usually work with smaller samples in contrast to researchers in quantitative studies that reach out for bigger samples. The authors furthermore explain that the samples used in qualitative research are not completely pre-specified. Once the researcher starts with fieldwork he might devolve to other informants similar or different to the ones picked initially.

Blaxter et al. (2001) state that there are various sampling strategies used in research and group these strategies into two main categories, namely probability sampling and non-probability sampling. The categorisation is also confirmed by other authors such as McDaniel and Gates (1999). According to Blaxter et al. (2001) probability sampling strategies can be simple random sampling (selection at random), systematic sampling (selecting every nth case), stratified sampling (sampling within groups of the population), cluster sampling (surveyed whole clusters of the population sampled at a random), and stage sampling (sampling clusters
sampled at random). Non-probability sampling includes convenience sampling (sampling those most convenient), voluntary sampling (the sample is self-selected), quota sampling (convenience sampling within groups of the population), purposive sampling (handpicking supposedly typical or interesting cases), dimensional sampling (multidimensional quota sampling), and snowball sampling (building up a sample through informants). Which sampling strategy a researcher should use partly depends on his knowledge of the population in question, the resources available and his disposal. A non-probability sampling is used when there is a lack of sampling frame for the population in question, or where probabilistic approaches are not judged to be necessary. (Ibid.)

We are using a non-probability sample strategy, as our study is exploratory and we do not aim to draw any generalisations from the results we will achieve. Firestone (1993) explains that the most useful generalisations a researcher can draw from his qualitative work are analytic, not “sample to population”. Since we are conducting case studies and they are used for theoretical rather than for statistical generalisation also De Vaus (2001) points out that there is little sense to conduct a probability sampling and select cases as they are in some way representative of a wider population. Furthermore, a non-probability sample is less cost intensive compared to a probability sample. This characteristic according to McDaniel and Gates (1999) may have considerable appeal when accuracy is not of critical importance such as in exploratory research.

For our thesis we decided to conduct two case studies with two big leading European automobile manufacturers coming from two different European countries both active worldwide. As explained earlier we are using a multiple case study approach based on two case study companies. The selection of our two case study companies is both purposive sampling and convenience sampling. We decided to focus on those two companies from the very beginning of our research, as we regard them as very interesting cases. As leading automotive manufacturers in Europe with a strong tradition of exploring new information technologies in the interaction with suppliers, we felt confident that the companies could provide us with valuable insights for our research problem. Furthermore, we wanted to focus on two companies from two different European countries. Those two issues account for a purposive sampling. However, our sampling strategy is to a certain degree also a convenience nature as we chose companies from those European countries we could reach as financial resources are limited. Last but not least, the two companies we have selected are cooperative and promised to support us.

At both companies we are focusing on one production plant in the home country of the organisations as both organisations are huge and widely networked. We selected those two specific plants as they are both typical for the organisations and can be used as a representative for each organisation. Furthermore, we did not regard it as necessary to focus on the whole organisation as we investigate supplier management and the plants we studied both are huge and responsible for their own suppliers and supplier management.

As explained earlier we will keep the company names anonymous so that our respondents could give us more detailed information and could talk more freely. For this reason we will refer to the to plants of the two organisations as ALPHA and BETA.

Holme and Solvang (1997) state that within qualitative studies it is crucial for the researcher to select a respondent who has knowledge about the area of research. We sent the same email to both of our case study companies telling them about our study and our intensions and
asking for a contact person who has knowledge about our research area. We listed the five different parts of our study related to our research question to let them know what exactly we are interested in. Furthermore, in order to be sure that this respondent will be able to provide us with the information we need we sent a second email giving more detailed areas and information about what we want to investigate and gain insights in.

Our respondent at ALPHA is responsible for start-ups within the area “Supply Chain Quality” of the Material Control department. He could provide us with all the information we needed about SPM – their management of their PFP suppliers - and furthermore with information on the usage of IT within SPM at ALPHA. Also our respondent at BETA could provide us with all the information we needed as he is working with issues such as purchasing projects that are not related to cars, operating development projects, normally including IT consequences, and management and project leadership within the purchasing department.

4.5 Data Collection Method

Blaxter et al. (2001) state that research always involves the collection and analysis of data. In this section we will discuss different methods of data collection and explain what data collection methods we use for our study. The authors state that each research approach of a study provides different alternative frameworks for the methods of data collection.

Yin (1994) in his book about case study research introduces different methods of data collection that can be applied in case study research, namely documentation, archival records, interviews, direct observation, participant-observation, and physical artifacts.

Yin (1994) discusses the strengths and weaknesses of each of the methods. Strengths of the documentation method are that it is stable and can be reviewed repeatedly, that it is unobtrusive, contains exact names, references and details of an event, and that it involves a broad coverage. Weaknesses of the documentation method are that retrievability can be low, that it can reflect an unknown bias of the author and that the access might be deliberately blocked. Blaxter et al. (2001) explain that all research to a higher or lower degree involve the analysis of documents, as researchers are expected to read, understand and analyse literature on the subject studied and the writings of practitioners or policy makers. Logically, researchers who base their study on documents make a considerable use of secondary data, which is data that has already been collected by someone else for another purpose such as for instance official statistics provided by government agencies. The potential of secondary data in qualitative studies is increasingly being recognised. However, there are several issues a researcher has to be aware of when using secondary data for his or her study such as the original conditions under what this data has been produced. It could be that variables especially in statistics have changed over time or that other variables that were used might have changed over time. (Ibid)

When discussing archival records Yin (1994) states that the strengths and the weaknesses are in general the same as of documents. But the author continues that archival records are precise and quantitative but also weak regarding accessibility, due to privacy reasons.

Referred to Baxter et al. (2001) an interview is a social event with at least two participants and involves questioning or discussing certain issues. Moreover, this method can according to the authors be a very useful technique to collect data that is probably not accessible through observation or questionnaires. The strengths of conducting interviews according to Yin (1994) are that they are targeted and focusing directly on one case study topic and that they provide
perceived causal inferences. On the other hand an interview can easily be biased due to poorly constructed questions and it can occur that the interviewee gives the answers the interviewer wants to hear. Furthermore, inaccuracies due to a poor recall can arise (Yin, 1994).

Observation in research as stated by Blaxter et al. (2001) is a method of collecting data through watching, recording and analysing events of interest to the researcher. Observation can be split into direct observations and participant observations. Direct observations according to Yin (1994) cover events in real time and also cover the context of an event. However, they are regarded as very time and costs intensive. Furthermore, Yin (1994) states that they are very selective unless they have a broad coverage and that the event might proceed differently because it is being observed. The same weaknesses and strengths go for participant observations. In addition though, with participant observations the researcher can gain insights into interpersonal behaviour and motives. On the other hand, a bias can occur due to an investigator’s manipulation of events.

Physical artifacts according to Yin (1994) provide insights into cultural features and technical operations. However, the author criticises the selectivity and availability with physical artifacts.

Yin (1994) regards interviews as the most significant source for obtaining case study information, as they allow interactions between the respondent and the researcher. Eriksson and Wiedersheim-Paul (1997) explain that there are two different ways of conducting an interview, by telephone and in person. The authors continue by stating that the advantage of a personal interview in comparison to a telephone interview is that it provides the researcher with the confidence of face-to-face interaction. For this reason we have decided to conduct personal interviews with the respondents of both companies even though this causes high travel expenses for us as the companies are not situated in our vicinity.

An interview can take different forms. According to Eriksson and Wiedersheim-Paul (1997) an interview can be open-ended, focused or structured and following the line of a formal study. In an open-ended interview the researcher can ask the interviewee for the facts of a matter as well as for the interviewee’s opinion about events (Yin, 1994). A focused interview lasts for a short period of time. The focused interview will still remain open-ended and assume a conversational manner, but is more following a certain set of questions compared to the open-ended interview. The structured interview contains, as its name suggest, a clearer structure along the lines of a formal study.

In this study we conducted focused interviews with the respondents of our case study companies, as we aimed to ask a certain set of questions in order to gain insights about the areas of research related to our five research questions. We developed an interview guide (see Appendix A) that covered the questions we had about our areas of interest in order to ensure that both interviews are conducted in the same manner. The estimated time for the interview to last was one to two hours in order to be able to investigate in all the areas that are of interest for our study. However, both respondents were willing to spend more time on the interviews in order to clarify every point and to ensure that everything has been understood. The first interview with our respondent at ALPHA lasted for approximately two and a half hours, the second one with our respondent at BETA for about two hours.

In order not to influence the interviewee during the interview and let the interview thus become biased, we basically asked open questions. When collecting data on what activities
exist within SPM and what IT tools are used, we first asked our company to identify and explain all their activities and IT tools. Afterwards however, we reviewed the activities and IT applications brought up in our frame of reference and checked if there were any activities or IT applications that have not been brought up in a similar way at our case study companies. If so, we asked more specifically as some activities and also IT tools are often taken for granted at many companies and are thus forgotten easily.

Blaxter et al. (2001) discuss one basic decision that has to be taken when conducting interviews, which is whether to tape record or to take notes. The authors list advantages and disadvantages for both methods. Tape recording enables the interviewer to concentrate on the interview, can however make the interviewee feel anxious and less likely to reveal confidential information. In addition to that it takes a long time to transcribe and analyse tapes. Note taking gives an instant record of the key points of an interview, can however be distracting. (Ibid.)

We have decided to tape record our interviews, as the interviews lasting for approximately two hours mainly involved very open questions where our respondent has to explain a lot. By tape recording the interview we could make sure not to forget anything. Especially in the first interview, it was necessary for us to tape record as it was held in another language and had to later on be translated into English. In order to avoid retention of information due to the fact that we are tape recording, we told our respondents that this tape is exclusively used for our purposes. Moreover, we told our respondents that they should give us a sign to switch off the recorder if they do not want certain information to be on the tape.

After the interviews, we stayed in contact with our respondents by email in order to be able to discuss questions that arose afterwards. Moreover, a draft of the empirical data presentation was sent to the respondents in order for them to be able to verify the data.

4.6 Data Analysis
According to Yin (1994) data analysis involves examining, categorising, tabulating, or recombining the evidence to address the initial proposition of the study. The author, moreover, states that it is necessary for a researcher to start with a general analytic strategy on what to analyse and how to do so that facilitates choosing among different techniques and to complete the analytic phase of the research successfully. He identifies two different strategies, namely relying on theoretical propositions, which is the more preferred strategy where the researcher follows the theoretical propositions, and developing a case description, which is of use when theoretical propositions are absent.

We are applying the relying on theoretical propositions strategy when analysing the data we have gathered from the case study companies. As our intention is to find answers to our research questions we will research questions by research question compare the case study data with our frame of reference in form of a within-case study. Furthermore, we will compare the data of the two case studies in form of a cross-case analysis for each research question.

Miles and Huberman (1994) define data analysis as consisting of three concurrent flows of activity, namely data reduction, data display, and conclusion drawing/verification.

With data reduction Miles and Huberman (1994) refer to the process of selecting, focusing, simplifying, abstracting, and transforming data out of written-up field notes or transcriptions.
The authors continue by stating that data reduction is a part of analysis, as the choice of the researcher to reduce certain data is analytic, but takes place continuously throughout the whole qualitatively oriented project. Through data reduction the data is sharpened, focused, discarded, sorted, and organised which facilitates “final” conclusion drawing and verification. Qualitative data can be reduce by many ways such as for instance by summarising or selecting. (Ibid)

The second flow of activity brought up by Miles and Huberman (1994) is data display which is an organised, compressed assembly of information in that helps to understand and allows for conclusion drawing and action. According to the authors the most common form of data display in qualitative studies in the past has been extended text. However, the crucial disadvantage of extended text as a means of data display is that it can overload human’s information-processing capabilities and preys on their tendencies to find simplifying patterns (Faust, 1982). Miles and Huberman (1994) suggest that there are better ways of displaying data as for instance with matrices, graphs, charts, and networks. Also data display is a part of data analysis as designing a display is also an analytic activity.

The last flow of activity of Miles and Huberman (1994) is conclusion drawing and verification. Even though “final” conclusions might not appear before the data collection is over the authors argue that the analyst is always somehow in this process, as he from the very beginning on decides what things mean. But conclusion drawing is not the end; those conclusions are also verified. Verification can be very brief and only consists of the analyst reading through it again and checking his notes again, or very extensive. Anyway, verification is necessary as the meanings emerging from the data have to be tested for their plausibility, their sturdiness, and their “confirmability” which is their validity. This issue of validity will be discussed more in detail later in this chapter.

We analyse the data we have collected in the same manners as Miles and Huberman (1994) explain by their three concurrent flows of activities brought up above. The first data reduction that took place was directly after the interview when we wrote the draft of the empirical data presentation of both case studies out of the interview we had tape recorded. Furthermore, as mentioned earlier we perform a within-case analysis of the two cases for each research question which makes it possible to further reduce data.

Holme and Solvang (1997) recommend to begin the systematic analysis with the within-case analysis followed by the cross-case analysis. For our analysis we revert to Holme and Solvang (1997) and conduct our analysis section research questions by research question each beginning with the within-case analyses and followed by the cross-case analysis.

In the within-case analyses we compare the data we have gathered from our case study companies with our frame of reference, research question by research question. Secondly, we will use this reduced data from the within cases to compare them to each other in the cross-case analysis. After each part of the analysis we display the insights we have gained in form of a table. Finally, we will draw our findings and conclusions based on the data we have gathered and analysed during our study.
4.7 Credibility of our study

Saunders et al. (2000) divide the credibility of the study into validity and reliability. These two areas are as well addressed by several other authors as Eriksson and Wiedersheim-Paul (1997), Svenning’s (1997) and Yin (1994). However Saunders et al. (2000) state when conducting interviews another issue is as well of importance for the credibility. This is the interviews bias. (Figure 4.2) Before discussing the validity and the reliability we will start with a discussion about the interview bias, as we conducted interviews for our data collection.

**Figure 4.2: The interview bias impact on the credibility of the study, developed by the authors**

This interview bias is according to Saunders et al. (2000) decreasing the quality of the data collected when employing interviews as a data collection method. In table 4.3 they present their view of relevant interview bias. Furthermore the authors provide a check list (Appendix 2.) before conducting interviews, in order to reach a high level of data quality in interviewing. As we choose to collect data with interviews we used this check list as a tool in the interview planning phase. The check list addresses issues as; what will be the aim of the research interview and how will you prepare yourself for the interview to be able to commence the interview with confidence and purpose.

**Table 4.3: Key measures to overcome bias in qualitative interviews, adapted from Saunders et al. (2000)**

<table>
<thead>
<tr>
<th>You will need to consider the following points in order to attempt to avoid sources of bias in qualitative interviews:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Your own preparation and readiness for the interview</td>
</tr>
<tr>
<td>• The level of information supplied to the interviewee</td>
</tr>
<tr>
<td>• The appropriateness of your appearance at the interview</td>
</tr>
<tr>
<td>• The nature of the opening comments to be made when the interview commences</td>
</tr>
<tr>
<td>• Your approach to questioning</td>
</tr>
<tr>
<td>• The impact of your behaviour during the course of the interview</td>
</tr>
<tr>
<td>• Your ability to demonstrate attentive listening skills</td>
</tr>
<tr>
<td>• Your approach to recording information</td>
</tr>
</tbody>
</table>
4.7.1 Validity

Saunders et al. (2000) state that validity is the case of answering the question: “are the findings really about what they appear to be about.” Svenning (1997) argues that validity is the study’s ability to only measure what it is supposed to be measured. He continues dividing validity into internal and external (also named construct) validity (mapped in figure 4.3).

![Figure 4.3: Visualising validity by Svenning (1997), adopted by the authors](image)

The internal validity according to Svenning (1997) deals with the design of the project. Are we using the right measurements at the right time? Are we asking the right questions? The external validity is argued by the author as the study’s possibility to generalise its results, from a study to the general theory.

In order to address the validity problem we decided to employ a framework of threats to validity presented by Saunders et al. (2000). They identify six distinctive threats; history, testing, Instrumentation, Mortality, Maturation and Ambiguity about causal direction and Generalisability

- **History**: When interviewing someone it is important to know if this interviewee has a past that could influence his answers e.g. asking about job security after a major redundancy programme. In our study this issue was of some concern as our interviewee could have been experienced problems with IT applications prior to our interview.

- **Testing**: This issue addresses the problem of the respondent being afraid of bad repercussions after answering the questions correctly, which means that the answers can become biased. This threat we minimise by keeping the company names anonymous. In this way our respondents could speak more freely. Moreover, we told them that we will switch off the tape recorder if they want to say something they do not want us to have on tape. Last but not least, we stayed in contact with the respondent after the interview and sent our findings back to the company so they could review it and tell us if they wanted to have anything deleted, added or changed. Moreover, we made our intentions clear and told the respondents what we need right from the beginning. Both of them agreed on that, which implies no fear of repercussions.

- **Instrumentation**: The instrumentation threat is about ensuring that the instruments for measurement are measuring the right variables. We created a semi-structured interview guide after extensive theory survey. Furthermore, we applied the check list
for semi-structured interviews proposed by Saunders et al. (2000) and discussed it with our supervisor. After the first interview, we went through the interview guide to see if we need to change anything, but we saw that this was not the case and the questions we asked provided us with the information we needed. Furthermore, both respondents agreed on staying in contact with us after the interview, so that questions that arose afterwards could be discussed.

- **Mortality:** Mortality concerns participants in the study that drop out. This, however, was no issue for our study, as we conducted interview with two companies that were very cooperative from the beginning. Furthermore, we got in touch with our respondents approximately two months before the interviews were conducted and stayed in contact by email and phone until the interviews.

- **Maturation:** If the study is conducted over a long period of time other events and happenings can affect the result. However, this issue was a small validity threat for our study as the data collection was gathered with interviews of 2 hours with a two weeks span from the first to the last interview and handling a research area that is not changing rapidly. We considered that the time factor had a very little impact on our problem area.

- **Ambiguity about casual directions:** According to the author this is a particular difficult issue to handle. It addresses the hen and egg problem in areas where different variables influence each other. This is an issue to us, as we are investigating the influence of IT on SPM. For this reason, we conducted extensive research on the influence of IT on SPM in order to identify and minimise the threat of ambiguity about casual directions.

- **Generalisability:** According to Svenning’s (1997) definition of validity the above mentioned threats are addressing internal validity. This is also supported by Saunders et al (2000) who refer to the last threat, generalisability, as an issue influencing external validity. As stated before by Svenning (1997) generalisability concerns the ability to generalise the results to general theory. We conducted qualitative research on two case study companies which does not allow us to generalise. Our intentions however are not to generalise. To this end the generalisability of our study is not an issue, as which is also stated by Saunders et al (2000) if the conclusions do not try to generalise.

The validity of this study can be further increased by conducting more research that is addressing the right issues and by collecting data on the same areas but from another perceptive. Furthermore, also more experienced researchers, especially for the interviews, can further increase the validity of a study. We are aware of these issues; however, we are not able to convert this due to a lack of time and resources.

### 4.7.2 Reliability

Reliability is referred to according to Yin (1989) “demonstrating that the operations of a study - such as data collection procedures - can be repeated, with the same results.” Eriksson and Wiedersheim-Paul (1997) explain that the study is reliable if a study conducted in the same way with the same methods would deliver the same results as the one conducted before.
Saunders et al. (2000) also present a framework concerning reliability were threats are discussed. As with the validity. The authors address four types of threats referring to Robson (1993), namely subject error, subject bias, observer error and observer bias.

- **Subject error**: The subject can answer differently at various times as if conducting a study about enthusiasm for work among workers, asking on a Friday afternoon instead of a Monday morning. Moreover there is a subject error if the subject is not familiar with the problem area and start providing answers that contain a lot of uncertainty. As this was a problem for us we put extra effort on finding respondents that were knowledgeable in our problem area and as well provided them with information about the problem area prior to the interviews.

- **Subject bias**: The subject can be affected by external factors as if an interviewee of a company is answering what he thinks his bosses want him to say. Because our study was interviewing personnel of a company this threat was a problem of us. The information we asked for concerned the organisation and not the respondent. Furthermore, at least at one of the companies our respondent discussed our report and the information with their legal department which makes it hard for him to give us wrong answers.

- **Observer error**: Observer error occurs when for example interviews in a study are conducted by various observers, which could mean that the interview data is collected in different ways. In order to minimise this threat the author who interviewed the first company in the foreign language also was the main interviewee at the second company. Moreover, also the interview guide we have developed minimises the risk of an observer error.

- **Observer bias**: Collected data needs to be interpreted. This interpretation process usually differs from observer to observer. The interpreted data was confirmed by the respondents of the two companies so that no interpretation mistakes could occur.

Saunders et al. (2000) state that some studies, that reflect a certain situation in time and place, do not necessarily have to be repeatable. Furthermore, the authors argue that those situations are usually linked to a complex and dynamic research problem. This is true to a slight degree for our research, as the study is qualitative and rather complex. The study is as well dynamic when for example exploring what kind of IT tools companies are using at a specific moment in time. Nevertheless, a reliable data collection method is crucial for this study as multiple case studies according to Yin (1994) should conclude some kind of replications.

Also regarding the reliability we did everything we could do to increase it. The fact that one of the interviews was conducted in another language than English which made it only possible for one of the authors to participate decreases reliability. However, the respondent of the first company asked us to conduct the interview in his mother language as he only then was able to explain in detail and avoid misunderstandings.
5  Chapter Five: Empirical Data Presentation

In this chapter we will present the empirical data we have gathered from our two case study companies - two big European automobile manufacturers. We will present the data company by company in two separated parts starting with a short introduction of the company and followed by the information we gathered RQ by RQ. We decided to keep the company names anonymous. This is done as we feel that the companies can, in this way, answer more freely to our questions and provide us with the information we need.

5.1  Case Study – automobile manufacturer ALPHA

ALPHA deals with approximately 600 external suppliers from which around 2/3 are situated close to their production plant or in the same country and 1/3 coming from abroad. 95 percent of the foreign suppliers are situated in Europe and the rest from other countries outside of Europe. One car produced at ALPHA consists of around 20.000 components and parts.

5.1.1  How can the segmentation of PFP suppliers of an automotive manufacturer be characterised?

When asking for different supplier segments of their PFP suppliers and for the criteria they segment their supplier portfolio after we got told that the main criteria regarding the suppliers important to ALPHA is the complexity of the purchased part or component and the design activities coming with the complexity. Under consideration of ALPHA’s core competencies the company decides if the supplier will be involved in certain areas such as for instance in design. In some cases even the whole design and development of a component can be given off to the supplier.

After segmenting the PFP suppliers by the complexity of the purchased good another differentiation takes place. Also the market situation of the supplier is a segmentation criterion. Thus, ALPHA’s PFP suppliers consist of three main supplier segments. These are:

- Market suppliers
- Serial development suppliers
  - System Supplier
- Portfolio suppliers

**Market Suppliers** cover around 30% of the supplier portfolio. These are suppliers of commercially available parts and components characterised by a low complexity and can be seen as the lowest category of supplier relationships. This, however, does not mean that they are less important compared to the serial development suppliers; also screws can be of great importance as nothing holds together without them, but the lowest level concerning the collaboration between the two parties and the management effort of the relationship. These types of suppliers are usually not included in any R&D activities.

**Serial development suppliers** are the most common suppliers for ALPHA’s production and account for around 2/3 of all suppliers in the portfolio. They deliver for serial production and are also involved in the design and development process for a certain part or component. Thus, the serial development supplier is responsible for the successful execution and if necessary further development of present concepts. The majority of the finished car consists of modules that are delivered by these suppliers.
**System Supplier**: One type of the serial development supplier is the system supplier. These suppliers are responsible for the assembly and supervision of components (systems). These suppliers stand out from other serial development suppliers as they through the responsibility over the assembly and supervision of components dispose of important know-how. The system supplier delivers a complete module or only a part of a module, but is responsible for the supervision and control of necessary modules or components for this module/system delivered by other suppliers.

**Portfolio suppliers** account for only a very little percentage of the supplier base. The selection of these suppliers occurs due to a certain competence or know-how this supplier has. These suppliers mostly have a unique market position for instance due to a unique technology and are thus not facing any kind of competition.

5.1.2 **What types of activities are used within the management of PFP suppliers of an automotive manufacturer and why?**

In the management of their market, serial development, and portfolio suppliers *ALPHA* carries out following activities:

- Ensuring understanding
- Product and process development
- Monitoring activities before serial production
- Monitoring activities during serial production
- Motivation
- Assistance
- Supplier surveys
- Additional activities in partnerships

When asking for differences in the management activities to the different supplier segments our respondent told us that all activities are performed for all suppliers. This stems from the fact that all suppliers delivering for production are regarded as highly important, since all parts, no matter how complex they are, are needed on time and to the right quality to be able to produce the final product.

One issue came across very often during our interview with our respondent, which is also reflected in most of the activities in their supplier management. This is that the company attaches a lot of importance on having a partnership atmosphere and not to be dictatorial. This is especially shown in the way they ensure mutual understanding.

5.1.2.1 **Ensuring understanding**

*ALPHA* always tries to provide their suppliers with all the latest information the supplier could need over the Internet. They created a *partner portal* available for all suppliers that have applied for access. This partner portal is an internet based tool that provides all the necessary general information about the company to the supplier such as the company’s requirements, logistical requirements, the status of ones PPM analyses, EDI guidelines, packaging guidelines and also an electronic delivery schedule. Furthermore, the suppliers can inform themselves about the latest news of the company on this portal. The suppliers have to apply for a password they then have to enter on the website to get to the portal.
Another tool in order to ensure mutual understanding is called Global Information System (GIS) which is an internet platform created and maintained by the purchase function of ALPHA. The difference of the GIS to the partner portal is that the GIS provides more specific information to the suppliers on a model or type series basis. This system mainly contains information for start-ups, such as production figures, when what cars are produced and what parts/components are needed to be delivered. They can even find information on how to label the containers on this internet site. The suppliers also apply for access and obtain a password for the information on the model or type series they deliver for.

During the start-up phase of a type series all suppliers that are considered for this type are invited to the supplier’s days, one more activity to ensure understanding. All information about the start-up is provided on these days and presentations about different areas are held by various departments. Here information about the project progress as well as about the outlook on future activities and requirements within the project is provided to the suppliers.

Apart from that, each supplier has contact persons at various departments at ALPHA, in order to provide help and ensure understanding. In very close relationships, which exist with suppliers that are highly involved in design, additional activities are created in order to ensure understanding, e.g. cross-organisational teams (further explained in 2.1.2.8 additional activities in partnerships).

To ALPHA the two variables information and communication are very important variables in their supplier management. According to the company information and communication are the base for efficient working together and a successful supply chain management.

5.1.2.2 Product and process development

Our respondent at ALPHA explained what logistical activities towards the suppliers are carried out in order to later on enable efficient serial production. They divide their logistics process chain up into two areas, namely the product development process and production run or series process.

During the product development process the product and process development starts 30 months before the start of the serial production. This is supported through the SPQM (Supplier Parts Quality Management) tool which is a tool to monitor project progress. The development of product and process is managed by the quality assurance department of ALPHA supported by the purchasing, the development and the logistics department. This SPQM consists of a list of questions, which is sampled at the supplier’s plant or with the supplier at eleven different points in time. These activities are completed with the accomplishment of the process and the first sampling.

In both the product development phase and the serial process ALPHA performs monitoring activities in order to enable a seamless production and delivery of the parts and components.

5.1.2.3 Monitoring activities before serial production

Before the serial process ALPHA performs following monitoring activities:

- Volume control
- Capacity Monitoring
**Volume Control:** Starting 30 months before the series the company controls the volume and determines forecast figures. The purchase department forwards needed capacity and flexibility demand to the suppliers so that they can also plan ahead. Our respondent highlighted the importance of this activity and mentioned that *ALPHA* will in future focus even more on this part of the logistical process.

**Capacity Monitoring:** Twelve months before series, *ALPHA* starts with monitoring the production capacity of the suppliers that takes place on a daily and weekly basis. These figures are then compared with the demand figures on basis of part numbers so that for instance a bottle neck can be identified far in advance and steps for solving the problem can be arranged. They created one tool called “capacity management supplier” that helps to identify a deficit and to avoid this above mentioned bottle neck. This is a company internal tool that once has been developed by our respondent and a colleague, was based on access and has been developed for a model the company started producing at that time. As nothing similar to this tool existed *ALPHA* continuously improved it and through a consultant agency transferred it to a web based tool. In the future, this tool will be used for all models throughout the whole company and is characterised by a rolling process. The suppliers have access to the database via the internet which enables an automated information flow. If data is changed in the system the supplier and the material controller responsible for this supplier are informed by email. Basically, already when commissioning a horizon of flexibility is concerted. With this tool, Alpha monitors what production capacity the suppliers have and what short-term arrangements for a demanded capacity increase can be carried out through the suppliers. If a bottle neck occurs, this will be indicated virtual through a traffic light system and an escalation process starts (this process will explained in detail later on). In a start-up discussion the purchasing department and the quality assurance department together with the supplier discuss the situation and define arrangements for problem solving.

This capacity monitoring is done in order to improve processes and to ensure a seamless delivery and production. The company continuously works on its processes based on information provided by this tool. Also the supplier reengineers its processes due to the data coming from this database.

### 5.1.2.4 Monitoring activities during serial production

During the production run process a day to day monitoring by the material controllers takes place. This monitoring basically consists of three activities:

- Monitoring of delivery date and quantity adherence
- Monitoring of wrong deliveries
- Supplier performance measurement (SUMIS)

Those three day-to-day monitoring activities during the production run process are performed through a traffic light. The traffic light is a highly automated system that has also been developed by the company itself and is used by all the material controllers throughout all the plants of the organisation. The system recognises failures within the areas of the monitoring mentioned above by itself and provides a report (telling what has happened) to the material controller. The material controller can either accept this report and thus start an escalation process or decline it. This depends on what has happened at the supplier’s plant and if the material controller was informed in advance. However, the decline of a report has to be discussed with the project leader of *ALPHA* and must lean on serious reasons and good
explanations of the supplier. The escalation process after a red light differs between the different monitor activities.

This traffic light is monitored on a day-to-day basis and at the beginning of each month analyses of the last month are done. If a supplier has a red light in one week during a period of twelve weeks the escalation process starts. This system is very strict as when a supplier has a red light, due to for instance a delivery arrear, the whole week is red for him.

**Monitoring of delivery date and quantity adherence:** The suppliers of less complex parts, such as standard parts, receive delivery schedules, which contain the weekly quantities for delivery. Parts that need to be delivered more than once a week are controlled through a delivery schedule and an additional type of delivery schedule, which contains daily quantities of the next 15 days. The *monitoring of delivery date and quantity adherence* is performed through an *ALPHA* internal traffic light system (will be explain more in detail later on). The material planner monitors on a daily basis if delivery date and quantity adherence matches the figures in the delivery schedule.

Back orders to more than ten percent from the given figures are evaluated red in the traffic light system. When a supplier is evaluated red for several weeks the escalation process starts with a *letter* from the material control department of *ALPHA* to the logistics manager of the vendor as the first step. With this letter *ALPHA* tells the supplier what has happened and asks for an action plan to solve the problem. If after four weeks no actions have been taken by the supplier or the actions didn’t show any improvements a *second letter* will be sent. Again after four weeks of no improvement the next step starts in the escalation process which is a *problem solving discussion* with the supplier. In this meeting the representatives of the purchase department, the quality assurance department of *ALPHA* and representatives on management level of the supplier participate and try to identify the problem. However, *ALPHA*’s representatives just help to identify the problem; problem solving is still responsibility of the vendor. If this problem cannot be solved by the supplier *ALPHA* offers the supplier to conduct a logistic process analysis (LOPA) which is then normally also performed. Logistical quality specialists (LQS) from *ALPHA* are sent to the supplier’s plant for several days in order to analyse their processes. This analysis is based on a list of questions the LOS go through together with the supplier’s staff. In the LOPA, which also is a company internal tool based on excel, the interface *ALPHA* – supplier, everything supplier internal, and the interface supplier – sub-supplier are analysed. Again, the car manufacturer’s team only helps identifying the problem; problem solving is still up to the supplier himself. The last step taken in the escalation process if the problem is still present is the *supplier support* which is conducted by the purchase department of *ALPHA*. Here a bigger team goes to the supplier’s plant trying to find a solution to the problem together with the supplier. The supplier support can not be seen as a tool based on questions, as this process very much depends on the problem and of course differs in each case.

**Wrong deliveries:** Furthermore, *wrong deliveries* are monitored on a daily basis. The only difference is that wrong deliveries are handled more strictly compared to a delayed delivery or wrong quantities. This is due to worse consequences wrong deliveries can have on the production process. A late delivery for instance you recognise in advance. A wrong delivery on the other hand will maybe not be noticed until the time the assembler opens the box and realises the mistake which can cause a shutdown of the assembly line. For this reason, the treatment of a wrong delivery in the escalation process consists of sharper actions. Also here an escalation process starts after several wrong deliveries.
The escalation process after having a red light in monitoring of wrong deliveries basically is the same as we saw before with the monitoring of delivery dates and quantity adherence. However, as mentioned earlier, due to the fact that a wrong delivery normally has worse consequences on the manufacturer’s production, also the escalation process is stricter. With the first letter ALPHA requires an 8-D-report from the supplier. The 8-D-report is an official document that is a standard in the automotive industry and needs to be filled in by the vendor to describe the problem situation. It consists of eight parts including the complaint of the car manufacturer, when the incident happened, to what quantities, what short term actions can be taken by the vendor to solve the problem and what has already been done. Formerly, this report has been sent out by mail or email but will be available online in future, as in this way the material controllers are immediately informed about what has been done and what has been changed. With this 8-D-report the material controller can evaluate the situation. Another difference in this escalation process is that there is no second letter following the first one. The escalation process continues with the problem solving discussion and if necessary with a LOPA for wrong deliveries.

The results of the monitoring of quantity adherence, delivery date and wrong deliveries go in to the supplier performance evaluation performed once a year.

Supplier performance measurement: Last but not least, our respondent explains that they furthermore assess the supplier’s logistical quality through a performance measurement system called Supplier Management Information System (SUMIS). This performance measurement system can be seen as a yearly certificate for all suppliers which is split into four different parts. One assessment conducted by the purchase department, one by the R&D department, one by the quality assurance department and one by the logistics department. All four are built-up in the same way but dealing with different issues important to the certain department. All plants throughout the whole company apply the same SUMIS system that is carried out once a year and assessing the performance of the suppliers of the last twelve months. This performance measurement works through a point system with maximum points of ten. The suppliers are evaluated along different criteria. Within the logistics department, for instance, following areas are evaluated:

- **Integration level of EDI**: what system requirements does the supplier meet
- **Delivery process**:
  - administrative and physical goods receiving, also evaluating how the supplier acts when delivering
  - every supplier has an empties account on the internet through which he receives an account statement at the end of each month, he has to communicate if any mistakes occur
- **Delivery reliability**: here the above mentioned monitoring activities go in
- **Communication**

According to ALPHA the goal of every supplier must be to achieve ten points in this assessment. Every abnormality from the requirements makes it impossible to achieve full points – the more abnormalities, the worse the results. This tool is a company internal tool based on Oracle with Access user interface. The results are communicated to the suppliers by sending them to them. Those results are in turn used for miscellaneous assessments such as for instance the project estimation for supplier selection.
The escalation process for the SUMIS also starts with a letter to the vendor when a certain target value has not been achieved (laying below). This letter can at the same time be an invitation to a problem solving discussion. If necessary the escalation process continues with the supplier support. Here no LOPA is conducted.

During the whole escalation process it is very important to ALPHA to maintain a partnership atmosphere. These processes and schemes are performed after the same criteria for all PFP suppliers and types of relationships and abnormalities are communicated immediately. Furthermore, all this monitoring information goes, among others, into the selection criteria for suppliers for future projects. The results the suppliers achieves in the assessments influence the future of the relationship ALPHA – supplier, as a bad performance can lead to ALPHA terminating the business relationship.

5.1.2.5 Motivation
As mentioned earlier, the results of the SUMIS measurement are forwarded to the company management of the suppliers in form of a letter. When the vendor performed well showing a result of at least nine points this letter can be seen as a letter of appreciation. As stated above, the results of the SUMIS and the other monitoring activities go into the next supplier selection. Also the suppliers are aware of this fact. With achieving a not so good result in the SUMIS due to some incidents the chance for getting awarded another contract decreases.

Abnormalities from the target values result in additional costs for ALPHA (for instance costs for additional handling of extra tours). For this reason, the results of the SUMIS assessment are used for future price negotiations and can affect those. Basically, ALPHA possesses a very good supplier structure and suppliers with good performance. Due to this process of improvement both, Alpha and its suppliers put a lot of effort into continuously improving and optimising their processes and quality. With quality not only the quality of the parts is considered but also total quality, which as well involves delivery date and quantity adherence and information and time quality. The tools and activities presented so far according to ALPHA significantly contribute to this continuous process of improvement.

5.1.2.6 Assistance
Assistance, if a problem occurs, is given through the SPQM tool during the product development phase and the escalation process during the production run (problem solving discussion, LOPA; supplier support). Furthermore, ALPHA sees information and communication as a way of assisting their suppliers. The company continuously informs the suppliers and keeps up a high communication level in order to avoid problems during the delivery or production process. This is also reflected in a statement given by our respondent:

“The better our supplier is informed, the better he can perform”
“The better Alpha is informed, the better it can navigate”

Moreover, ALPHA offers its suppliers adequate support for new IT systems, especially in the logistics area. Basically, user guides in which the operations and the handling of the new systems is explained in detail, are available for the suppliers. Partially, also workshops and information events are performed in order to teach the suppliers. Furthermore, the suppliers always have the opportunity to gain support from their contact person at the certain department of ALPHA.
5.1.2.7 Supplier Surveys

Through their headquarters *ALPHA* conducts supplier surveys in order to gain feedback on all areas and departments of the company. The results are then forwarded to the certain departments so that they can convert this information. The company is always exerted to improve their processes and activities also in direction of the supplier as this will in turn have influence on the delivery performance. Therefore, feedback also from suppliers is necessary. Furthermore, through those supplier surveys the company sees its situation of the supplier’s viewpoint compared to its competitors (other companies the suppliers deliver to) which provides good benchmark information.

5.1.2.8 Additional activities in partnerships

As *ALPHA* works closely together with most of its PFP suppliers they often have employees of the supplier sitting at their plant together with their staff (especially in the area of R&D and quality assurance). This is done in order to get to known to each other and create a good communication level to in turn optimise the relationship and the mutual performance. Through the earlier brought up LOPA also the logistic department has closer contact to the vendors. However, it is not only *ALPHA* going up to the suppliers and conduct a LOPA if a problem occurs; sometimes also the suppliers come up to the car manufacturer asking for advice through conducting a LOPA in order to improve and optimise their performance.

With selected supplier that are mostly larger and of high strategic importance due to for instance a higher involvement in R&D *ALPHA* has a so called supplier performance discussion. This is a strategic meeting with the purchase department of *ALPHA* and the selected supplier. Here the strategic directions of both organisations are discussed in order to find out where both companies want to go and how to optimise the partnership. These meetings take place approximately once a year but only with selected and mainly large suppliers.

5.1.3 How can the information exchange with PFP suppliers of an automotive manufacturer be characterised?

The whole information exchange between *ALPHA* and its suppliers is about requirements of the car manufacturer and performance of the vendors. The material controller is in daily contact with the supplier in order to manage the delivery situation and to for instance be able to avoid a bottle neck or an arrear and also to make change management possible. Here the information exchanged covers all details that have to be discussed when a problem arose.

Data that needs to flow towards the suppliers is the delivery schedule with the updated requirement figures exchanged on a daily basis. Furthermore, the logistical performance of the suppliers concerning delivery date and quantity adherence is in general communicated to the vendors once a month if no major incident occurred. However, if a problem occurred, as for instance a bottle neck situation through a too late delivery, this is communicated towards the certain supplier immediately in order to find a solution to the problem.

The results of the performance measurement system of *ALPHA* – SUMIS – are communicated after they are gathered and analysed once a year.

All other additional data and information that needs to be exchanged depends on the situation and/or on the phase of the relationship towards the supplier, e.g. in the start-up phase a lot more information and communication is required.
On the other hand, there is also a lot of data and information that needs to flow from the supplier towards the car manufacturer, such as shipment and consignment announcements and transit inventories. This information is exchanged daily or even per hour facilitated by the systems explained above.

This electronic data exchange is of course running all the time.

*ALPHA* highlights that also the supplier is called upon active communication. The suppliers informing the company about possible problems that can occur far in advance is necessary in order to avoid bottle neck situations and keep production on a high and effective level.

When asking our respondent for any kind of barriers the company has to face concerning the information flow, he stated that there are minor difficulties as some of their vendors are situated abroad. A difference in time, holidays and also for instance shipment times need to be considered when doing business with those suppliers. But *ALPHA* treats all its suppliers in the same manner no matter where they are located; they all go through the same escalation process when not delivering on time, wrong or to the wrong quantities.

### 5.1.4 What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?

*ALPHA*’s usage of IT all comes together in one system – the “Legacy World”. The “Legacy World” mainly consists of *ALPHA* internal systems and tools. The complete material planning and production planning system and all the tools and systems used, for instance all the monitoring tools earlier described, are integrated in this legacy world.

However, *ALPHA* will change this legacy world over to SAP. This has already been done in one of the head company’s plant nearby about half a year ago. This is of course an advantage for *ALPHA* as they have learned their lessons from the experience the other plant has made and can use this when they replace their legacy world in the turn of the year 2005/2006. As the processes are not identical between the different plants SAP has to be adjusted for each of them. For the change from their legacy world to SAP a project team, with an employee from each department, has been created that is responsible for all the preparations and the process itself. Of course, the level of efficiency they have right now through the legacy world is to be at least kept; the goal of course is to achieve more efficiency. The tools and systems they use now will still be used in future, even though they are then integrated in SAP and will probably look different.

All the communication is and will also after the implementation of SAP still be done via EDI. The suppliers of course need to be informed about the change over to SAP, as they then have to use another platform for their supply enquiry. The replacement of the legacy world with SAP is only carried out after careful check up and conditionally considering contingency alternatives. The time of the change over will be communicated in time and adequately to all suppliers. Here again the issues communication and information are very important.

Until a couple of years ago it still happened that a few suppliers still received their supply delivery schedule in paper form or via fax. Nowadays however, this does not exist anymore as everything now works completely electronically. The majority (more than 90 percent) of *ALPHA*’s suppliers are connected to the communication network. Due to their technical
infrastructure the rest are not connected to this network and get their information via the internet. Our respondent told us that he believes that in future it is absolutely possible to do even more via web EDI as the possibilities offered by the internet continue to grow and the web world and IT are more and more improving.

*ALPHA* uses the internet in many ways to communicate and manage their suppliers. One way they use the internet is by operating the two internet portals “partner portal” and “GIS”.

*ALPHA* is always working on building up not only a good supplier structure but also a good partner network when coming to relationships. The suppliers are not only expected to deliver as required but also to be network compatible and able to work together also with other suppliers. As the company’s goal is to create the best partner network, there is no need for them to use e-marketplaces when it comes to PFP suppliers.

**5.1.5 How can the influence of information technologies on the management of PFP suppliers of an automotive manufacturer be characterised?**

Our respondent stated that information flow in the past (not only at *ALPHA*) can be regarded as a one way street. The information was flowing in one direction for instance from *ALPHA* to the supplier, then needed to be processed by the supplier and sent back to *ALPHA* again. The need of real time information and a close working together environment is enabled through the use of IT tools and applications. Through the use of the right IT tools *ALPHA* is enabled to maintain a good working information exchange flowing in both directions.

Through IT *ALPHA* could improve in that way that they became more flexible, able to provide and receive real time and the most recent information, which is the base for a high communication level. In turn good communication and information influence quality which again has influence on sales. In supply chain management the customer or end-consumer in the end is the one all the organisations in the supply chain want to satisfy. Information therefore also has to flow towards the customers and back. According to *ALPHA*, IT can be seen as the base for a good supply chain management.

*ALPHA*’s main philosophy regarding IT in supplier management, but not only in supplier management, is to use everything available on the market and develop it further to take the best out and take all the chances coming with the opportunities given through IT.

“It is not the big ones eating the small ones, it is the fast ones eating the slow ones”

Former member of the board at *ALPHA* (translated into English)

With this statement our respondent showed us what philosophy is laying behind this – the most important thing is to be fast and flexible and produce to a high quality as this has a direct impact on sales. This fastness and flexibility require good communication and information. Close relationships, a high level of communication, developing mutual goal and to satisfy the end-customer are the basis for active and successful supply chain management.

However, *ALPHA* also mentioned drawbacks that come with the utilisation of IT. Our respondent stated that EDI creates dependency. He explains that one becomes more and more reliant on systems in day-to-day work. He states that this is not only true for the automotive industry but can be for instance also seen in the personal (consumer) area. On the other hand
EDI provides such a variety of advantages that this “small” drawback is definitely outweighed. As in our communication era all different kinds of data can be exchanged to highest accuracy and speed one cannot set this technology aside. There is an ongoing development taking place in this area continuously providing us with more and better advantages.

To sum up in a few words it can be clearly seen, and has also been confirmed by our respondent, that ALPHA’s direction in utilising IT goes towards being able to work very close with the suppliers and to create a high level of communication and information in order to make SCM work. Following statement (by our respondent) also shows that IT is seen as a base or even as a necessity and a day-to-day tool that enables the company to do business the way it wants to:

“We take everything that is available on the market, adjust it to our company, and improve it over time in order to take all the opportunities that comes with IT”

5.2 Case Study – automobile manufacturer BETA
Also our second case study company is one of the leading automotive manufacturers in Europe. In production they work with approximately 500 suppliers.

5.2.1 How can the segmentation of PFP suppliers of an automotive manufacturer be characterised?
First of all the company differentiates between PFP suppliers and non PFP suppliers. The PFP suppliers provide the automotive manufacturer with parts that go directly into the production of automotives. Non PFP suppliers contribute with goods and services that are not directly going in to the final product (MRO) such as computers, pens, paper.

The PFP suppliers first of all need to reach certain prerequisites such as quality standards assurance, logistical requirements, finance and product development requirements. After this is accomplished there is no special treatment of different types of suppliers. To this end BETA runs contracts including the same conditions for every supplier. According to the automotive manufacturer every PFP supplier is equally important due to the fact that also a missing bracket can cause a shutdown of the assembly line. However, even though BETA runs the same contracts under the same conditions with every supplier, there are suppliers BETA needs to work with more closely. This stems from the fact that some parts, components or modules, (which account for 75 percent of value of the final product) such as for instance dashboards or seats, demand closer cooperation than others. The suppliers of these parts are highly involved in some of BETA’s processes in order to be able to mange the close cooperation that these parts demand.

The supplier segmentation criteria are closely linked to the sourcing of suppliers through a commodity strategy. A commodity is a product group that can be strategic or non strategic as well as production related or non production related. For this reason, the term “commodity” does not imply that it is a standardised product. For each commodity a commodity strategy is developed. This strategy is based on an evaluation of issues regarding the commodity such as the commodity complexity, market conditions, few vs. many suppliers, requirements from product development, logistics, and support and production impact. The commodity strategy serves as a base for how to handle this commodity. Of the hundreds of commodities the automotive manufacturer especially focuses on commodities of a high money value as well as on commodities that are involved in a sensitive area of the business.
5.2.2 What types of activities are used within the management of PFP suppliers of an automotive manufacturer and why?

At BETA various activities are performed in the management of their PFP suppliers, namely ensuring understanding, pre-award phase, monitoring project progress, supplier performance measurement, motivation, assistance, supplier surveys, and additional activities with close cooperation suppliers.

5.2.2.1 Ensuring understanding

Ensuring understanding is an activity that the company highlights. For the automotive manufacturer, it is important to communicate the company’s needs and wants, and its vision and goals in order to help the suppliers contribute to the company’s value proposition. Mutual understanding is principally ensured through a high communication level, mainly by face to face meetings. To further ensure understanding the company employs buyers with key accounts so that every supplier has a contact person at BETA. Furthermore, BETA communicates through letters backed up with emails. The automotive manufacturer also utilises a web portal as a repository for news and past events.

5.2.2.2 Pre-award phase

No special pre-award conference is held before a contract is awarded to a supplier. The phase from selecting potential suppliers to the moment the contract is awarded is a process lasting two to three years, including activities such as visiting each others manufacturing plants.

5.2.2.3 Monitoring and controlling project progress

For bigger projects, such as a supplier constructing a new dashboard for a car, the automotive manufacturer mainly uses a quality-planning tool named advanced quality planning tool. This tool basically consists of a set of questions that monitors project progress. These questions address issues from the initial sampling to the final delivery, e.g. FMEA (Failure Mode Effective Analyses) and trial runs.

5.2.2.4 Supplier performance measurement

This activity consists of the evaluation of the supplier’s capabilities and the monitoring of day-to-day transactions. The evaluation of the supplier’s capabilities concerns for instance financial capabilities, quality capabilities and product development capabilities. In the monitoring on day-to-day basis BETA especially focuses on the quality of goods and services received, but also on issues such as logistics, timing and costing. The data of the day-to-day monitoring is compared to the supplier capabilities (estimation on how the suppliers should perform) to see if the supplier performed as the company thought. When a supplier underperforms in a certain area BETA, together with the supplier, sets up a meeting where an action plan is developed in order to reach a satisfactory level of performance. When this action plan is implemented and the supplier still does not perform as required the company might consider terminating this business relationship. This, however, is considered as a failure of both parties.

5.2.2.5 Motivation

In order to motivate its suppliers BETA especially emphasises soft values such as respect. They argue that this is important as the company’s relationships are based on interdependence between the parties. They state that it is the small things that matter - soft values, such as being on time for meetings. Furthermore, good results are communicated in order to raise the level of motivation. In order to show commitment to the suppliers and to make them feel
important and as a part of the process the suppliers are informed about the different areas of the company. Moreover, BETA runs an annual price award ceremony where suppliers can receive awards in the core values of BETA. Punishments for motivating suppliers is mainly threatening to stop doing business with them, even if as mentioned before this is considered to be a failure for both parties. Another punishment acting as a motivator is the contracts, there it is stated that if the supplier underperforms they will receive a fine for the consequences of the underperformance.

5.2.2.6 Assistance

If a supplier cannot reach a specific requirement the automotive manufacturer in some cases offers training and assistance opportunities. These can be programmes for example concerning cost management activities, lean production, evaluation and foremost quality insurance.

5.2.2.7 Supplier surveys

The supplier survey is a means the company performs in order to gain feedback on how the suppliers perceive their relationship. These surveys are conducted more on an intuitive than on a regular basis and usually involve around eight percent of the supplier base.

5.2.2.8 Close cooperation suppliers

This subject has been discussed in the company for over 15 years, with the main message that the company and its suppliers are one team. In practise, partnerships are facilitated by for example BETA inviting suppliers to help them design and develop specific parts thus involving them already in the concept phase. These kinds of relationships are based on mutual trust and dependence, as it is both time consuming and costly to switch to another supplier in those types of relationships. To this end, good and well functioning relationships are a necessity for BETA.

5.2.3 How can the information exchange with PFP suppliers of an automotive manufacturer be characterised?

The information exchange at BETA is based on a general agreement level of terms and conditions, such as a contract on how to use EDI. They also establish so called framework agreements that address how the relationships should operate. In addition to that, they create target agreements when the company has a concrete product to buy from a supplier. In these agreements, targets for product characteristics such as price, amount and quality level are agreed upon. These agreements are created together with the suppliers and serve as the foundation of what kind of information to exchange.

In order to obtain more detailed information the respondent mentions numerous examples. BETA sends RFQ’s (Request For Proposal) and orders of various types such as blanket orders / production pots or one time orders. These orders make it possible for BETA to send schedules (long-term), call offs (day by day schedule) and synchronic messages (e.g. messages addressing in what order parts should be send). They send self billings to suppliers, which are invoices on the actual delivery, payments in EFT (Electronic Fund Transfer) format, deviations reports on for instance quality and daily performance measurements such as defects per million.

From the supplier they receive information such as invoices, quotas, action plans (for improvements) and daily performance measurements. In addition to these information flows
the company and its suppliers also exchange information face to face through for instance information meetings, negotiations and supplier forums.

According to the respondent in general there is no major resistance from the suppliers to exchange information. The suppliers are more concerned about being involved early in new projects to be able to fulfil BETA’s needs. The automotive industry as a whole is according to our respondent an industry of good information flows, especially due to a stable market, where suppliers can for example trust forecasts and specifications. In some cases the company even thinks they provide the suppliers with too much information, as they say they require a lot of their suppliers. However, all requirements are appreciated in most cases, as it also works as a motivator for the suppliers to develop their own businesses. Furthermore, the company believes that they have managed to evolve a sound relationship philosophy towards suppliers from different cultures, thus making information sharing easier. This mainly stems form the fact that the company originally is from a smaller European country.

5.2.4 What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?

BETA use Microsoft products such as Word and Excel to create all the documents that are then mainly exchanged through EDI. For information that is not exchanged on a day-to-day basis (smaller information flows), such as RFQ’s, BETA to a high degree uses e-mail programs. However, they are reviewing web-based applications as a means for exchanging this kind of data. Currently, they have these web-based applications running parallel to the more manual driven products (e-mail programs). As stated before, in order to communicate with its suppliers BETA primary uses EDI but also the Internet, apart from the traditional ways of communication as posting letters, telephone calls and meetings.

To better understand what kind of information needs to be exchanged through IT our respondent gave us a few examples. They for example use EDI for communicating drawings, schedules, call offs, synchronisation messages, pre-delivery reports, invoices, self-billing, payment (EFT) and deviation reports. The Internet is mainly used for exchanging reports and performance measurements.

Several IT applications are utilised in order to support the information exchange. BETA uses PDM (Product DATA Management) -systems, purchasing systems, MPL (Material Planning Logistic)-systems and finance systems, which are all linked to each other. In order to illustrate how the systems work together our respondent provided us with an example of a bill of material going through the system: a bill of material is triggered from the production to the purchasing function, telling what is needed. This bill of material then works as the base for RFQ’s, orders and quotations. After that the same bill of material is then called off by the MPL-system (60min). All these IT applications are according to the company a mixture of old and new ones; some are purchased applications (that can be both stand alone applications or ERP-systems) whereas some are self-developed. The main goal with applying these applications is to automate various processes in order to free people from the processes.

In order to develop a high-integrated relationship with the suppliers BETA employs supplier-integrated systems. Through those systems the supplier can gain information on productions plans, finance and sales. Although the company has succeeded to automate a lot of the back office processes they still need a system to handle paper documents, as they still have to collect their received paper invoices at one place and scan them into electronic format. After
that the invoices are sent to a different place where they are deciphered by hand and turned into the standardised invoice format of the company.

Furthermore, BETA also uses stand-alone IT applications such as COVISINT (the e-marketplace, which is sold to Compuware that merged with Freemarkets). COVISINT is a consortium e-marketplace for the automotive industry that provides several services for automotive manufacturers as auctioning, e-procurement-services and asset services. BETA’s supplier portal is operated by COVISINT. They as well look into adapting other e-marketplace services such as catalogues and capital services, but at this time BETA wants and tries to keep most of the power within the business.

5.2.5 How can the influence of information technologies on the management of PFP suppliers of an automotive manufacturer be characterised?

The main issue that is to a high degree influenced by IT is that BETA tries to automate as much as possible, especially on the transaction side. This implies that the company for instance wants a higher degree of integration of its suppliers, more standardisations and an extension of the commodity coding, all in order to increase the possibility of automating processes.

Furthermore, IT has influenced knowledge management, as through utilising IT BETA is able to gain a lot of information on for example suppliers, commodities and costing issues. Nevertheless, more information according to our respondent also implies a need for better data warehousing in order to get the information the company needs. BETA as well recognises external opportunities on the Internet to gain intelligence on e.g. commodities, markets, or steel prices.

Information technologies have as well made it possible for the automotive manufacturer to outsource more of the business, especially on the engineering side. Nowadays, the company engineers around ten percent of the parts in a car in comparison to all the parts ten to fifteen years ago. According to our respondent this outsourcing trend on the engineering side would not be as drastic without IT as an enabler.

Our respondent moreover states that the e-business revolution that was supposed to happen has not happened due to the fact that it was not based on facts and research. Firstly, the costs are higher than thought. Private persons are used to get information for free on the Internet, but there are high costs involved in the business world. Secondly, the concept of for example a total transparent value chain (all information in the value chain being available for every player, thus increasing the effectiveness of the value chain) is a revolution that has not happened as a total transparent value chain can diffuse the responsibility issue of who will be responsible for mismatches. Our respondent states that BETA has contracts with their first tier suppliers to deliver a certain amount who then in turn must put pressure on the second tier supplier to deliver. These responsibilities and dependences are not (yet) matching the concept of a total transparent value chain.

BETA highlights the fact that IT is just a tool or application that supports and does not replace for instance a business idea or strategy. There is a risk of implementing IT systems without understanding the consequences. One example is the implementation of an IT system at a company that provides its suppliers with the opportunity to directly type information into the companies computer system. The company will as a consequence have less typing to do as
they have transferred this typing operation to the suppliers. However, this in turn results in more work for the supplier and hence an increase in the suppliers costs that in turn results in an increase in the prices of the supplier’s products. To this end, no real money is saved. According to our respondent, a good way to identify the consequences of IT implementation is to begin with a bigger perspective, from the whole value chain perspective and then break it down to more detailed areas.

IT also provides a good opportunity to optimise office work. A challenge for the company is to redesign the office work so that it is similar to line production, where the computers are redesigned to gigantic lines (computer systems) with smart built in features between computers and systems (doing business without people). The people will in this scenario have a more controlling responsibility. According to BETA, when this happen the next industrial revolution will take place.

BETA especially regards IT as a tool to automate day-to-day communication on transaction side in order to free employees. Furthermore, the company sees IT as providing an opportunity to communication on the more intelligent side (like quotation packages). At the moment this intelligent side, however, needs more standardisation.

As a whole the company argues that IT has absolutely had a positive impact on the management of existing suppliers. However, they do see some disadvantages with the utilisation of IT, especially regarding the implementation of EDI. Firstly, implementing EDI takes time, demands long set-up times and a lot of testing, testing and more testing. The company also identifies a problem in standardisation, as different standards in EDI, for instance, result in issues such as testing as a base requirement before implementing this IT tool in a relationship. Even if there are standards for EDI big customers have the tendency to modify the standard anyway, consequentially making testing between supplier and buyer necessary.

Last but not least, utilising IT has also contributed to raising the barrier for becoming a new supplier of the company, even if this trend is not only a result of IT development.
6 Chapter Six: Analysis

In our sixth chapter we will analyse the data we have gathered from our two case study companies ALPHA and BETA. Firstly, we will perform a within-case analysis for both companies where we compare the data from our companies with our frame of reference. Secondly, we will perform a cross-case analysis by comparing the data of the two companies with each other. These two steps will be carried out for each research question.

6.1 How can supplier segmentation regarding PFP suppliers of an automotive manufacturer be characterised?

In our frame of reference Bensaou (1999) provides a supplier segmentation model where suppliers are segmented due to the buyer’s specific investments and the supplier’s specific investments. By segmenting the supplier base after those criteria Bensaou (1999) presents four different types of supplier relationships, namely the captive buyer, the captive supplier, the strategic partnership and the market exchange relationship.

6.1.1 Car manufacturer ALPHA

The main criteria for supplier segmentation for car manufacturer ALPHA is the complexity of the component or part purchased from the supplier and the, with the complexity associated, level of involvement in R&D. This segmentation results in two supplier segments, namely market suppliers (characterised by delivering a low complexity part or component) and serial development suppliers (delivering highly complex parts or components). Within the serial development suppliers system suppliers stand out through their responsibility over assembly and supervision of components and parts. Furthermore, ALPHA differentiates between suppliers due to the supplier’s market position. Suppliers with a very strong market position, due to for instance a unique technology, are referred to as portfolio suppliers. Figure 6.1 below provides an overview of ALPHA’s supplier segmentation.

![Figure 6.1: Supplier segmentation and supplier segments at ALPHA, developed by the authors](image-url)
Even though Bensaou (1999) does not exactly suggest the same variables as segmentation criteria as \textit{ALPHA}, a similarity can be seen, since the complexity of the parts or components is linked to the level of involvement with the supplier, and a higher level of involvement implies higher investments from both, \textit{ALPHA} and its suppliers.

In order to be able to compare the types of relationships \textit{ALPHA} has with its suppliers to the types of relationships presented in the frame of reference we will base the comparison on the connection of the level of involvement to the buyer and supplier specific investments. Also the market position of the supplier, \textit{ALPHA}’s second segmentation criterion, can be linked to Bensaou’s (1999) framework, since a strong market position of a supplier implies higher buyer specific investments than supplier specific investments.

The serial development suppliers, which are characterised by a high product complexity and high level of involvement, can be related to the strategic partnership suppliers (high buyer and supplier specific investments) brought up by Bensaou (1999), since only a higher investment of both parties make a higher involvement possible.

Thus, \textit{ALPHA}’s market suppliers, which are less involved with \textit{ALPHA}, can be related to Bensaou’s (1999) market exchange relationships and the captive supplier relationship, since these two relationships are characterised by low investments of at least one party, which makes a high involvement impossible. However, even though both buyer and supplier specific investments are lower in relationships with market suppliers, they are still of major importance to \textit{ALPHA}, as they, regardless of their complexity, deliver parts that are needed on time and to the right quantity and quality for the final product.

The captive buyer relationship, as brought up by Bensaou (1999) in our frame of reference, also implies to be similar to \textit{ALPHA}’s market suppliers, since there is a low level of investments from the supplier. However, these captive buyer relationships can be connected to \textit{ALPHA}’s portfolio suppliers, since a strong market position of the suppliers leads to lower investments of the suppliers and higher investments of the buyer.

Nevertheless, when comparing \textit{ALPHA}’s supplier segments to the relationships brought up in our frame of reference one main issue needs to be considered. Since we are focusing on suppliers that deliver parts for the final product of \textit{ALPHA} also market suppliers are considered as important. The level of involvement should not be seen as low, but as lower than the involvement of serial development suppliers.

\textbf{6.1.2 Car manufacturer \textit{BETA}}

Car manufacturer \textit{BETA} regards the commodity (group of products) strategy as the major criterion for segmenting their supplier base. The commodity strategy in turn is built up by various variables and is addressing how \textit{BETA} wants to work with a specific commodity. From the commodity strategies \textit{BETA} indirectly establishes two major types of relationships, ordinary suppliers and close cooperation suppliers. Their close cooperation suppliers require high involvement from both buyer and seller due to variables in the commodity strategy (e.g. high money value and high complexity of parts and components). For ordinary suppliers the level of involvement is significant even if it is less than for close cooperation suppliers. This stems from the fact that all suppliers that deliver for production are considered as highly important.
Since BETA uses the commodity strategies as the main criterion for supplier segmentation and since the commodity strategies in turn provide BETA with an answer on how involved they are with their suppliers, a similarity to the framework of Bensaou (1999) presented in our frame of reference can be seen. The level of involvement is connected to the level of specific investments, since a higher involvement with the supplier implies both parties to invest more in the relationship.

BETA named two major types of relationships it has with its suppliers. In our frame of reference Bensaou (1999) suggests that there are four possible kinds of relationships that a company has with its suppliers, ranging from market exchange relationships to partnership relationships. Even though BETA differentiates between its suppliers, the importance of each one of them is significant since these are suppliers that deliver for the final product.

Close cooperation suppliers at BETA can be connected to the strategic partnership relationship in Bensaou’s (1999) framework, as both relationships involve high investments from buyer’s and supplier’s. We are, however, not able to further connect BETA’s supplier relationships to the relationships brought up in our frame of reference, since BETA’s selection criterion, the commodity strategy, consists and depends on many different variables.

Nevertheless, there is still a significant similarity to our frame of reference remaining, since the commodity strategy determines the level of involvement and as we explained earlier, a higher level of involvement implies higher investments in the relationship from both parties.

6.1.3 Cross-case analysis

By comparing the way our case study companies segment their supplier base we can see that both do segment their supplier base after certain criteria, as suggested in our frame of reference. Nevertheless, this might be more apparent at ALPHA, as they clearly segment their suppliers by naming the different supplier segments, in comparison to BETA. There are similarities in the way both companies segment their supplier base as the complexity of the parts or components purchased (segmentation criterion at ALPHA and included in the commodity strategy at BETA) and the level of involvement the purchased part/component requires as the outcome of this complexity are the crucial issues in the different supplier segments.
However, whereas ALPHa clearly differentiates between its suppliers by referring to the suppliers that are more involved as serial development suppliers, the ones of less complexity and involvement as market suppliers, and the ones characterised by a strong market position as portfolio suppliers, BETA does not differentiate between the suppliers by using different names/terms. This shows slightly different approaches at the two companies. ALPHa considers issues such as the complexity of the purchased good, the level of involvement and responsibility, and the market situation of the suppliers as segmentation criteria and created different segments associated to each of these criteria. In general BETA also considers these criteria in their commodity strategies but does not develop any supplier segments or names groups of suppliers after different commodity strategies.

There is one main similarity between both companies to highlight. The segmentation criteria at ALPHA (complexity and market position) and BETA (commodity strategies) both result in different levels of involvement of certain suppliers. This can, as already done in both within-case analyses, be connected to the frame of reference, since a higher level of involvement implies higher buyer and supplier specific investments. Table 6.1 provides an overview of the comparison between ALPHA and BETA’s segmentation criteria and relationships to the ones presented in the frame of reference.

Table 6.1: Cross-case analysis, RQ 1

<table>
<thead>
<tr>
<th>Buyer specific investment</th>
<th>Supplier specific investment</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High</td>
<td>Strategic partnership</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>Captive Buyer</td>
</tr>
<tr>
<td>Low</td>
<td>High</td>
<td>Captive Supplier</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>Market Exchange</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier segmentation at ALPHA</th>
<th>Supplier segmentation at BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Market situation</td>
</tr>
<tr>
<td>High</td>
<td>Normal</td>
</tr>
<tr>
<td>High</td>
<td>Special</td>
</tr>
<tr>
<td>Low</td>
<td>Special</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier segmentation at BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonded supplier</td>
</tr>
<tr>
<td>Market Supplier</td>
</tr>
<tr>
<td>Ordinary Supplier</td>
</tr>
</tbody>
</table>

In table 6.1 the similarities of the two car manufacturers to the frame of reference are outlined. As shown in this table all relationships brought up by Bensaou (1999) can be in some way related to the relationships at the companies.
Close cooperation suppliers at BETA are characterised by a high level of involvement with the supplier and are thus similar to the serial development suppliers at ALPHA. Both can be compared to the strategic partnership suggested by Bensaou (1999), since a high level of involvement implies higher investments of both parties.

Ordinary suppliers at BETA are all other suppliers that deliver for production which are not as highly involved with BETA and are thus similar to the market suppliers at ALPHA. However, due to the more apparent supplier segmentation at ALPHA another distinction takes place with the portfolio suppliers as the outcome. These suppliers possess a monopoly-like market position and can thus be compared to the captive buyer relationship from Bensaou (1999), since these suppliers can do business with the company without having to invest significantly in the relationship.

However, this comparison is only based on the connection between the level of involvement (ALPHA and BETA) with the buyer and supplier specific investments, in order to be able to highlight the similarity of the two case studies and the frame of reference. Other issues that determine the buyer and supplier specific investments brought up by Bensaou (1999) are not considered which makes it impossible to compare the relationships on a more detailed level.

### 6.2 What activities are used within the management of PFP suppliers of an automotive manufacturer and why?

In our frame of reference Dobler and Burt (1996) identified eight postaward activities of supplier management, namely ensuring understanding, preaward conference, monitoring and controlling of project progress, supplier performance evaluation, motivation, assistance, supplier surveys, and partnerships.

#### 6.2.1 Car manufacturer ALPHA

There are various activities ALPHA performs within their SPM. The company always tries to provide all the latest information needed to its suppliers through their partner portal, their Global Information System (GIS) and the supplier days. Furthermore, if help is needed or questions arise the suppliers always have the opportunity to contact their contact person at various departments. In order to manage logistical issues the material controller is in daily contact with the supplier. Within the product-development-phase the Supplier Parts Quality Management (SPQM) is performed. The supplier selection phase, from picking potential suppliers until series production, takes up to five years. During the whole time (product-development-phase and series process) the company monitors capacities, their own and their supplier’s capacity, in order to control project progress and to avoid bottle-neck situations. Within the series process two additional monitoring activities take place. The first one involves the monitoring of delivery date and quantity adherence and the second one the monitoring of wrong deliveries. Furthermore, they have their own supplier performance measurement system called SUMIS. The results of this SUMIS are communicated with the suppliers, which is also used as a means of motivation. Through tools like their SPQM, problem solving discussion, logistical process analysis (LOPA), and supplier support the suppliers are given assistance from ALPHA. Also adequate support for new IT systems, especially in the logistics area is provided and partially even workshops and information events are offered in order to develop the suppliers. In order to further develop their processes and optimise the way of working ALPHA conducts supplier surveys to gain feedback on the relationship from their suppliers. Last but not least there are additional activities that can be found in the close relationships to ALPHA’s partners (serial development suppliers) such as...
the supplier’s employees working at ALPHA together with their staff or LOPA’s that are conducted after a request of the supplier.

ALPHA’s activities in their management of PFP suppliers are visualised in table 6.2 below in comparison to the framework presented by Dobler and Burt (1996).

Table 6.2: Within-case analysis ALPHA, RQ 2

<table>
<thead>
<tr>
<th>Post-award Activities according to the frame of reference (Dobler and Burt, 1996)</th>
<th>Operational Definition</th>
<th>Activities in the management of PFP suppliers at ALPHA</th>
</tr>
</thead>
</table>
| Ensuring Understanding  
  • Early supplier involvement | Activities performed in order to ensure understanding |  
  • Internet portals  
  • Supplier days  
  • Daily contact with material controller  
  • Contact person at various departments of ALPHA |
| Preaward Conference | Activity taking place before the contract is awarded in order to discuss contact requirements |  
  • Phase from selection of suppliers until start of serial production takes a couple of years |
| Monitoring and Controlling Project progress | Activity/-ies performed in order to ensure project progress |  
  • SPQM |
| Supplier performance measurement | Activity/-ies performed in order to control performance |  
  • Logistical monitoring on a day to day basis  
  • Supplier performance measurement system |
| Motivation  
  • Rewards  
  • Punishment | Mean/-s used for motivation |  
  • Letter of appreciation  
  • Bad results jeopardising future contracts |
| Assistance  
  • Problem solving  
  • Training | Activity/-ies performed in order to assist the supplier |  
  • Structured problem solving through SPQM, problem solving discussion, LOPA, supplier support  
  • Workshops  
  • Information events good communication and information |
| Supplier Surveys | Activity/-ies in order to gain feedback from the supplier |  
  • Supplier surveys conducted regularly |
| Additional activities in partnerships  
  • Cross-organisational teams  
  • Additional Training  
  • Integrated communication system  
  • Plans for cooperating  
  • Identify common objectives  
  • Guest engineers | Activities that are necessary when managing a supplier of strategic importance |  
  • Involvement of suppliers in design and quality assurance  
  • Cross organisational teams  
  • Supplier performance discussion |

ALPHA attaches a lot of importance to providing their suppliers with the information they need and have for this reason created two internet portals (partner portal and GIS) that provide the suppliers with necessary information. Through their supplier’s days they provide their suppliers at the very beginning of the process (in the product-development-phase) where the final suppliers haven’t even been selected yet with information about the company, the single
departments and their requirements on the final suppliers. Also within the series process *ALPHA* tries to keep up a very high level of information through a daily contact of the material planner with the supplier and through contact persons at various departments at *ALPHA*. Those activities are also regarded as important and necessary by Dobler and Burt (1996) in our frame of reference in order to ensure mutual understanding.

The phase from the very starting point where the suppliers are selected to the start of the series production takes up to five years. This is because these contracts last for the production of whole series and are involving a very high dollar-value. Furthermore, concepts have to be developed first, which can also take several years. Dobler and Burt (1996) in our frame of reference suggest a pre-award conference, which is held just before the contract is awarded in order to discuss the contact requirements and make sure that everything is understood. This is also necessary at *ALPHA*, but is however included in the phase from supplier selection to the final start of the series, since the requirements and issues that need to be discussed for producing parts or modules of a car are too complex and too important to cover this in one conference. Thus, this pre-award activity basically exists at *ALPHA* but should in the case of *ALPHA* rather be referred to a pre-award phase than a pre-award conference.

During the product development phase *ALPHA* estimates the project, which is supported by their SPQM tool that helps to ensure quality of product and process development. Furthermore, as mentioned earlier, the material planner is in daily contact with the supplier in order to discuss the situation, avoid problems and make change management possible. This has also been brought up in our frame of reference. Dobler and Burt (1996) state that monitoring and controlling of project progress is highly important and regard it as the buyer’s responsibility to monitor the supplier’s progress.

Furthermore, *ALPHA* monitors the volume and through their “capacity management supplier” tool the capacity and flexibility of their suppliers in order to avoid bottle neck situations. During the series process there are additional monitoring activities such as the monitoring of delivery date and quantity adherence and the monitoring of wrong deliveries. These activities are of major importance as poor performance or late deliveries can in the end disrupt production operations and result in lost sales. In order to control and optimise the supplier’s overall performance *ALPHA* conducts supplier performance measurement once a year. This is also seen as a necessity by Dobler and Burt (1996) to enhance the relationships and thereby control performance. *ALPHA* developed its own supplier performance measurement system called SUMIS, assessing every supplier’s overall performance of the previous twelve months regarding quality, logistics, purchasing process and R&D activities. The company highlight the importance of this area to maintain their partnership atmosphere towards their suppliers.

*ALPHA* uses the results of the SUMIS assessment as a means for motivation in order to optimise overall performance. Dobler and Burt (1996) suggest two means of motivation, rewards and punishment. This can also be seen at *ALPHA* as the results of the SUMIS can be used in both ways – rewarding through communicating and acknowledging good results and punishment through communicating bad results and make aware of the repercussions (price negotiations, decreasing chance to get awarded a future contract).

Through assisting the suppliers with training and problem solving the companies are able to optimise their own as well as their supplier’s performance and in turn the relationship. This is also discussed by Dobler and Burt (1996). *ALPHA* assists their suppliers through problem solving activities during the product development phase such as with their SPQM tool and
during the serial production process with problem solving discussions, LOPAs, and supplier supports. Furthermore, especially when implementing new IT systems, adequate support is offered to the suppliers. Also training programs (workshops, information events) are provided to the suppliers, as also suggested by Dobler and Burt (1996).

One more activity, ALPHA carries out, which helps optimising the collaboration and the overall performance is to conduct supplier surveys, in which ALPHA’s suppliers are asked for feedback on the ALPHA and their relationship. Through this ALPHA does not only gain important feedback information and insights in how the relationships is experienced by the supplier, but does also show its commitment. These advantages are also brought up by Dobler and Burt (1996). ALPHA asks for feedback on various areas in the whole organisation, which is then forwarded to the certain departments in order to be converted (if necessary).

According to ALPHA all those activities are performed in all types of relationships it has with its suppliers. However, our data shows that there is a difference in to what extent some of these activities are carried out and how involved the suppliers are in them. Automated activities such as all the monitoring activities, ensuring project progress and the supplier surveys do not differ between the different types of suppliers – they are performed automatically for all suppliers. Activities such as ensuring understanding, motivation and assistance, however, are more “soft” activities that do not necessarily follow certain processes. Even though also those activities are performed in the management of all PFP suppliers, these are performed “stronger” with serial development suppliers. This stems from the fact that those suppliers have more contact with the car manufacturers due to the cooperation in some areas, e.g. R&D or quality assurance. Also the pre-award phase differs depending on what kind of part or component is delivered. Dobler and Burt (1996) cover these issues in their last activity called “additional activities in partnerships”. We also address this “more intensive treatment” of serial development suppliers and within those especially system suppliers in our last activity “additional activities for suppliers of highly complex products”.

At ALPHA additional activities for serial development suppliers which are involved in processes such as R&D and quality assurance, involve a closer contact to the supplier especially created by cross-organisational teams. This is done in order to create a good level of communication and to be able to really work as a team in certain areas. Furthermore, once a year ALPHA invites large and strategically important suppliers to a meeting in order to discuss objectives and the future direction of both companies (supplier performance discussion). This is also suggested by the Dobler and Burt (1996), who furthermore suggest additional training, plans for cooperating and identifying common objectives as additional activities. Moreover, the Dobler and Burt (1996) bring up integrated communication systems. These are as well used at ALPHA; however for all suppliers that deliver for production.

In general all activities performed at ALPHA are also brought up by Dobler and Burt (1996). Moreover, there are no activities mentioned in our frame of reference, which are not in the same or a similar way performed at ALPHA. Nevertheless, ALPHA especially focuses on and puts a lot of effort into activities that directly influence the production process, such as monitoring project progress and monitoring and measuring supplier performance, as this is of major importance for a car manufacturer to create and maintain a seamless and efficient production.
6.2.2 Car manufacturer BETA

The first activity BETA mentions is supplier performance measurement that is conducted both on long-term and day-to-day. They especially emphasise that the activities with suppliers are built on trust and commitment and regarding PFP suppliers BETA especially focuses on ensuring a high quality level of the suppliers operations. According to the company it takes time to build trust, commitment and operations of a high quality level. For this reason it takes around two to three years to start doing business with the company after a supplier has been selected by BETA. In order to help the suppliers perform satisfactory they motivate and in some cases provide assistance and training programmes for the suppliers. BETA as well conducts supplier surveys to gain knowledge about the suppliers view on various issues. For bigger projects BETA uses an advanced quality tool to monitor and control project progress. Finally, they emphasise early supplier involvement for close cooperation suppliers, arguing that they want them to be involved as soon as possible in new projects.

Table 6.3 Within-case analysis BETA, RQ 2

<table>
<thead>
<tr>
<th>Post-award Activities according to the frame of reference (Dobler and Burt, 1996)</th>
<th>Operational Definition</th>
<th>Activities in the management of PFP suppliers at BETA</th>
</tr>
</thead>
</table>
| Ensuring Understanding  
• Early supplier involvement | Activities performed in order to ensure understanding | • Face-to-face meetings  
• Email  
• Letters  
• Supplier portal |
| Preaward Conference | Activity taking place before the contract is awarded in order to discuss contact requirements | • Phase from selection of suppliers until start of serial production takes a couple of years |
| Monitoring and Controlling Project progress | Activity/-ies performed in order to ensure project progress | • Advanced quality planning tool. |
| Supplier performance measurement | Activity/-ies performed in order to control performance | • Day-to-day monitoring  
• Measurement of overall performance of suppliers |
| Motivation  
• Rewards  
• Punishment | Mean/-s used for motivation | • Annual prices for good results  
• Bad results jeopardising future contracts  
• Respect |
| Assistance  
• Problem solving  
• Training | Activity/-ies performed in order to assist the supplier | • Problem solving through action plans  
• Training |
| Supplier Surveys | Activity/-ies in order to gain feedback from the supplier | • supplier surveys conducted on an irregular basis |
| Additional activities in partnerships  
• Cross-organisational teams  
• Additional Training  
• Integrated communication system  
• Plans for cooperating  
• Identify common objectives  
• Guest engineers | Activities that are necessary when managing a supplier of strategic importance | • Cross-organisational teams  
• Integrated communication systems  
• Guest engineers |
BETA sees mutual understanding as crucial and ensures this understanding mainly through face-to-face meetings, but also through letters, e-mail and the supplier portal. For BETA communicating their needs and goals is very important so that the suppliers can contribute to BETA’s value proposition. This can be confirmed by our frame of reference as ensuring understanding is also according to Dobler and Burt (1996) of significant importance when creating and maintaining a successful relationship.

In our frame of reference Dobler and Burt (1996) mention a preaward conference as an activity where buyer-seller related issues (contact and requirement details) are discussed before the contract is awarded. At BETA this activity is manifested in a long process over two to three years, where all necessary issues that are relevant for the relationship are considered and discussed.

For BETA monitoring and controlling project progress is performed through their advanced quality-planning tool, which basically consists of a number of set questions. Thus, BETA deals with this activity in the same way as suggested in our frame of reference, as Dobler and Burt (1996) mention the utilisation of management tools (e.g. CPM) as a way to monitor and control project progress.

BETA monitors and measures their supplier’s performance through a long-term evaluation (supplier capability) and on a day-to-day basis. Moreover, if a supplier underperforms BETA together with the supplier constructs action plans in order to increase the performance of the supplier. Hence, they are able to together with the supplier optimise the supplier’s performance and as well BETA gain information that they can use for future sourcing decisions. This can be confirmed by our frame of reference, since Dobler and Burt (1996) state that the two main reasons for supplier performance measurement are to control a supplier’s contract performance and to use it as a base for future sourcing decisions.

At BETA the suppliers are motivated through punishment, rewards and especially respect. This is similar to what has been discussed by Dobler and Burt (1996), who consider two major ways of motivating suppliers, namely rewards and punishment. Dobler and Burt (1996) furthermore state that recognition is a powerful motivator addressing rewards. Even if respect has not been brought up as a way of motivation in our frame of reference there are similarities between respect and recognition, which according to the frame of reference is a means of motivation. Respect is manifested in the sharing of company information and is emphasised by soft values such as being on time for meetings. Moreover, in order to motivate suppliers through rewarding BETA communicates good performance and also arranges an annual price ceremony in the company’s core values. BETA also makes use of punishment as a means for motivation through threatening to terminate business with a continuously underperforming supplier. Furthermore, “bill back” is used (if the supplier underperforms, the supplier will pay for the underperformance) as another punishment tool to raise the motivation level, which is also discussed by Dobler and Burt (1996). Dobler and Burt (1996).

BETA offers training programs to their suppliers as in for example lean production. They perform problem-solving activities when a problem with a supplier occurs in an area by constructing action plans. This corresponds to our frame of reference, as Dobler and Burt (1996) also bring up training and problem solving as means for assisting suppliers.
BETA performs supplier surveys on an irregular basis. Gaining feedback from suppliers is according to our frame of reference important, especially in order to show that the car manufacturer is willing to improve before asking suppliers to improve.

BETA performs all these activities for all their PFP suppliers. However, just as discussed in the case of ALPHA there are differences in how “strong” these activities are performed between different suppliers. As explained in our first case study this also in BETA’s case depends on the level of involvement with the supplier. For this reason, we will address this difference in the intensity of the activities with the last activity performed at BETA – additional activities with close cooperation suppliers.

In our frame of reference these extra activities are also discussed in Dobler and Burt’s (1996) additional activities in partnerships and include integrated communication systems, cross-organisational teams, additional training, plans for cooperating, identifying common objectives and guest engineers are suggested for partnership suppliers (supplies strategic importance). BETA performs additional activities with close cooperation suppliers such as inviting suppliers to its plant to support and work together in design and development of parts. Furthermore, BETA and its close cooperation suppliers have integrated systems that are more complex than for ordinary suppliers. In general the company highlights the importance of ESI with these suppliers and emphasises that there is inter-dependency between them and their suppliers.

6.2.3 Cross-case analysis

Basically, the same activities are carried out by both companies. These activities can be grouped after the eight post-award activities presented by Dobler and Burt (1996). We did not find any activities that have not in a similar way been brought up by our frame of reference or vice versa.

However, there are differences in how these activities are carried out at the two companies and in comparison to the frame of reference. The activities of both companies and of the frame of reference are schematically presented in table 6.6 below.
Table 6.4 Cross-case analysis, RQ 2

<table>
<thead>
<tr>
<th>Post-award Activities according to the frame of reference (Dobler and Burt, 1996)</th>
<th>Activities in the management of PFP suppliers at ALPHA</th>
<th>Activities in the management of PFP suppliers at BETA</th>
</tr>
</thead>
</table>
| **Ensuring Understanding**  
- Early supplier involvement | • Internet portals  
- Supplier days  
- Daily contact with material controller  
- Contact person at various departments of ALPHA | • Face-to-face meetings  
- Email  
- Letters  
- Supplier portal |
| **Preaward Conference** | • Phase from selection of suppliers until start of serial production takes a couple of years | • Phase from selection of suppliers until start of serial production takes a couple of years |
| **Monitoring and Controlling Project progress** | • SPQM | • Advanced quality planning tool. |
| **Supplier performance measurement** | • Logistical monitoring on a day to day basis  
- Supplier performance measurement system | • Day-to-day monitoring  
- Measurement of overall performance of suppliers |
| **Motivation**  
- Rewards  
- Punishment | • Letter of appreciation  
- Bad results jeopardising future contracts | • Annual prices for good results  
- Bad results jeopardising future contracts  
- Respect |
| **Assistance**  
- Problem solving  
- Training | • Structured problem solving through SPQM, problem solving discussion, LOPA, supplier support  
- Workshops  
- Information events good communication and information | • Problem solving through action plans  
- Training |
| **Supplier Surveys**  
- Supplier surveys conducted regularly | • Supplier surveys conducted regularly | • Supplier surveys conducted irregularly |
| **Additional activities in partnerships**  
- Cross-organisational teams  
- Additional Training  
- Integrated communication system  
- Plans for cooperating  
- Identify common objectives  
- Guest engineers | • Cross-organisational teams  
- Involvement of suppliers in design and quality assurance  
- Supplier performance discussion | • Cross-organisational teams  
- Integrated communication systems  
- Guest engineers |

Both companies put focus on information and communication and ensure understanding through personal contact such as face-to-face meeting and the supplier’s days as well as through tools such as the Internet portals. Thus, the activity ensuring understanding brought up by Dobler and Burt (1996) is performed in both case study companies.  
*ALPHA* and *BETA* both regard the pre-award conference, as brought up by Dobler and Burt (1996), as a process lasting for a couple of years instead of a one time meeting.
The monitoring and controlling project progress activities are similar in both companies. Both apply a tool in order to ensure quality during the development process (SPQM at ALPHA, advanced quality planning tool at BETA).

Also supplier performance measurement is carried out in both companies and regarded as important to create and maintain a high level of performance. In both companies this measurement consists of two parts; a day-to-day monitoring and the evaluation of the long-term overall performance. ALPHA and BETA take the results of the supplier performance measurement into future supplier selection and use it as a means for motivation. Furthermore, ALPHA highlights that they try to keep up a partnership atmosphere. Also BETA regards supplier performance measurements as a way to support the suppliers rather than a toll of control. Another similarity can be seen in the way the companies use the results of the supplier performance measurements. However a difference between the companies could be identify and exists in the actions taken from the companies when a supplier underperformed. At ALPHA this escalation process is highly structured and follows certain rules whereas BETA only mentions action plans.

Dobler and Burt (1996) name two means of motivation; rewards and punishment. These means are also used at both of our case study companies in form of communicating the supplier’s assessment results. BETA even rewards an annual price for the best performing supplier. In addition to these motivators BETA also regards respect as important.

Assistance according to Dobler and Burt (1996) consists of training and problem solving efforts. Both companies provide problem solving activities and training activities to their suppliers. However, the activities at ALPHA again, especially concerning problem solving, apply a more structured process than at BETA.

Supplier Surveys, as a means for gaining feedback, as suggested by Dobler and Burt (1996) are conducted in both companies. A dissimilarity, however, exists in the frequency and accuracy of those surveys, as ALPHA states that supplier surveys are conducted on a regular basis approximately once a year and sent out to all suppliers, whereas BETA sends out these surveys on an irregular basis and to only approximately eight percent of the supplier base.

Last but not least, there are additional activities performed in relationships towards ALPHA’s serial development suppliers and BETA’s close cooperation suppliers. These suppliers are regarded as those PFP suppliers that are involved in design due to a highly complex part, component or module. Additional activities are necessary here as a closer cooperation is needed especially regarding R&D and quality assurance. This closer cooperation is in both companies mainly enabled through cross-organisational teams.

6.3 How can the information exchange towards PFP suppliers of an automotive manufacturer be characterised?

The frame of reference regarding the information exchange based on Childerhouse et al. (2003a, b) and Bensaou (1999) will in this section be compared with the empirical data collected at the companies. As stated in chapter three this research question is split into; to find out the character of the information that needs to be exchanged between buyers and suppliers; how the information flows, between buyer and supplier can be characterised; with what tools the information is exchanged and if the character of the information is varying between different types of relationships.
In the frame of reference Childerhouse et al. (2003a,b) identify that information exchange concerns information flows, that is flowing upstream (towards buyers, fulfilment information) and downstream (towards suppliers, demand information). These information flows according to the authors sometimes experience problems as bad quality because of trust issues in the buyer seller relationship. Bensaou (1999) contribution to our frame of reference is his concept about information sharing practise. According to him the information sharing practise differ between various types of relationships, for example he states that for a strategic partnership relationship the information exchange is of a rich and frequent character. Furthermore he states that the tools utilised for exchanging information in successful relationships are reflecting the type of relationship, e.g. in a successful strategic relationship the tools for information exchange should allow rich and frequent information exchange as; cross organisational teams and broadband connections.

6.3.1 Car manufacturer ALPHA

In general information exchange is a crucial topic at Alpha, as exchanging all the necessary and rich information with the suppliers is vital for a well working production. Alpha regards both information flows, upstream and downstream, as very important. Information is basically exchanged through the databases both parties use on a day to day basis, through personal contact and information meetings. Table 6.7 visualises the information exchange of Alpha in comparison to the concepts of our frame of reference.

Table 6.5: Within-case analysis ALPHA, RQ 3

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Information Exchange</th>
<th>Information exchange at ALPHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of information exchange</td>
<td>Information flow Childerhouse et al., 2003</td>
<td>Up-/downstream information flows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No major problems</td>
</tr>
<tr>
<td></td>
<td>Information-sharing practise Bensaou, 1999</td>
<td>Rich</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Through databases personal contact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Additional information flowing with serial development suppliers</td>
</tr>
</tbody>
</table>

At ALPHA, their information exchange is based on requirements of ALPHA and performance of the supplier and is crucial for developing and maintaining a seamless production. Childerhouse’s et al. (2003a,b) state that for effective buyer supplier relationships information flowing up- and downstream is necessary. As the base for information exchange at ALPHA requires information flows up- and downstream Childerhouse et al. (2003a,b) suggestion is confirmed by the automotive manufacturer.

ALPHA is calling upon its suppliers to be active and communicate all necessary information and also provide all the information the suppliers need from ALPHA. Regarding logistical issues this is first of all ensured through the databases that contain both, upstream and downstream information. Furthermore, regarding logistical aspects the company’s material
controller is in daily contact with the supplier. Moreover, ALPHA also includes its customers in the information flow process, as they state this information is also necessary in order for all companies in the supply chain to achieve the main goal – satisfying the end customer, which is also stated as necessary by Childerhouse et al. (2003). By taking all this actions ALPHA avoid major problems related to information flows, problems that are for example addressed by Childerhouse et al. (2003a,b). However there is a minor problem within exchanging information with suppliers from abroad (especially non-European) due to time differences, different holidays and shipment times that need to be considered.

The information exchanged to all suppliers of ALPHA is rich and flowing on a regular and frequent basis, as this is crucial for the company’s production. However, there is of course more detailed information flowing towards and from the suppliers that are involved in R&D (serial development suppliers) through personal contact and cross-organisational teams. Bensaou (1999) argues that the information exchanged with more strategic suppliers (strategic partnerships) is rich and exchanged frequently, thus supporting the case at ALPHA. Furthermore in agreement with Bensaou (1999) all suppliers of importance require rich and frequent information exchanged.

The exchanging information process at ALPHA is carried out in different ways. The most important means of exchanging information especially regarding logistical issues is the electronic data exchange, where through IT tools such as their whole production planning system, an automated information exchange is provided. In addition to that ALPHA is in constant contact with the supplier meetings are held at the beginning of the relationship in order to discuss the requirements from both parties, and if a problem occurs. Cross-organisational teams are as well created for development and quality assurance with serial development suppliers. In general the means of exchanging information at ALPHA is the same as suggested by Bensaou (1999). He proposes means for information exchange such as, meetings, IT tools and cross-organisational teams.

6.3.2 Car manufacturer BETA

In general BETA exchanges rich information frequently with its suppliers as all the PFP suppliers are of major importance to BETA. In order to exchange information they utilise personal contact (letters, face to face meetings etc.), IT tools, cross-organisational teams and supplier’s days. Regarding the information flow more information is flowing towards the suppliers as BETA puts a lot of different requirements on the suppliers as; quality insurance and IT infrastructure. Furthermore BETA does not experience a lack of information flowing downstream or upstream. Table 6.8 provides an overview on how the information flow is characterised in BETA compared to the frame of reference.
Table 6.6: Within-case analysis BETA, RQ3

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Information Exchange</th>
<th>Information exchange at BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childerhouse et al., 2003</td>
<td>• Up-/downstream information flows</td>
<td></td>
</tr>
<tr>
<td>• Provisions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristics of information exchange</td>
<td>Information-sharing practise</td>
<td></td>
</tr>
<tr>
<td>Bensaou, 1999</td>
<td>• Richness</td>
<td></td>
</tr>
<tr>
<td>• Frequency</td>
<td>• Through personal contact and IT tools</td>
<td></td>
</tr>
<tr>
<td>• Means for information exchange</td>
<td>• Differences in relationships</td>
<td></td>
</tr>
<tr>
<td>• Additional information flowing towards close cooperation suppliers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*BETA* exchanges detailed information both upstream and downstream. Childerhouse *et al* (2003a,b) argue that in order to have an effective buyer-supplier relationship both demand information (flowing upstream) and fulfillment information (flowing downstream) is needed thus confirming the situation at *BETA*. However, there is more information flowing towards the supplier, suggesting a problem of a “lack of not looking forward” type as suggested by Childerhouse *et al* (2003a,b).

The PFP supplier’s relationships with *BETA* have evolved during several years and the information exchange is characterised as rich and frequent, due to a high importance of all PFP suppliers. *BETA* and its suppliers exchange information such as specifications, just-in-time coordinating information, mutual goals and company specific information. As suggested in our frame of reference the character of the information exchange is of this nature regarding suppliers of importance. For close cooperation suppliers (e.g. suppliers of complex products as dashboards) additional information is exchanged at *BETA* such as CAD drawings and project progress information, in order to handle the complexity and importance of these products. These additional information flows are following Bensaou (1999) proposal of additional information exchange in well functioning strategic partner relationships.

In *BETA’s* case their means of information exchange allow rich and frequent information exchanged as all their PFP suppliers are regarded as important. They use face to face meetings, letters, assistance, supplier forums and especially advanced information technologies (EDI with capability to transfer large amount of data, integrated supplier system, supplier portal and Internet) for their information exchange. Bensaou (1999) confirms the need for this kind of means for information exchange regarding important suppliers. For close cooperation relationships at *BETA* the means for information exchange allow even richer information exchange, as for instance *BETA* and its suppliers employ guest engineers at each others plants as a way to optimise these relationships. Again this is also suggested by Bensaou (1999), addressing the need for special means of information exchange for strategic partnerships suppliers.

There are various ways to exchange information according to Bensaou (1999) who provides examples such as meetings, information technologies (such as broadband connections) and cross-organisational teams. In general Bensaou (1999) states that the more strategic the
relationship is the more important it is for the information exchange tools to allow rich and frequent information exchange. This is also confirmed as they exchange rich and frequent information through the use of.

### 6.3.3 Cross-case analysis

Basically, there are similarities in the way both companies exchange information and also in what information is exchanged. Table 6.9 visualises the characteristics of the information exchange of both companies compared to the frame of reference.

**Table 6.7: Cross-case analysis, RQ 3**

<table>
<thead>
<tr>
<th>Information exchange according to the frame of reference</th>
<th>Information exchange at \textit{ALPHA}</th>
<th>Information exchange at \textit{BETA}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information flow</strong></td>
<td>Up-/downstream information flows</td>
<td>Up-/downstream information flows</td>
</tr>
<tr>
<td>Childerhouse et al., 2003</td>
<td>No major problems</td>
<td>More information flowing upstream</td>
</tr>
<tr>
<td></td>
<td></td>
<td>than downstream</td>
</tr>
<tr>
<td><strong>Information-sharing practise</strong></td>
<td>Rich</td>
<td>Rich</td>
</tr>
<tr>
<td>Bensaou, 1999</td>
<td>Frequency</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Through databases personal contact</td>
<td>Through personal contact and IT</td>
</tr>
<tr>
<td></td>
<td>Additional information flowing with</td>
<td>tools</td>
</tr>
<tr>
<td></td>
<td>serial development suppliers</td>
<td>Additional information flowing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>towards close cooperation suppliers</td>
</tr>
</tbody>
</table>

Basically, the character of the information flow at both companies corresponds to what is suggested in the frame of reference. However, where \textit{BETA} states that there is more information flowing towards suppliers than the other way round, \textit{ALPHA} calls upon active communication in order to encourage the suppliers to participate in an active buyer-supplier relationship. \textit{ALPHA}, in comparison to \textit{BETA}, as well highlights the importance of considering its customers in the process of exchanging information.

As both companies regard their PFP suppliers as important, rich information is exchanged on a frequent basis. This has also been stated by Bensaou (1999) regarding important suppliers. The means of exchanging information are similar in both companies. \textit{ALPHA} and \textit{BETA} both need to employ means that allow rich information to be exchanged frequently. For this reason, personal contact regarding more general issues and advanced IT tools for information that needs to flow on day-to-day basis e.g. logistic information, are the main ways of exchanging information at both companies.

Another similarity our within case analyses show, which also corresponds to the frame of reference, is that more detailed information is required in strategic relationships. \textit{ALPHA}’s and \textit{BETA}’s suppliers of complex products, who are involved in R&D and quality assurance, participate in cross-organisational teams in order to manage the high complexity of these components.
6.4 What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?

The main points Ross (2003) provides to our frame of reference is that e-SRM consist of four different areas; EBS-backbone, e-services, e-processes and e-technology services. In addition to these areas a company as well utilise EDI, the Internet and e-marketplaces in the e-SRM field. In order to gain a more detailed picture on how the Internet is utilised in the area of SPM we as well picked Porter’s (2001) model of Internet’s impact on companies for our frame of reference.

6.4.1 Car manufacturer ALPHA

ALPHA’s current EBS is called legacy world, which consists of all the tools and systems the company uses for its processes. The company will however switch to SAP starting the implementation end of 2005/2006. ALPHA’s communication with its suppliers is mainly carried out through EDI. The company further more uses the internet, especially as a means for information. Through IT the company is able to improve and automate their systems and work more closely together in the supply chain. Table 6.10 below maps the use of information technologies in ALPHA’s supplier management in comparison to our frame of reference.

Table 6.8: Within-case analysis ALPHA, RQ 4

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Utilisation of IT</th>
<th>Utilisation of IT at ALPHA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EBS-backbone</td>
<td>Automated processes</td>
</tr>
<tr>
<td></td>
<td>E-services</td>
<td>Few e-processes</td>
</tr>
<tr>
<td></td>
<td>E-processes</td>
<td>Infrastructure</td>
</tr>
<tr>
<td></td>
<td>E-technology services</td>
<td>EDI</td>
</tr>
<tr>
<td></td>
<td>EDI</td>
<td>Internet</td>
</tr>
<tr>
<td></td>
<td>Internet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E-marketplaces</td>
<td></td>
</tr>
<tr>
<td>Internet’s impact on the value chain Porter, 2001</td>
<td>Mainly tool for communication and information</td>
<td></td>
</tr>
</tbody>
</table>

At ALPHA they as also suggested by Ross (2003) have an EBS-backbone, called “Legacy world”, which consists of mostly ALPHA internal systems and tools, such as for instance their complete material and production planning system. The “Legacy world” will however be replaced by SAP in the near future in order to integrate the companies functions and processes even more effectively as SAP is a very integrated and complete EBS with a good structure. This integrity an EBS provides has also been stated as significantly important by Ross (2003).

Through utilising IT ALPHA is able to automate most of their traditional functions and make them more effective, this kind of IT usage is also suggested by Ross (2003), calling it e-services. A good example of ALPHA’s progress in this area is the traffic light system that is for example making the supplier performance measurement activity more effective.
New activities that have evolved from new IT tools are very rare in the field of supplier management at ALPHA. However, the company is always looking for what is possible through technology and then decide how they can use this to further optimise their business as they are aware of its potential as suggested by Ross (2003), addressing it as e-processes.

ALPHA is mainly using EDI as a means of data exchange. They also sees even more done via web EDI in the future as the internet evolves more and more. Concerning portals ALPHA employ internet based portals. The partner portal is a portal providing more general information, whereas the GIS is in some way customised as the suppliers only get information on the model and production they deliver for. Both portals, however, can only be accessed by indicating supplier and password to maintain confidentiality and security. The supplier portals and what information technologies to use for communication with suppliers are also proposed as areas of interest by Ross’s (2003) e-SRM technology services.

Concerning e-marketplaces ALPHA does not make use of these kinds of information technologies, even though Ross (2003) mentions e-marketplaces such as COVISINT as a part of e-SRM. For Alpha their suppliers are very important partners and when selecting these suppliers not only an excellent performance is crucial but also being network compatible which means that a supplier also needs to be able to work together with other suppliers. The company’s goal is to create the best partner network which for them gives no need to utilise e-marketplaces for their PFP suppliers as suggested by Ross (2003).

At ALPHA the Internet, another communication tool related to e-SRM discussed by Ross (2003), is used in many ways within their supplier management. The so important communication and information issues are apart from EDI for communicating with the suppliers, mainly carried out through the Internet. Their two portals, partner portal and GIS for instance are Internet based and aim to provide the suppliers with all general and more customised information. Porter (2001) in his “prominent applications of the internet in the value chain” sees the Internet used as an internet-enabled demand planning, real-time available to promise/capable to promise and fulfilment supporting tools. Furthermore, the author regards it as another linkage of purchase, inventory, and forecasting systems with suppliers and to automate the “requisition to pay”. At ALPHA these activities via the Internet are also performed and thus support Porter (2001) in these areas. However, the last way the Internet can be used in the procurement function Porter explains is direct and indirect procurement via marketplaces, exchanges, auctions, and buyer-seller matching, cannot be supported by our findings at ALPHA as they told us that they do not use the internet in that way.

6.4.2 Car manufacturer BETA

Beta uses various information technologies in the management of their PFP suppliers. One information technology that is used for several functions is EDI. The EBS of the company is a mixture of bought EBS/stand alone applications, modified EBS/stand alone applications and self developed applications. Furthermore they are utilising the Internet, supplier portals and e-marketplaces. In general BETA has through the utilisation of IT manage to automate a lot of processes in order to free people. Table 6.11 provides a graphical view of BETA’s utilisation of information technologies compared to the frame of reference.
**Table 6.9: Within-case analysis BETA, RQ4**

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Utilisation of IT</th>
<th>Utilisation of IT at BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information technologies utilised in the management of suppliers</td>
<td>E-SRM B2B e-marketplace functions model</td>
<td>• Mixed EBS</td>
</tr>
<tr>
<td></td>
<td>Ross, 2003</td>
<td>• Automated processes</td>
</tr>
<tr>
<td></td>
<td>• EBS-backbone</td>
<td>• Few e-processes</td>
</tr>
<tr>
<td></td>
<td>• E-services</td>
<td>• Infrastructure</td>
</tr>
<tr>
<td></td>
<td>• E-processes</td>
<td>• EDI</td>
</tr>
<tr>
<td></td>
<td>• E-technology services</td>
<td>• Internet</td>
</tr>
<tr>
<td></td>
<td>• EDI</td>
<td>• COVISINT</td>
</tr>
<tr>
<td></td>
<td>• Internet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• E-marketplaces</td>
<td></td>
</tr>
<tr>
<td><strong>Internet’s impact on the value chain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Porter, 2001</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mainly tool for communication and information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Knowledge management</td>
</tr>
</tbody>
</table>

*BETA* has an EBS-backbone that is a mixture of bought EBS/stand alone applications, modified EBS/stand alone applications and self developed applications. Despite the variety of the EBS-backbone all parts of it are linked with each other. According to Ross (2003) an EBS is a database that provides a company with useful information in order to facilitate work, at BETA this statement is confirmed.

The car manufacturer utilises information technologies to make traditional functions more effective by focusing on automating processes. This type of IT utilisation is as well suggested by Ross (2003). Furthermore, this is an area in e-SRM where BETA is highly active employing services such as collaborative design/planning, fulfilment, synchronised supply chain procurement planning, EFT (Electronic Fund Transfer), billing, electronic transfer of drawings and electronic transfer of deviation reports, just to name a few of them.

*BETA* is also interested in how IT can be used in order to create new ways of doing business, as it provides new opportunities, however they do not use IT to such a high degree compared to use it as a tool for making existing processes more effective. Ross (2003) as BETA proposes IT utilisation of this kind as well. In their interaction with PFP suppliers the company to some extent uses new IT based functions as; RFQ, purchase order generation and tracking and logistic.

Considering the IT infrastructure BETA’s web processing (handling data communication) is mainly focused on the use of EDI as the Internet so far hasn’t provided enough bandwidth for all the data that needs to be transferred between the suppliers and the company. Furthermore, the company offers member services through a supplier portal as well as supplier integrated systems where their suppliers can by themselves gain information about BETA. All these areas are parts of e-technology services as suggested by Ross (2003) that is about issues concerning the IT infrastructure.

*BETA* is aware of the value of e-marketplaces and utilises a consortium e-marketplace (COVISINT). This e-marketplace operates the car manufacturer’s supplier portal. Ross (2003) confirms that e-marketplaces can be employed in the management of PFP suppliers; our frame of reference also confirms that e-marketplaces can be used for more than just basic transactions activities. BETA is also reviewing other advanced e-marketplace services such as
capital services. Right now, however, they do not want to put too much power on the e-marketplace.

EDI is utilised at _BETA _as a tool for communicating with the car manufacturer’s suppliers. It is as well an element of e-SRM as suggested by Ross (2003). _BETA _mainly employs EDI to automate processes and free people. Moreover, EDI is the main ICT (Information Communication Technology) at _BETA _compared to for example the Internet.

The car manufacturer is also aware of the impact Internet has had on today’s business markets and employs it in some parts of their business; one area is in the management of PFP suppliers. To use this ICT tool for supplier is also suggested by Ross (2003). Today _BETA _uses the Internet in the context of their suppliers mainly for reporting, sending e-mails, in order to operate their supplier portal and for supplier performance measurement. Porter (2001) addresses the value chain as a tool to analyse how the Internet is utilised in businesses calling it “prominent applications of the Internet in the value chain”. All the activities above are related to the procurement area in the value chain that Porter (2001) presents, except the supplier portal that can be derived to the company’s infrastructure area. At _BETA _most of the real time communication is carried out with the help of EDI. This kind of real time communication can also as proposed by Porter (2001) be supported by the Internet, even if _BETA _mainly uses EDI. However _BETA _is currently reviewing web based tools for communicating real time information. The car manufacturer is also reviewing possibilities to put more of the company’s infrastructure on the Internet, they as well uses the Internet to gain intelligence on for example markets and steel prices.

6.4.3 Cross-case analysis

Basically, the two car manufacturers use IT within their supplier management in a similar way. The utilisation of IT at both companies to a large extent reflects the areas of e-SRM presented by Ross (2003). However, a few differences can be seen. In table 6.12 we visualise our findings on the use of IT by comparing both cases with each other and to the frame of reference.
Concerning the EBS-backbone, as referred to by Ross (2003), both companies use one “mixed” EBS, where the companies integrated company internal tools and purchased tools in to one system. Both companies saw the need to integrate their single systems and processes to be able to work most efficiently throughout all functions of the company. \textit{ ALPHA}, however, decided to replace their legacy world with SAP at the end of the year 2005, in order to have an even more structured and complete enterprise business system.

\textit{ ALPHA} and \textit{ BETA} both utilise information technologies to automate their processes and activities, especially when coming to logistical issues. \textit{ ALPHA} even states that IT is the base for making their logistics, as it works today, possible.

We could identify similarities and dissimilarities in the field of new activities that arose through new information technologies. Both car manufacturers rather apply IT to automate and optimise their traditional activities within the management of their PFP suppliers. However, \textit{ BETA} considers performing new activities that are enabled through IT, such as for instance COVISINT - the e-marketplace. \textit{ ALPHA} on the other hand strictly declines the use of those market hubs, as they highlight their intention to create and maintain a good supplier network, where it is necessary for a supplier to be network compatible. For this reason, they do not want to “outsource” this activity to a market hub when coming to PFP suppliers.

Concerning the firm infrastructure \textit{ ALPHA} and \textit{ BETA} handle this area in a similar way. They both offer member services within their supplier portals through giving suppliers permission to access to those portals by indicating their password. Another similarity in the usage of IT can be seen in their way of communication, as both companies mainly use EDI for communicating with their suppliers. \textit{ ALPHA} and \textit{ BETA} rely on EDI as this is the most appropriate tool available right now for exchanging rich data on a day to day basis.

When coming to the internet within supplier management we could see that both companies principally use it as a tool for providing information, as \textit{ ALPHA} and \textit{ BETA} for instance both created supplier portals with the aim of informing their suppliers best possible. However, one main difference between the two car manufacturers is that where \textit{ BETA} is reviewing new possibilities the internet offers as with COVISINT, \textit{ ALPHA} does not see this as use for their intentions. As explained earlier \textit{ ALPHA} focuses on creating a partner network with their

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**Table 6.10: Cross-case analysis, RQ 4**

<table>
<thead>
<tr>
<th>Utilisation of IT according to the frame of reference</th>
<th>Utilisation of IT at \textit{ ALPHA}</th>
<th>Utilisation of IT at \textit{ BETA}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E-SRM B2B e-marketplace functions model</strong></td>
<td><strong>Mainly tool for communication and information</strong></td>
<td><strong>Mainly tool for communication and information</strong></td>
</tr>
<tr>
<td>Ross, 2003</td>
<td><strong>“Legacy world “</strong></td>
<td><strong>Mixed EBS</strong></td>
</tr>
<tr>
<td>• EBS-backbone</td>
<td><strong>Automated processes</strong></td>
<td><strong>Automated processes</strong></td>
</tr>
<tr>
<td>• E-services</td>
<td><strong>Few e-processes</strong></td>
<td><strong>Few e-processes</strong></td>
</tr>
<tr>
<td>• E-processes</td>
<td><strong>Infrastructure</strong></td>
<td><strong>Infrastructure</strong></td>
</tr>
<tr>
<td>• E-technology services</td>
<td><strong>EDI</strong></td>
<td><strong>EDI</strong></td>
</tr>
<tr>
<td>• EDI</td>
<td><strong>Internet</strong></td>
<td><strong>Internet</strong></td>
</tr>
<tr>
<td>• E-marketplaces</td>
<td><strong>COVISINT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Internet’s impact on the value chain</strong></td>
<td><strong>Mainly tool for communication and information</strong></td>
<td><strong>Knowledge management</strong></td>
</tr>
<tr>
<td>Porter, 2001</td>
<td><strong>Knowledge management</strong></td>
<td></td>
</tr>
</tbody>
</table>
suppliers and for this reason regards a market hub such as COVISINT as inappropriate. However, *ALPHA* stated that they do review new opportunities and are aware of what exists, but only employ what fits to their philosophy.

### 6.5 How can the influence of information technologies within the management of PFP suppliers of an automotive manufacturer be characterised?

In our frame of reference Jap (2001) provides us with the interdependency between IT and relationships as a way to gain competitive advantage and Bensaou (1997) added that different IT philosophies have an impact on how IT is utilised in companies. Finally we as well added Rysell *et al.* (2004) as they state that IT can have a negative influence on inter-organisational value creation however they continue arguing that this negative influence can be found in the newness of the technology suggesting that new IT tools need time to mature in order to deliver inter-organisational value.

#### 6.5.1 Car manufacturer ALPHA

The company in general regards IT as the base for making it possible to work closely together with their suppliers and to enable them to create their partner network. Through IT Alpha is mainly able to optimise their traditional functions and their communication and information exchange with their suppliers. In table 6.13 a summary of the influence IT has on SPM is mapped in comparison to the frame of reference.

**Table 6.11: Within-case analysis ALPHA, RQ 5**

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Influence of IT on SPM</th>
<th>Influence of IT on SPM at ALPHA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The relationship-technology interface</strong>&lt;br&gt;Jap, 2001</td>
<td>IT influencing relationship; Relationship influencing IT; Interdependency of IT and relationship as a base for competitive advantage</td>
<td>make use of everything technology offers; Automate existing processes</td>
</tr>
<tr>
<td><strong>IT in inter-organisational cooperation</strong>&lt;br&gt;Bensaou, 1997</td>
<td>IT to strengthen partnerships; IT to create more efficient markets</td>
<td>Strengthen relationships towards suppliers and automate processes</td>
</tr>
<tr>
<td><strong>The impact of information technology deployment on trust, commitment and value creation in business relationships</strong>&lt;br&gt;Rysell <em>et al.</em>, 2004</td>
<td>Negative impact due to newness</td>
<td>Increasing dependency on systems; Outweighed through advantages</td>
</tr>
</tbody>
</table>

At *ALPHA* the utilisation of IT is the base for efficient supply chain management, as it enables the company to work with their suppliers as partners which is necessary to stay competitive. This has also been stated by Jap (2001) who argues that the interdependence of
IT and relationships is a base for competitive advantage. Furthermore \textit{ALPHA}'s relationships influence the use of IT in that way that they are able to automate their processes and activities through IT. The car manufacturer is also trying to make use of everything provided through technology and to keep improving their processes, tools and methods used. They analyse those opportunities and review how they could profit from it in their relationships. These two facts confirm Jap (2001), framework that IT and relationships are affecting each other in a bidirectional manner and indeed is a base for competitive advantage.

The philosophy laying behind the usage of IT at Alpha is to use it as a tool to strengthen the relationships towards their suppliers and optimise supply chain management. Bensaou (1999) investigated the philosophy regarding the use of IT of Japanese and American car manufacturers. Our results show that \textit{ALPHA}'s opinion of IT utilisation is similar to the Japanese car manufacturers IT philosophy.

In the utilisation of IT there is a disadvantage at \textit{ALPHA}, especially with EDI, they become more and more dependent on systems. However, this “little” disadvantage is more than outweighed through the advantages that come with the utilisation of IT. Rysell \textit{et al.} (2004) suggests that IT has a negative impact on the value creation in relationships. Even if there is a disadvantage with utilising IT at \textit{ALPHA}, Rysell \textit{et al.} (2004) findings can not be confirmed as this disadvantage is more than outweighed by the advantages.

\textbf{6.5.2 Car manufacturer BETA}

In general IT has had a positive influence on the inter-organisational value creation of the company. IT has influenced SPM especially as a way to automate processes in order to free people. Furthermore, IT has made it possible for the company to outsource parts of its manufacturing as well as it has provided \textit{BETA} with new opportunities for knowledge management. However, \textit{BETA} states that IT implementation has complex implementation consequences that need to be mapped before implementation of new IT tools.
Table 6.12: Within-case analysis BETA, RQ 5

<table>
<thead>
<tr>
<th>Operational Definition</th>
<th>Influence of IT on SPM</th>
<th>Influence of IT on SPM at BETA</th>
</tr>
</thead>
</table>
|                        | The relationship-technology interface | • COVISINT  
|                        | Jap, 2001 | • Outsourcing manufacturing  
|                        | • IT influencing relationship  
|                        | • Relationship influencing IT  
|                        | • Interdependency of IT and relationship as a base for competitive advantage  | • Automation of existing business processes. |
| Influence of IT on SPM | IT in inter-organisational cooperation | • Automation of processes in order to free people.  
|                        | Bensaou, 1997 | • Creating more efficient markets with the help of COVISINT  
|                        | • IT to strengthen partnerships  
|                        | • IT to create more efficient markets  | |
|                        | The impact of information technology deployment on trust, commitment and value creation in business relationships | • Long-term positive impact  
|                        | Rysell et al, 2004 | • Complex implication consequences  
|                        | • Negative impact due to newness  | |

At BETA their relationships are influencing the utilisation of IT, as they state that IT has primary influenced the company as a tool to automate processes. This type of IT utilisation is also suggested by Jap (2001). Furthermore BETA recognises that IT has influenced relationships (the other way around). As this direction of influence includes new ways of doing business they observe that IT has contributed to the outsourcing trend in manufacturing. Moreover, IT has influenced the possibility for good knowledge management (E.g. utilisation of Internet to gain information on markets and steel prices). Jap (2001) as well proposes the utilisation of new information technologies that has influenced relationships. At BETA both ways of IT usage is considered even if relationships have influenced IT more than the other way around. To consider both directions is supported by Jap (2001), who suggests that the interdependency between IT and relationships is a base for competitive advantage.

The car manufacturer employs IT in order to automate processes and to free people, thus increasing process efficiency. Bensaou (1997) suggests that a company’s IT philosophy is either going towards employing IT in order to create more efficient markets or to strengthen relationships. The IT philosophy of BETA can not be supported by our frame of reference. Even if automation of processes is a way to create more efficient markets with for example the utilisation of COVISINT it doesn’t imply that this philosophy can not strengthen relationships also, as the people that are free due to automation of processes can engage in relationship building activities. However the background of COVISINT is primary to create more efficient markets suggesting the IT philosophy of BETA going more towards creating more efficient markets.

IT has definitely influenced the management of suppliers in a positive way at BETA which is in contrast to Rysell et al. (2004) findings that IT has a negative impact on relationships value creation. Furthermore BETA addresses the time issue of implementing new information
technologies. They state that an IT implementation sometimes is not beneficial as the consequences of IT implementation are not analysed enough (e.g. implementation of transferring a typing process to suppliers that save costs for the company but raise it for suppliers). This is confirmed by Rysell et al (2004) who suggest that the negative impact IT has on relationship value creation can lay in the newness of the technology and that a positive value creation can be found over time.

6.5.3 Cross-case analysis

In general both companies regard IT as a way of automating processes and activities. However, we could identify dissimilarities in the philosophy laying behind the use of IT by comparing the two cases. A summary of our findings regarding the influence of IT is visualised in table 6.13 below in comparison to the frame of reference.

Table 6.13: Cross-case analysis, RQ 5

<table>
<thead>
<tr>
<th>Influence of IT on SPM</th>
<th>Influence of IT on SPM at ALPHA</th>
<th>Influence of IT on SPM at BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The relationship-technology interface</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Jap, 2001</em></td>
<td>IT influencing relationship</td>
<td>Make use of everything technology offers</td>
</tr>
<tr>
<td></td>
<td>Relationship influencing IT</td>
<td>Automate existing processes</td>
</tr>
<tr>
<td></td>
<td>Interdependency of IT and relationship as a base for competitive advantage</td>
<td></td>
</tr>
<tr>
<td><strong>IT in inter-organisational cooperation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bensaou, 1997</em></td>
<td>IT to strengthen partnerships</td>
<td>Strengthen relationships towards suppliers and automate processes</td>
</tr>
<tr>
<td></td>
<td>IT to create more efficient markets</td>
<td></td>
</tr>
<tr>
<td><strong>The impact of information technology deployment on trust, commitment and value creation in business relationships</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Rysell et al, 2004</em></td>
<td>Negative impact due to newness</td>
<td>Increasing dependency on systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outweighed through advantages</td>
</tr>
</tbody>
</table>

To start with there is interdependency between IT and relationships at our case study companies that are as well supported by the frame of reference. In detail both ALPHA and BETA mainly use IT in order to automate their traditional processes and to optimise the communication level and information exchange. Furthermore both companies review new IT and the way they can employ it. However, there is one difference to highlight. BETA employs new information technologies in order to automate processes and free people for example leading to utilising an e-marketplace. Even though, ALPHA are as well reviewing and trying to make use of everything technologies offers, their intention is to create and maintain a partner network with their suppliers and for this reason strictly decline to employ information
technologies that could jeopardise the intensity of their partnership atmosphere and their partner network.

This also results in a slight difference when comparing the philosophy laying behind the utilisation of IT. Even though the importance of the PFP suppliers has been highlighted from both car manufacturers, where ALPHA clearly regards the importance of their supplier’s network capability, their partnership atmosphere and effective supply chain management as the main goal when utilising IT, BETA uses IT as a tool mainly for creating effective and efficient processes, not emphasising the partnership atmosphere to the same degree as ALPHA.

Both companies also see downsides of IT, as the increasing dependency (pointed out by ALPHA) and the complexity of implementing new information technologies (pointed out by BETA). Nevertheless, ALPHA and BETA both state that IT has definitely influenced the management of suppliers in a positive way which is in contrast to Rysell et al. (2004) findings that IT has a negative impact on relationships value creation. ALPHA explains that the disadvantages of IT are compared to the advantages and the opportunities provided through IT only minor.
Chapter Seven: Findings and Conclusions

In this final chapter we will firstly discuss our findings from our analysis chapter and draw conclusions for each research question. Secondly, we will discuss our findings regarding our research problem as a whole. Thirdly, we will address implications for theory and management and suggest areas for further research.

7.1 Findings and Conclusions

7.1.1 How can supplier segmentation of PFP suppliers of an automotive manufacturer be characterised?

Both, ALPHA and BETA, make use of supplier segmentation and differentiate between their suppliers due to certain criteria. This is, however, more obvious at ALPHA, which names the different supplier segments, in comparison to BETA, which does not. The main segmentation criterion (at ALPHA directly, at BETA indirectly) is the complexity of the purchased part or component and the level of involvement with the supplier associated with this complexity. Even though BETA does not explicitly mention the part’s complexity as their segmentation criterion, it is the focus of the commodity strategies after which the company segments. The level of involvement is the outcome of the supplier segmentation at both companies.

Even though both companies segment their suppliers, ALPHA even by naming the segments, no significant difference in the management of these supplier segments can be seen. Our analysis shows that both companies regard all their PFP suppliers as important no matter if they deliver simple or highly complexity products. This is due to the fact we are focusing on suppliers that deliver parts for the final product where every single part or component is needed to finalise the car.

7.1.2 What activities exist within the management of PFP suppliers of an automotive manufacturer and why?

Our analysis shows that there are significant similarities between ALPHA, BETA and our frame of reference regarding the activities that are performed in the management of PFP suppliers. At the companies following main activities are performed:

- Ensuring understanding
- Pre-award phase
- Monitoring and Controlling of Project Progress
- Supplier Performance Measurement
- Motivation
- Assistance
- Supplier Surveys
- Additional activities for suppliers of highly complex products

Ensuring understanding is regarded as crucial in supplier management by ALPHA and BETA, as it is a prerequisite for a successful supply chain management. Both parties need to be aware of and understand the supply chain process. Our case study companies ensure understanding by establishing and keeping up a high level of information and communication with their suppliers especially by involving their PFP suppliers at an early stage. This high level of information and communication is established through personal contact and supported by information technologies (further developed in parts 7.1.4 and 7.2)
**The phase** from the time *ALPHA* and *BETA* select potential suppliers to the time the contract is awarded lasts up to several years. This stems from the fact that most of the components or modules delivered are highly complex, include a high money value and can involve cooperation in R & D. Furthermore, due to the high complexity of car production, requirements on the suppliers are high which also leads to a longer pre-award phase. For this reason, we refer to this activity as the pre-award phase instead of a pre-award conference as suggested in theory.

**Monitoring and controlling of project progress** is another activity in the management of PFP suppliers at both of our case study companies. Monitoring is crucial during the product development phase, as the car manufacturer needs to make sure that quality is assured and projects are running on time. Furthermore, as most parts are delivered just in time or just-in-sequence where a late or wrong delivery can cause a shutdown of the assembly line, capacity is monitored already before the start of the serial production.

Furthermore, **supplier performance** is monitored and controlled in order to ensure best performance and thereby enhance the relationship. *ALPHA* and *BETA* monitor the supplier’s performance on a day-to-day basis, dealing especially with logistical issues, in order to ensure a seamless production, as well as in form of a total supplier performance measurement carried out once a year. The assessment of the supplier’s performance consists of different areas, namely assessing logistical performance, quality, R&D issues and purchasing issues. This assessment information is also used by the two companies for future supplier selection in order to ensure that only satisfactory performers are considered.

Another activity in the management of PFP suppliers performed by *ALPHA* and *BETA* is **motivation**. The car manufacturers need to motivate their suppliers in order to gain and maintain a high level of performance and to optimise the relationship. Basically, two means of motivation are accomplished, namely rewards and punishment. We could see that both these means are based on the supplier’s performance assessed through the car manufacturer’s supplier performance measurement system. On one hand, the suppliers are motivated through communicating and acknowledging good results (*BETA* even awards a price for the best performer on a one-year basis), but on the other hand also through making the suppliers aware of the impacts of bad performance, such as a decreasing chance of getting awarded future contracts. In addition to that, also respect and to keep up a partnership atmosphere were highlighted by our case study companies as means to increase motivation.

Within the management of PFP suppliers both car manufacturers provide **assistance** to their suppliers. This assistance is, first of all, provided through a high level of information and communication and training programmes offered to suppliers mainly in order to prevent problems. Secondly, assistance, as in the case of *ALPHA*, can also range to extensive efforts, such as identifying the problem and providing know-how in order to solve it. All in all, we could see that the process of giving assistance to suppliers is much more structured and following certain rules (through the escalation processes) at *ALPHA* in comparison to *BETA*.

Our analysis furthermore shows that another way for *ALPHA* and *BETA* to improve processes is to gain feedback through **supplier surveys**. At *BETA* these surveys are conducted on an irregular basis in comparison to *ALPHA*, which conducts them once a year. Asking suppliers for feedback does not only help the companies to improve where necessary but also shows their commitment to the suppliers, which helps creating trust and a partnership atmosphere.
The activities within the management of PFP suppliers are performed in all types of relationships our two case study companies have with their suppliers. As already explained in RQ one, this stems from the fact that each and every PFP suppliers is of high importance to car manufacturers.

The only differences that can be seen in the management of the different supplier segments is to what extent these activities are performed and how involved the suppliers are in those. Automated activities such as the monitoring activities or the supplier surveys do not differ between the different types of suppliers. Activities such as ensuring understanding, motivation and assistance are more “soft” activities that do not necessarily follow certain processes. Even though also those activities are performed in the management of all PFP suppliers, these might be performed “stronger” with suppliers that are more involved in ALPHA’s or BETA’s processes (ALPHA’s serial development suppliers, BETA’s close cooperation suppliers). This stems from the fact that those suppliers have more contact with the car manufacturers due to the cooperation in some areas, e.g. R&D or quality assurance.

Dobler and Burt (1996) cover these issues in their last activity “additional activities in partnerships” which we also use for additional activities in ALPHA’s and BETA’s management of suppliers of highly complex components. In ALPHA and BETA’s cases these additional activities include cross-organisational teams, early supplier involvement, supplier-integrated systems, guest engineers, and strategy meetings.

7.1.3 How can the information exchange towards PFP suppliers of an automotive manufacturer be characterised?

With all PFP suppliers both companies exchange rich information on a frequent basis. Moreover, our analysis shows that suppliers of complex products require even richer information exchange. The tools that are used for exchanging information are mainly information technologies for standard communication (day-to-day basis) and personal contact for non-standard communication. As there is a difference in what information are exchanged between different types of suppliers, there is as well a difference in the tools utilised for information exchange. These differences however are minor, since all information flows to all PFP suppliers are most of rich and frequent nature to insure a seamless production. Additional tools for information exchange used towards serial development suppliers and close cooperation suppliers include cross-organisational teams and overall a higher level of personal contact.

Our analysis shows that the information flows flowing towards the suppliers (upstream) are of a higher concentration. There are no major information flow problems, due to for example a lack of trust between players in the value chain, as the automotive market is a rather stable market where suppliers can trust the forecasts and also a market characterised by a good relationship atmosphere. One way to avoid problems corresponding to information flows is to call upon active communication from the suppliers. ALPHA calls upon active communication in order to increase its own performance by encouraging its suppliers to communicate problems they relate to ALPHA.
7.1.4 What types of information technologies are used within the management of PFP suppliers of an automotive manufacturer and why?

All information technologies utilised at our case study companies can correspond to one of the seven areas brought up in our frame of reference, namely the EBS-backbone, E-services, E-processes, E-technological services, EDI, the internet and e-market-places. EBS was adopted early at both companies and until now consists of a mixture of various applications, both purchased and self-developed. However, ALPHA is currently adopting a fully purchased EBS - SAP. Moreover, our case study companies state that the most popular way of employing information technologies is in order to make traditional processes more effective, even if they as well have released the value of new IT driven processes (e.g. reversed auctions). Furthermore, our analysis shows that both ALPHA and BETA have for a long time understood that they need a good technological infrastructure to make new information technologies work in a satisfying way. This understanding derives from a long history of utilising new information technologies. In general our case study companies are IT aware companies, as they have utilised IT for a long time and are always reviewing new IT related possibilities.

In order to communicate real time information electronically ALPHA and BETA mainly use EDI. This especially stems from the fact that EDI can handle a larger amount of data compared to for example the Internet. The Internet is primarily used as an information carrier of non real time information such as reports. However, our case study companies do not consider EDI as the ICT (Information Communication Technology) tool for tomorrow as the Internet is continuously evolving. BETA as well utilises e-marketplaces (COVISINT) in order to gain a better position in the marketplace. This is in contrast to ALPHA, as e-marketplaces would not fit to the overall philosophy of the company. This area of IT utilisation is today mainly focused on non-production suppliers.

7.1.5 How can the influence of information technologies within the management of PFP suppliers of an automotive manufacturer be characterised?

Various information technologies have had a major impact on both ALPHA and BETA, especially as a way to make existing processes more effective and to automate processes. Information technologies have as well created new ways of doing business with the help of for example e-marketplaces (in BETA’s case). This field, however, is not as heavy used as the area of making existing processes more effective with the help of IT. This mainly stems from the fact that it is harder to map the consequences of utilising IT for new business functions. BETA suggests that the problem of utilising IT for new business functions is referred to the so-called e-business revolution that has not happened. The revolution has not happened according to them because it was not based on facts and research. The impact of new information technologies on for example responsibilities and dependences were not adequately mapped. Another problem that BETA addresses with utilising IT for new business functions (or more specific concerning e-marketplaces) is that the companies do not want to put too much power outside the company’s boundaries.

In our interviews with the companies and also in our analysis it came across that ALPHA and BETA have slightly different philosophies laying behind the utilisation of IT. ALPHA tends to utilise IT in order to optimise supplier chain management and to strengthen their relationships towards their suppliers. BETA’s goal with the employment of IT, however, is
more towards creating efficient markets and to make their internal processes more effective. Those different philosophies are for instance reflected in the usage of an e-marketplace in the case of \textit{BETA} in contrast to \textit{ALPHA}.

IT has definitely had a positive influence on our case study companies. \textit{BETA} states that information technologies have made it possible for companies to outsource most of their production of components; this would not be possible without IT. Moreover, for \textit{ALPHA} IT is the base for strong relationships and effective SCM. However, there are also disadvantages. \textit{BETA} argues that implementing IT is difficult as the impact of the implementation is sometimes hard to map and \textit{ALPHA} states that IT employment often results in high dependency on systems. A good starting point to utilise IT in a profitable way according to \textit{BETA} is to analyse the impact of new IT from a supply chain perspective.

\textbf{7.2 How can the use of information technologies in SPM regarding PFP suppliers of an automotive manufacturer in the automotive industry and their influence on it be characterised?}

The utilisation of IT in SPM is foremost towards automating existing business processes and thus more effective and efficient. However, IT also provides companies with the possibility to explore new IT driven processes, new ways of doing business. Employing IT to creating new ways of doing business in SPM in the context of an automotive manufacturer is although minor compared to using IT in order to automate existing processes.

SPM as it is performed today would not be possible without IT. IT has definitely had a significant influence on SPM over time, which is also proven in the automotive manufacturer’s adaptation of EDI and various other information technologies. Moreover, the influence of IT on SPM for an automotive manufacturer requires time before it can be understood and fully mapped. Because of this reason it is a risk in adapting IT in SPM too rapidly, as many information technologies were during the “e-business revolution”.

\textbf{7.3 Implications for management}

Our study provides several implications for management. These are shown in table 7.1 where we present an overview of the utilisation of E-SRM in SPM regarding PFP suppliers at our case study companies. The table is based on our frame of reference and our findings and provides managers with an idea of how IT can support SPM.
### Table 7.1: E-SRM adaptation in SPM

#### Elements of E-SRM

<table>
<thead>
<tr>
<th>Elements of SPM</th>
<th>Activities in SPM</th>
<th>EBS-backbone</th>
<th>e-services</th>
<th>e-processes</th>
<th>e-technological services</th>
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<td>ALPHA</td>
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<td>BETA</td>
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</table>

**X** = Ordinary PFP suppliers

**O** = Serial development suppliers at ALPHABETA and close cooperation suppliers at BETA

**OO** = Higher use of IT with serial development suppliers at ALPHABETA and close cooperation suppliers at BETA compared to other PFP suppliers.
The table above visualises the utilisation of information technologies at ALPHA and BETA and can give managers an idea and how information technologies can be used within supplier management. This table is however limited, as one part of e-SRM, namely e-processes, is not directly included. This is as this table shows how activities in the management of existing suppliers can be supported through IT, whereas e-processes involve new ways of doing business, new activities created through IT. We however included this area of e-SRM in this table since it is an important element that should also need to be considered.

In the following section we discuss and explain each activity and how it is supported through IT at the two case study companies in detail. In the end we also present implications for managers that are not table 7.1 related.

**Ensuring Understanding:** The main role of IT in ensuring understanding is to support the understanding of mutual goals of the two parties, their missions and the aim of the relationship. ICT tools such as the Internet and EDI is used in order to support the process of informing each other, backing up what is discussed in personal meetings. Furthermore, different types of member portals is created in order to provide general and more specific information on the organisations in order to again enhance the understanding between the two parties. Considering serial development suppliers/close cooperation suppliers IT has had a higher degree of influence on ensuring understanding as these suppliers have supplier integrated systems with the car manufacturers and more issues to be discussed and understood between buyer and seller.

**Preaward phase:** As we saw from our findings the preaward conference, as suggested by Dobler and Burt (1996), in the automotive industry is more a preaward phase, as it takes years from selecting potential suppliers until the final contract is awarded. During this time communication with suppliers and informing them is crucial, which is again supported mainly through ICT tools, is crucial.

**Monitoring and Controlling Project Progress:** In practice, especially ICT tools and EBSs are significantly supporting this activity. One might even say that it would be impossible to monitor and control project progress to today’s high degree without supporting information technologies. When larger projects are conducted, such as outsourcing parts of the production, it is crucial for a car manufacturer to be up to date and to ensure that everything is going fine. This would be highly resource demanding without information technologies. ICT tools for communication and an EBS in order to store and organise project information.

**Supplier performance measurement:** In supplier performance measurement information technologies are used to analyse data on performance and to communicate the results of the analyses. Through ICT tools electronic data such as capacities and demand figures are communicated on a regular and frequent basis. This can then be automatically analysed through companies EBS or/and additional systems.

**Motivation:** Also in a way IT is supportive for supplier motivation. As we saw in at our case study companies, motivation is mainly based on the results of supplier performance measurement, thus IT as an EBS is used as a tool to get relevant data for motivation purposes. Communicating motivation related material (e.g. how the suppliers are performing relative other suppliers) is supportive by ICT tools as EDI and the Internet. Supplier portals are also utilised, in order to present results on how the suppliers are doing.
Assistance: Information technologies are supporting and easing the process of assisting suppliers. Especially in problem solving information technologies are applied in order to handle cross organisational activities more effective. A more concrete example provided by ALPHA is problems solving through a capacity management system there bottlenecks are identified automatically in advance so that actions are taken in order to avoid problems and ensure seamless production. For serial development suppliers/close cooperation suppliers IT has had a higher impact on assistance than for other PFP suppliers. This stems for all extra cross organisational activities the car manufacturers have with these types of suppliers, there the supplier integrated systems are an important part of making this assistance processes effective and efficient.

Supplier Surveys: Information technologies are also applied in supplier surveys. They are especially useful for distributing the results (communicating) by ICT tools and on supplier portals.

Additional Activities in Partnerships: These activities mostly concern design and R&D issues where information technologies provide ways to enable close collaboration, such as for instance collaborative design. Also here information activities are necessary for creating and maintaining a high level of communication. Without employing ICT tools this communication process would be very resource demanding. In some cases also supplier integrated systems are applied so that both parties have access to each others EBS and in this way make the inter-organisational processes more effective.

Information Exchange: In order to perform all the activities we have brought up in this study information needs to be exchange, showing the importance of this area. IT has as stated in literature dramatically changed the possibilities to exchange information as it provides ways to make it more efficient and safe. Through information technologies, especially ICT tools such as EDI, companies are able to exchange rich and real-time information on a regular and very frequent basis which makes them much more flexible. Furthermore, a well working information sharing mechanism is crucial in supply chain management and of significant importance in relationships of a partnership character, where the parties work together on issues such as design and quality assurance. The information exchange process for serial development suppliers/close cooperation suppliers has gain extra value from new information technologies, as they demands additional activities (e.g. collaborative design).

The findings of this study furthermore indicate problems and repercussions companies need to be aware of when implementing and using certain IT tools (discussed in the findings of research question five). In this section we present problems and repercussions that are of interest for managers. We also point out recommendations for the use of IT.

- IT implementation often results in dependencies on systems and thus decreases flexibility.

- IT implementation requires carefully mapping before implementing, in order to avoid costly IT infrastructure that the company does not need.

- When employing IT that is affecting other companies in the supply chain it is advisable to start from the supply chain perspective.
• IT standardisation is a critical factor when employing IT that is affecting other companies.

• Inter-organisational IT demands time before it creates positive inter-organisational value, so these types of information technologies demands patience.

• Utilise IT not just as a tool to make existing processes more efficient and effective, employ it also in order to create new ways of doing business.

• Think about the balance between utilising e-services and e-processes as e-processes usually incorporate a higher risk factor.

### 7.4 Implications for theory

The purpose of this study was to gain a deeper understanding of how IT is used in supplier portfolio management regarding PFP suppliers in the automotive industry and how the influence on it can be characterised. Our study has to some degree been exploratory as we were exploring what activities exist in SPM and also what IT tools are used within SPM. Furthermore, our study has also been descriptive since we through collecting data have been able to describe SPM by looking at supplier segmentation, activities within SPM and by describing the information flow. Lastly, we also explored and described the influence IT has on SPM and vice versa.

The contributions of this study to theory are based on empirical findings of the observable facts from two case studies on companies in the automotive industry. Basically, all models and theories we have used for our frame of reference are in agreement with our findings. By investigating how supplier segmentation can be characterised the models presented in our literature overview and used for our frame of reference could be supported, since both our case study companies differentiate between their suppliers due to certain criteria. We could also confirm our frame of reference concerning the activities in the management of existing suppliers, since all activities our case study companies perform are also in the same or a similar way brought up in our frame of reference. Moreover, the information flow at our case study companies is characterised by the main issues brought up in the frame of reference. Lastly, also most of the information technologies brought up in the frame of reference are used at ALPHA and BETA in the same or a similar way. However, one main finding needs to be highlighted. At the two car manufacturers we have studied information technologies in the management of PFP suppliers are mainly used to automate processes and activities rather than creating new ways of doing business. This, however, mainly stems from the fact that we studied the management of suppliers that deliver for production where automated processes are necessary for a seamless and efficient production.

### 7.5 Suggestions for further research

In this study the utilisation of IT in supplier portfolio management regarding PFP suppliers and its influence on it in the automotive industry was investigated. As our purpose was to gain a better understanding of this area and not to generalise our results, the area of investigation is very specific and case-related. Due to those limitations we propose following suggestions for further research:

• Conduct the same study with focus on non-PFP suppliers, as the management of those suppliers might differ.
- Conduct the same study in another industry, so the researcher can be able to draw conclusions across industry boundaries.

- Conduct the same study including more case studies, mainly in order to raise the validity of our research.

- Investigate the usage of IT in SPM with a more quantitative approach based on this study, so general conclusions of certain areas within our research problem can be drawn.

- Investigate the usage of IT in supplier management including sourcing issues, to gain a better understanding of IT utilisation within supplier management, not just for existing suppliers.

- Investigate the usage of IT in buyer-supplier relationships by including the supplier’s perspective, so a better understanding of the research problem can be achieved by introducing different opinions of the area.

- Investigate the difference of IT utilisation in SPM in different countries, so country specific finding can be found as for example country X utilise IT within SPM in order to create more efficient markets in contrast to country Y.
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Appendices

Appendix 1a: Interview Guide – English Version

A) Opening Questions

- How are you?
- Do you have any questions concerning the interview?
- Is it okay if we tape record this interview?
- For how long and in what positions do you work for ALPHA/BETA?
- Can you describe your present position?

B) Supplier Segmentation

- What different kinds of relationships does ALPHA/BETA have with its suppliers that deliver parts for the final product?
- After what dimensions/criteria do you segment them?
- Could you briefly characterise each type of relationship?
- Could you quantify the number of each of the types of relationships in your supplier portfolio?

C) Information Exchange

- What kind of information flowing upstream needs to be exchanged within your different types of suppliers (the types discussed above)?
  - How rich
  - How frequent
- What kind of information flowing downstream needs to be exchanged within your different types of supplier (the types discussed above)?
  - How rich
  - How frequent

- Do you see any problems regarding the information exchange with your PFP suppliers?
D) Activities within the management of PFP suppliers

- What types of management activities exist within the management of ALPHA’s / BETA’s PFP suppliers?

- What about:
  - Ensuring understanding
  - Preaward conference
  - Monitoring and controlling project progress
  - Monitoring and controlling total supplier performance
  - Motivation
  - Assistance
  - Supplier Surveys
  - Partnerships

- How do the activities differ between the different types of relationships?

E) Types of Information Technologies used in Supplier Management

- What different information technologies do you use within your supplier relations (Software, IT-applications, and hardware)?

- What about:
  - EDI
  - EBS
  - Internet
  - E-hubs

- How is IT used in the different activities?

F) Influence of IT on Supplier Management

- How do you see IT influencing your management of PFP suppliers?
  - The influence on the Information flow in interaction with the supplier (advantages/disadvantages)
  - The influence on the different activities (advantages/disadvantages)
  - The influence on the different types of relationships (advantages/disadvantages)

- How do you see ALPHA’s / BETA’s management of PFP suppliers influencing the utilisation of IT (e.g. new IT applications necessary through certain types of relationships)?

- How would you describe the link between IT and ALPHA’s / BETA’s management of PFP suppliers?
G) Closing Questions

- Do you feel we have covered everything within the area of your supplier portfolio management and the utilisation of IT?

- Is there anything you would like to add?

- Can we send you an email or set up a telephone conference if any further questions arise?
Appendix 1b: Interview Guide – Deutsche Version

A) Eröffnende Fragen

- Wie geht es Ihnen?
- Haben Sie irgendwelche Fragen bezüglich des Interviews?
- Ist es in Ordnung, wenn ich dieses Gespräch aufzeichne?
- Wie lange und in welchen Positionen arbeiten Sie jetzt schon für ALPHA / BETA?
- Wie würden Sie Ihre derzeitige Positionen beschreiben?

B) Supplier Segmentation

- Was für verschiedene Zulieferertypen bestehen innerhalb ihrer Zulieferer von Autoteilen?
- Nach welchen Kriterien werden diese Zulieferer segmentiert? Nach welchen Kriterien unterscheidet man bei diesen Zulieferern?
- Könnten Sie kurz diese beschreiben?
- Können Sie mir Zahlen nennen wie sich diese Zulieferer aufteilen?

C) Information Exchange

- Was für Informationen/Daten upstream werden zwischen Ihnen und den verschiedenen Zulieferern ausgetauscht (Unterschiede in den einzelnen Beziehungen)? (z.B. Auftragsinformationen)
- Was für Informationen/Daten downstream werden zwischen Ihnen und den verschiedenen Zulieferern ausgetauscht (Unterschiede in den einzelnen Beziehungen)? (z.B. Lieferzeiten)
- Sehen sie irgendwelche Schwierigkeiten bezüglich des Informationsaustausches?

D) Aktivitäten innerhalb des Managements von bestehenden Zulieferern

- Welche Arten von Aktivitäten/Aufgaben bestehen innerhalb des Managements der oben genannten Zulieferer?
- Was ist mit:
  - Gegenseitigem Verstehen sicherstellen
Vorvertragskonferenz
Verfolgung und Controlling des Projektfortschritts (um sicherzustellen, dass termingerecht geliefert wird)
Verfolgung und Controlling von der Leistung der Zulieferer
Motivation
Assistenz / Hilfe
Zuliefererumfragen
Partnerships

Welche Unterschiede bezüglich der Aktivitäten gibt es zwischen den verschiedenen Zulieferertypen?

E) Arten von Informationstechnologien im Zulieferer Management

Welche verschiedenen Informationstechnologien benutzen Sie zum Management der Zuliefererbeziehungen (Software, IT- Anwendungen, Hardware)?

Was ist mit:
- EDI
- EBS
- Internet
- E-hubs

Wie werden Informationstechnologien innerhalb der vorhin angesprochenen einzelnen Managementaktivitäten benutzt?

F) Einfluss von IT auf das Zulieferermanagement

Wie sehen Sie IT Ihr Management von den oben besprochenen Zulieferern beeinflussen?

- Den Einfluss auf den Informationsfluss in der Interaktion mit dem Zulieferer (Vorteile/Nachteile)
- Den Einfluss auf die einzelnen Aktivitäten/Aufgaben innerhalb des Managements (Vorteile/Nachteile)
- Den Einfluss auf die einzelnen Arten von Zuliefererbeziehungen (Vorteile/Nachteile)

Wie sehen Sie den Einfluss von Ihres Management dieser Zulieferer auf den Einsatz von IT (z.B. neue IT- Anwendungen nötig durch neue Beziehung durch Zulieferer)

Wie würden Sie die Beziehung zwischen IT und Ihrem Management der diser Zulieferer beschreiben?
G) Abschließende Fragen

- Glauben Sie wir haben alle wichtigen Punkte innerhalb ihres Managements von Zuliefererbeziehungen mit Hilfe von IT betrachtet und eingeschlossen?

- Gibt es noch etwas, dass Sie gerne hinzufügen würden?

- Können wir mit Ihnen per E-Mail und evtl. per Telefonkonferenz in Kontakt bleiben, falls noch weitere Fragen auftreten?