LISBOA SCHOOL OF ECONOMICS & MANAGEMENT

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MESTRADO

GESTÃO E ESTRATÉGIA INDUSTRIAL

TRABALHO FINAL DE MESTRADO

TRABALHO DE PROJECTO

AVALIAÇÃO DO DESEMPENHO DOS FORNECEDORES: UM ESTUDO DE CASO

MAXIMILIAN MICHAEL CHRISTL

SETEMBRO DE 2013

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Abstract

The aim of this case study is to analyse the relevance of multiple perspectives of a customer firm in evaluating their suppliers, as well as the importance of trust, commitment and conflict resolution in relationships between customer and supplier. The starting point for the analysis was non-accomplishments of functional specifications from suppliers. The research was performed as an explanatory single case study involving an auto manufacturer located in Europe and some of its suppliers. Empirical evidence revealed that non-accomplishments of functional specifications from the supplier may reflect a fragmented view of targets, as well as a distributed evaluation of suppliers between functional departments within the customer company in the product creation process. Some functional departments of the customer company were found to be more collaborative with suppliers than others, especially those involved in the preparation for series production and during series production. Experience of these departments should be of crucial importance in the supplier evaluation and selection process.

Keywords: supply network, relationship, supplier evaluation.

Resumo

Este estudo procura analisar a relevância de perspectivas múltiplas de uma empresa cliente na avaliação dos fornecedores, como também a importância da confiança, compromisso e resolução de conflitos entre uma empresa cliente e seus fornecedores. O ponto de partida da análise foi o incumprimento de especificações funcionais da parte dos fornecedores. A estratégia de pesquisa adoptada baseou-se em um estudo de caso singular de natureza explanatória, envolvendo uma empresa construtora de automóveis situada na Europa e alguns dos seus fornecedores. Por evidências empíricas demonstrou-se que o incumprimento de especificações funcionais dos fornecedores pode reflectir uma visão fragmentada de objectivos no processo de criação de produto da empresa cliente, como também a avaliação distribuída destes fornecedores. Constatou-se que alguns departamentos funcionais da empresa cliente têm maior disposição em colaborar com os fornecedores do que outros, principalmente os que estão envolvidos nos processos de produção em série. As experiências destes departamentos são cruciais no processo de avaliação e selecção de fornecedores.

Palavras-chave: rede de fornecimento, relação, avaliação de fornecedores.

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1. Introduction

An increasing part of technologic resources used by a company is mobilized through external sources. In many industries, more than a half of the total costs of the final products are originated from purchased parts and services (Ford, 2011; Gadde, 2010).

Traditionally, companies were afraid of losing valuable intellectual property to other competitors. Assemblers produced most of the components for the equipment “in-house”, to preserve the total control over the value chain. But through globalisation and rapid technology changes, original equipment manufacturers (OEM) are impelled to recognise the importance of inter-company relationships in order to access new resources (Handfield et al., 1999). Nowadays, the complexity of products, like a car, increased to such an extent that no single company has all the resources to develop and produce every necessary component by themselves (Ford, 2011). In this vein, the productivity and effectiveness of OEMs depend essentially on the performance of the supply network. Moreover, suppliers can contribute to innovation, thus generating great competitive advantages for their clients.

As suppliers usually act in different markets at the same time, knowledge can be transferred in-between industries, complementing core competences from the organisations. Therefore, relationship management and supplier performance evaluation have become fundamental in some companies’ strategic plans, being target of numerous empirical studies.

In the stage of new product development (NPD), but also in the series production, an activity carried out by customer firms is the evaluation of the degree of fulfilment of the required specifications.

Different configurations in terms of supplier evaluation dimensions and techniques have been established, which resulted in diverse approaches and philosophies of purchasing. In the automotive industry, several practices were made explicit throughout the decades. The Western car assemblers use to keep “arms-length” relationships with extensive portfolios of suppliers, having the main focus on the price of purchased products. Yet, by the fact that the Japanese car manufacturers like Toyota have shorter lead times, better quality and lower production costs compared to most of the western OEMs (Clark, 1989; Cusumano and Takeshi, 1991; Dyer and Hatch, 2006; Kamath and Liker, 1994), there is a growing interest in developing co-operative inter-firm relationships (Dyer, 2000; Phillips et al., 2012). What a supplier is willing to do for and with the customer, however, depends to a large extent on the relationship between the parts (Fredrikson and Araujo, 2003).

In the line of the research conducted by Fredrikson and Araujo (2003), this study aims to highlight the importance of including perceptions and experiences in between different functional departments within buying firms in the suppliers’ performance evaluation. More precisely, the starting point was chosen to be the department of Quality Assurance of Buy-Parts.

This study is divided into six parts. The first section briefly presents the topic and the purpose of the study. The second section reviews literature about relationships and networking, supplier involvement in product and process development and purchasing orientations. The third section presents a synthesis of the reviewed literature. The fourth section treats the research method, justifying the choice of the tools used to conduct the study and the limitations connected with the approach of this case study. The fifth section describes the units of analysis of the case study. The sixth section analyses the empirical results of the units of analysis, and

confronts the result with the relevant literature. In the seventh and final chapter, conclusions are drawn.

2. Literature Review

2.1. General Framework

Lundval, (1988), contrary to the neoclassic literature, suggests that companies should pursuit innovation through information flow and direct cooperation, an exchange beyond price signals. Nowadays, in an industry of rapid market changes, there is an increasing interest to change from in-house supply to outsourcing, in order to concentrate on the competencies that add value to the client (Quinn and Hilmer, 1994).

According to researchers like Imai et al. (1985), cited by Corswat and Tunälf (2002), the inter-organizational network of suppliers is of great importance for increasing speed and new product development. In this context, suppliers assume, in a growing extent, activities of the customer companies, resulting in an increase of customers' bill accounts, as well as higher focuses and importance on supplier selection. Despite of the costs involved, the collaboration with suppliers is crucial for companies not only in financial terms, but also in providing technological resources and benefits, which rewards the buying firms (Ford et al., 2008). In an environment of accelerating product technologies and highly dynamic processes, companies must be capable of creating access to competencies to complement the internal capacities (Phillips et al., 2012). This interaction implies close attention to the strategy of relationship management with suppliers.

2.2. Relationships and Networking

Håkansson and Senhota (1995) defined characteristics and variables that are important to build up and exploit a relationship. One of the most essential prerequisites of developing a relationship over time is mutual and continuous adaptation of the companies involved. Adaptations are necessary to facilitate the coordination of the common activities and to create a common view of important targets (Håkansson and Senhota, 1995). The adaptations may concern technical issues (changing production processes or modifying products) or administrative and logistical company rules and routines (Hallén et al., 1991; Håkansson and Senhota, 1995). Adaptations may imply dedicated investments by one or both companies involved (Hallén et al., 1991).

These dedicated investments create dependency between the companies. Traditionally, a dependent supplier might fear being forced to lower the price, if they would be dependent on a customer (Ford, 2011). In the same way, a dependent customer might be worried about the supplier becoming negligent in terms of quality and other accomplishments (Ford, 2011). Nevertheless, the resulting interdependency gives, over a period of time, access to resources and skills that a company alone could not develop (Ford, 2011). This is supported by Walter (2003, p. 724), who defines adaptations in a study about supplier involvement as *"investment of a customer in the supplier's knowledge, structures, and processes to make use of its resources".*

When companies work together closely, several key behavior aspects like trust, commitment and conflict resolution have to be taken into account (Anderson and Narus, 2004). These behavioral characteristics are fundamental elements for a successful partnership (Mohr and Speckman, 1994; Morgan and Hunt, 1994).

In a working relationship, trust is when a company has faith that the activities performed by the other company with whom it has a relationship, will lead to a positive result for itself (Anderson and Narus, 2004). If, however, companies do not trust each other, they will hesitate to share information and decline any form of influence from the other party, which subsequently disturbs joint goal-settings and joint problem solving (Zand, 1972).

Through commitments, companies promote among themselves investment in dedicated assets to develop a stable relationship (Dyer, 2000). Ford et al. (1986) argue that the nature of a relationship, collaborative or transactional, and whether it develops or stagnate, depends on the change in commitments.

Commitments involve willingness to make short term sacrifices and actions to maintain a relationship (Anderson and Narus, 2004). This can be made by guaranteeing a supply contract for the life of a model (Dyer, 2000). Having the certainty of a model's life time or beyond life time contract, a supplier is much more likely to make dedicated investments and share valuable knowledge with the customer (Dyer, 2000).

Håkansson and Senhota (1995) emphasised the importance of commitment in joint product development. With a high degree of commitment, companies are likely to succeed without running the risk of opportunism from one side (Mohr and Speckman, 1994). With a lack of commitment, synergistic benefits may become entirely extinct (Håkansson and Senhota, 1995).

In every business relationship sooner or later some sort of conflict will arise. Sources of conflict are misunderstood communications, divergent or incompatible goals in the organizational structure or between the companies, insufficient domain definitions and differences in perception of specifications (Rosenberg and Stern, 1970).

Stern and EL-Ansary (1992) mentioned that without *any* conflict companies in a relationship will be apt to become passive and non-innovative. However, conflicts frequently degenerate into behaviours that heavily disturb relationships. Only when business managers understand potential sources of conflicts, can they successfully lead and recover them (Anderson and Narus, 2004).

Anderson and Narus (2004) suggest that instead of disguising disagreements, they should be anticipated and resolved by suitable measures, to avoid pathological conflicts and turn them into functional conflicts. Pathological conflicts harm or may even destroy a relationship (Anderson and Narus 2004; Morgan and Hunt, 1994). Functional conflicts, on the other hand, are productive discussions held to settle tensions, and result in policy or procedure changes to add value to the relationship (Anderson and Narus, 2004). Morgan add Hunt (1994) claim that the ability to make conflicts functional is a result of trust between the companies.

Anticipation can be achieved by both sides exploring inputs from each other on how modifications can be made to adapt processes or technology to common interests (Håkansson and Senhota, 1995), by joint goal setting and information sharing[1]. This leads to mutual expectations and specification of cooperative efforts (Mohr and Speckmann, 1994). Stern and El-Ansaryn (1992) suggested bilateral exchange programs of employees, to be able to represent viewpoints of partners of major projects with a high potential of conflict, to be an effective way of preventing problems. Anderson and Narus (2004) advocate the introduction of boundary-spanning personnel, employees who are in close contact with the partner companies and sensitive to problem detecting. The responsibility of these individuals is to solve identified

[1] Information sharing in the sense of communication of critical and often proprietary information between the companies involved (Mohr & Spekman, 1994).

problems at an early stage, informally, before the conflict starts to develop (Anderson and Narus, 2004).

The way the parties involved resolve the conflict has implications for the health of the relationship. It can be either productive or destructive (Mohr and Speckman, 1994). By using destructive methods, like domination and confrontation, the relationship is placed under stress, and can result in ruptures (Mohr and Speckmann, 1994).

Constructive measures to resolve conflicts were shown by researchers (Anderson and Narus, 2004; Stern and El-Ansaryn, 1992). Some companies use arbitration by a third party to resolve conflicts. The third party's function is to focus the discussion regarding key issues and to encourage resolution of the disagreement, giving a binding and final decision (Stern and El-Ansaryn, 1992).

2.2.1. Supplier involvement in product and process development

The strategy in managing supplier relationships depends on the supplier's level of integration in product and process development, which, is related to the specification generating process. Several researchers established theories based on empirical studies in order to demonstrate advantages and disadvantages in collaborations, along with approaches of cooperation with suppliers.

Kamath and Liker (1994) have categorized suppliers into four groups: *Partner, Mature, Child* and *Contractual*.

- A *partner* supplier, defined as a relationship *"between equals"* has autonomous engineering and development capacities. During the product development process,

a partner collaborates with the OEM from the pre-concept stage onward, and is responsible for entire subsystems;

- A *mature* supplier, defined as *"customer has superior position"* needs only basic specifications from the OEM to develop a product, like interfaces with adjacent parts and aesthetic requirements. A *mature* supplier may provide input to the customer;
- A *child* supplier, defined as *"customer calls the shots"* necessitates complete specifications, e.g. dimensions, functional and technical requirements and materials to be used, to produce the component exactly as the customer stipulates.
- Lastly, *contractual* suppliers, defined as "*extension of a customer's manufacturing capabilities*" provide "off the shelf" parts, which an OEM purchases through catalogues.

The degree of supplier involvement in product development can be understood as the division of activities between the supplier and the client in the product creation process.

In studies about the automobile industry, Clark (1989) concluded from empirical evidences that the supplier's role in product development can be divided into three groups of components:

- *Black-Box Parts*, the OEM specifies the general product requirements like performance, cost targets, lead time, etc., and the supplier carries out the development;
- *Detail Controlled Parts*, components developed entirely by the OEM, while the supplier is responsible for the production processes;

- *Supplier Proprietary Parts*, when the supplier produces standard parts (off the shelf parts) completely on his own.

As mentioned, in the case of *Black Box Parts*, the OEM takes advantages of the supplier's development capacity. This implies close relationships with the supplier as well as intensive involvement, yet resulting in more efficient product development (Clark, 1989). However, since the product development in certain cases happens to be an interactive process between the OEM and the supplier, Lamming (1993), argued that these should be distinguished between *Black Box Parts* and *Grey Box Parts,* the latter components being the ones where the OEM has more influence in the development processes of the supplier.

Some researchers have linked the specification generation process to supplier performance. Karlson et al. (1998) highlighted that disregard in specifications are strongly related to the evaluation of product development, in terms of quality, costs and lead time. Incomplete specifications may cause delays in the product design and increase of costs; over-specification in turn may result in inability to produce the component within existing budget and technologies (Karlson et al., 1998).

However, as Quinn (1999, p. 18) points out: "*If the buyer specifies how to do the job in detail, it will kill innovation and vitiate the supplier's real advantage".*

Araujo et al. (1999) presented a framework to categorize suppliers, linked to the level of interactions and development of resource interfaces between buyer and supplier. This model differs from the model of Clark (1989), since the classification of Clark (1989) is concerned with the division of labor instead of how companies can combine internally controlled resources with external ones (Araujo et al, 1999). Mouzas and Ford (2012) remark that the use and value of a particular resource, results from the combination and interaction with other resources in a

business relationship. In a similar context, Araujo et al. (1999) argue that the resources of buyer and supplier and the way they are developed and brought together, determine the static and dynamic efficiency of a company.

The model of Araujo et al. (1999) divides the different types of interfaces as follows:

- *Standardized interface,* arms-length relationship without technical or organizational interdependencies between the supplier and the customer. Supplier and buyer do not need to know the producer's or user's context;
- *Specified interface,* traditional subcontracting or outsourcing. Supplier requires specifications based on how the product has to perform and production schedules, therefore a degree of interdependency between the parts exists;
- *Translation interfaces,* the supplier translates the functional description from the customer into a solution. The buyer allows the supplier to take important decisions on how to best meet the user context;
- *Interactive interfaces,* buyer and supplier develop together, based on a set of combined resources, a product. Many parameters are kept open ended, which increases the possibility to learn from each other and find new opportunities along the interaction. This joint learning process includes adaptation from the parties involved.

Differences in establishing interfaces are related to costs, innovation and other benefits generated by activated resources (Araujo et al., 1999). In the case of standardized interfaces, the customer does not need to invest in knowledge about the product's design and production and the price acts as the main criteria for the supplier selection (Araujo et al, 1999). Nevertheless, adaptation of other resources to fit in standardized components may create

indirect costs, without innovation benefits for the customer, through joint learning (Araujo et al., 1999). Costs also arise from coordinating large bases of *arm's-length* suppliers (Dyer, 2000). More customized solutions for customers, will require the combination of resources from both sides (Araujo et al. 1999). In this case, business managers have to invest immediately in the relationship, while returns are only visible at a later stage (Gadde, 2010).

2.3. Specific Framework: Supplier Evaluation, a purchasing decision?

To evaluate the performance of suppliers, several techniques and emphasis were established over time (Fredriksson and Araujo, 2003). These techniques reflect the expectations a customer has on the supplier and also whether the emphasis is on short-term performance or on long-term relationships and its resulting benefits (Fredriksson and Araujo, 2003). Each functional department of a company has its own evaluation criteria, since the interests and expectations in the counterpart are different (Ford et al. 1986). Consequently, a customer cannot present a totally common approach in its interactions with suppliers (Ford et al. 1986). Fredriksson and Araujo (2003) pointed out that instead of placing too much emphasis on one single dimension, i.e. cost, delivery and quality, the use of multi-criteria models in supplier evaluation provides advantages through complementing and overlapping perspectives.

2.3.1. Purchasing Orientations

Anderson and Narus (2004) argued that the scope of evaluation criteria is associated with different types of purchasing orientations.

Different purchasing orientations have been defined as an evolution from buying- to procurement orientation and more recently to supply management orientation (Anderson and Narus, 2004; Axelsson et al., 2005).

Buying orientation, or the traditional model of purchasing (Gadde, 2010), is a purchasing activity focusing on transactional and short term relationships with suppliers (Anderson and Narus, 2004). Every purchasing decision is an isolated event (Gadde, 2010), in which usually a different functional department of a customer company issues a purchasing release to the purchasing department (Anderson and Narus, 2004). Quality and availability are basic conditions for the supplier being recognized by the customer, but decisive for being selected out of potential suppliers, is the price (Anderson and Narus, 2004; Gadde, 2010). Deflective behavior and withholding information happens from both sides to gain business or gain lower prices (Anderson and Narus, 2004; Lamming, 1993). As in buying orientation the target is set by the customer, the supplier hardly ever being willing to provide benefits through best performance, since the emphasis is on the price (Lamming, 1993; Nellore et al., 2001). The products offered by the suppliers are mainly based on the customers' specifications (Gadde, 2010). Through multi sourcing and global sourcing, the customer maximizes the power over the suppliers and lowers the prices, since he is able to obtain quote for tenders from large numbers of suppliers around the world (Anderson and Narus, 2004).

Procurement orientation aims at optimizing quality and logistic issues by integrating other activities like production and logistics in the purchasing process (Anderson and Narus, 2004; Axelsson et al., 2005). Although the characteristic of buying orientation is still the focus in this relationship approach, procurement orientation tends to increase cooperation with suppliers (Anderson and Narus, 2004).

Supply management orientation seeks to develop suppliers' capabilities and improve administrative routines, e.g., to reduce total cost, not only in the price of the product, but also increase product and process innovation (Axelsson et al., 2005). This is done by early supplier

involvement, combining internal with external resources and long-term partner relationships and integrating other functional groups within the company in the purchasing decision (Anderson and Narus, 2004; Axelsson et al., 2005; Gadde, 2010).

2.3.2. Changing Relationship through Purchasing Orientation

In the traditional purchasing model as already referred, the customer evaluates tenders from competing suppliers, in order to purchase the cheapest product based on the buyer's specification (Gadde, 2010). Even if a supplier wins the business with its offer, frequently the bidding does not stop. In a study about the American auto industry, Dyer (2000, p. 111) pointed out: *"In the spring of 1992, General Motors' purchasing czar, Jose Ignacio Lopes, instructed his troops that cozy supplier relationships were a thing of the past. Every supplier would have to re-win its business in a new round of bidding."* In the opinion of General Motors' executives, partnerships with suppliers were obstructive (Dyer, 2000). However, in this radical-traditional model the supplier is not disposed to provide its unique capabilities which could be a benefit to the buyer (Gadde, 2010). Ford (2011) claimed that the target of business customers should not be to purchase the cheapest pre-specified product, but to look for solutions by using resources of specific suppliers. Teece et al. (1997) argued equally that purchasing decisions need to consider the value of the resources integrated and reconfigured by other functional departments, since these resources define the dynamic capabilities of the organization.

In the same study as mentioned above, Dyer (2000) contrasted General Motors with the example of Chrysler's *Extended Enterprise.*

During the 80's and 90's the American auto OEMs were far behind its Japanese competitors in terms of delivery, costs and quality of products (Dyer, 2000). American OEMs competed alone against Japanese groups of companies, so called *keiretsu*[2].

Many companies tried to imitate the Japanese supply management system, like cutting costs through reduction of supplier bases, giving quality responsibility to the suppliers and just in time (JIT) delivery. But, as Dyer (2000) asserts, these measures just helped the companies to survive. To become truly competitive, adversarial relationships with suppliers had to be turned into partnerships. Initially, Chrysler engineers developed components and then buyers selected a supplier capable to produce it at the lowest price (Dyer, 2000). After the change, the automaker eliminated competitive bidding in order to create a mutual vision of how to create value.

Cross functional teams of engineering, quality and purchasing professionals were then choosing the most appropriate suppliers, and giving them significant or total responsibility for developing prototypes and series production, which resulted in a common view of design, quality and cost (Dyer, 2000). In addition, suppliers were asked to assist the OEM in matters relating to improvements in weight, warranty and complexity. Former president of Chrysler, Robert Lutz, explained the new program to his largest suppliers in following words: *"All I want is your brainpower, not your margins"* (Dyer, 2000, p. 124).

By doing so, Chrysler managed to become the company with the highest profit per car in the world (Liker, 2004), but only until Chrysler was taken over by Daimler in 1998 (Liker and Choi, 2004).

[2] *Keiretsu* are networks of companies that continuously learn and develop together (Liker and Choi, 2004).

3. Synthesis

With the aim of building research related questions, it is necessary to analyse the significance of the literature approach about relationship management and evaluation of supplier performance.

We suggest that buying-firms should interact with their suppliers, to enrich and accelerate the development and innovation processes. Business relationships tend to deepen with the development of adaptations, trust and commitment. Conflicts can always appear, and the sources of conflicts may be associated with failures in communication, incompatible goals and expectations, wrong or insufficient definition of responsibilities and different viewpoints of specifications.

We establish also that supplier involvement and the related specification creation process are crucial elements of product development, moving, in some cases, parts of the engineering responsibilities to suppliers, who are integrated in the activities of the OEM.

Due to the resulting inter-dependency between both sides, arises an increasing need to elaborate models for supplier performance evaluation, both at new product development stage and continuing series production.

The aim of this research is to examine, through an explanatory single case study involving a buying firm located in Europe and some of its suppliers, *how* a non-accomplishment of functional specifications of the product and the process, can reflect:

- The relationship between the actors (e.g. maintenance or changes in the attitudes transactional or collaborative – trust, commitment, communication and conflict);

- The division of labour in the specification generating process and product development;
- The relevance of the formal evaluation of suppliers to the customer company.

4. Methodology

This section aims to briefly describe and justify the research strategy used to conduct the study.

Easton (2010) argues that among industrial marketing researchers, case study research can be considered as the most popular strategy. A case study of a single or a small number of organizations and relationships, offer a profound understanding about the interaction between phenomena and its context (Dubois and Gadde, 2002; Easton, 2010). Due to Yin (2003, p. 9), a case study is an adequate research strategy for *"how"* questions about a *contemporary set of events over which the investigator has little or no control*. This kind of questions is also associated to processual[3] analysis, taking into account that organizational networking is not a steady but a dynamic state with indirect and often delayed correlations which can only be investigated over a period time (Dubois and Araujo, 2004; Pettigrew, 1997). Furthermore, according to Van der Valk (2008), ongoing interactions within an organization as well as across organizational borders, can only be investigated in a real life situation.

Since our purpose is focused on "*how"* questions in a contemporary context, involving interactions within an organization and across its borders, the strategy of using a case study suits our research. The research site was chosen to be the Quality Assurance Buy-Parts Department (QA) of the car assembly plant during August 2012 until June 2013. This area is

[3] Process is here defined as a *sequence of individual and collective events, actions, and activities unfolding over time in context* (Pettigrew, 1997:338)

particularly interesting, since the competences of both, different supplier and customer's functional departments converge from the organizational network to resolve, together on the shop floor, non-conformances resulting from earlier activities.

The case study is about one single organization, the larger unit of analysis, and includes two sub units of analysis, which results in an *embedded case study design* (Yin, 2003). The idea of this design was not to compare the sub units, but to observe the variations among them. If the subcases show minor variations between each other, their individual contribution to the larger unit increases (Dubois and Gadde, 2002).

Every sub unit involves the car assembly plant and suppliers in different technological fields, and in current activity stages. Both stages are directed to new product development and the ongoing process of buy part series supply.

Evidence in our study was collected through multiple sources, to converge lines of inquiry (Yin, 2003). The evidence contains company records, statistics, meeting minutes and internal company guidelines from the OEM, as well as direct observations, participant observation and informal conversation with quality engineers of the OEM and representatives of the suppliers.

Direct observations were conducted at four meetings at management level between the OEM and the suppliers used in the study. Every meeting lasted, in average, three hours. According to Dubois and Gadde (2002), data gathered at meetings is unique and not available by means of search.

In addition, the researcher attended weekly video conferences between the Purchasing-, Quality-, Logistics-, Development- and Production departments of the OEM regarding running changes of the current models and delivery dates of first samples of pre-series models. Participant observations were made possible by assuming different functions related to quality concerns and preparation of series processes of buy-parts and direct interaction with suppliers.

Every week during the nine months, the researcher assumed the position of a neutral organizer of round table meetings between the OEM and several suppliers. These round table meetings had the purpose to solve quality concerns and to follow up new projects of buy parts.

The study presents restrictions linked to its own nature. Access to first-hand information is often hard to obtain and respondents sometimes do not remember important historical aspects. (Leonard-Barton, 1990). Lack of objectivity due to long term employment and company philosophies may render questionable the informants' output. Biases, like risk of misjudging the quality and validity of the research as well as overstating easily accessible information, may occur (Voss, C. et al. 2002).

5. The Case Study

5.1. Larger Unit of Analysis: The Functional structure of the Auto OEM

5.1.1. Research and Development

The product development process consists of different stages: the project definition stage, the concept and product development stage, the preparation for series production and the series production (see Attachment 1).

The Research and Development department of the OEM (R&D) is responsible for the development of new parts and the vehicle itself and detailed construction and try-outs.

The R&D consists of the following sub-divisions:

- Aggregate-, Electric/ Electronic-, Body/ Interior-, Chassis-, Complete vehicle/ Assembly-, Concept- and Commercial vehicle development;
- Group research;
- Design;
- Technical project management;

- Group development management.

In general, future series suppliers are not integrated in the concept developing phase. Integration usually only happens in the sense of a consulting function where the supplier (or engineering service provider) is compensated directly from the development budget.

After the technical and feasibility approval of a component, the R&D generates the purchasing release (PR, see Attachment 1)). With the PR, the Purchasing department, centralized in the OEM's head office, receives the entitlement to start sourcing relevant suppliers. SET[4] work serves to reduce the product development time. SETs are composed of employees from the divisions involved in the product development process (e.g. including Production, Logistics, Purchasing and Quality Assurance). The members of SET are responsible for representing project needs of their divisions and for incorporating the specific requirements of their divisions into the project development. SET does not include representatives from suppliers. However, the suppliers of more complex components, like heating or seat systems, are in close contact, on informal basis, with the responsible engineer, for the respective part, from the QA and R&D department of the OEM (information from representatives from SET interior development).

5.1.2. Specifications at the OEM

The General Management together with the R&D and Production department generate the Product Requirement Letter (PRL) with product and market targets. The PRL, along with the Product Concept (Market Segment and Project Timings), give the input for the Technical Concept Description (TCD), generated by the R&D. The TCD is the main specification in the early stage of the product development process and includes rough estimations of Target Markets, and is used for evaluation of the concepts. The Technical Product Description (TPD) is a

[4] Simultaneous Engineering Teams, opposite method of the traditional sequential way of product development work.

complete and structured description of the technical requests and specifications for the NPD in the early stage of the Product Development Process. The TPD is generated by the Technical Project Management of the R&D. Based on the TPD, the R&D sub-divisions evaluate the financial and time expenses, which occur during the development process. The TPD also provides the Finance, Purchasing, Production, Marketing and QA departments an overview and evaluation of the project. For every component, the sub-divisions of the R&D generate detailed specifications. These specifications are part-delineations, technical descriptions on sub system and component level, drawings and project-specific functional dimension catalogues. Suppliers only have influence in the specification generating process if they are contracted as engineering service providers. All specifications are binding forces for the supplier. Suppliers sometimes claim that the OEM should be more open to suppliers' suggestions (observations as participant).

5.1.3. The OEM's sourcing process

When choosing among different suppliers, the OEM separates the sourcing process into two phases; the development phase, where new components for new projects are first developed and then sourced (forward sourcing) and the series phase (global sourcing, see Attachment 2). Each decision is made by the Central Sourcing Committee CSC through nomination of the most adequate supplier sourced by the purchasing department.

Despite the standardized product development process (PDP) indicating that the sourcing process starts with the PR, depending on the complexity of the components, i.e. time to completion for series tooling, meanwhile the purchasing department starts sourcing the suppliers parallel to the development of the respective component.

Forward sourcing process

Based on the information provided to the OEM at a B2B platform, potential suppliers are identified. After a pre-selection, the supplier receives a request for quotation based on technical, financial, organizational and quality requirements of the OEM. The request is then provided to the OEM by the supplier and the Purchasing department ensures that the quotation does not neglect any important aspect of the component, possibly price relevant. In this phase, the suppliers are also requested to meet with the R&D representatives, with a presentation of their engineering capabilities and available technologies, preferably with reference sample parts.

To be considered as a potential supplier, the supplier has to fulfill the standards of the OEM (e.g. quality, process and production). The Purchasing department then initiates the bidding process, usually oriented at the A-price[5]. Thereafter, a selection of the most attractive suppliers is presented to the CSC, who nominates the supplier, based on strategic considerations and competitiveness of the quotations.

After the nomination, the supplier starts manufacturing the series tooling. Production budget is advanced by supplier and is returned by the Purchasing department upon the parts being evaluated with note 1 by the QA[6]. The Purchasing department constantly monitors the project performance of the new components, i.e. Supplier Readiness Management, to guarantee the supply of samples for specific project mile stones.

[5] A-price is the price of the product, not including transport costs.
[6] Quality engineers evaluate part-samples and give notes 1:“total acceptance”, 3: “conditional acceptance” and 6: “failed”.

Global sourcing process

The aim of the global sourcing process is to optimize the resources of built-to-print parts. At certain time intervals in the series process, the supplier base is reviewed in terms of cost and performance[7]. The OEM exercises price optimization through benchmarking, procurement of advantage of price potential, creation of competition, money exchange rates and tracking of new sub-suppliers. As per informant of the CSC: *"With the nomination of a supplier, the sourcing process does not stop. It is a continuous process of price optimization and quality improvement at the same time."*

5.1.4. Quality Assurance of Buy-Parts

The QA is divided into four groups: interior; exterior; chassis and electrical parts. Once a supplier is nominated, the QA of the OEM collaborates with the supplier in order to build up a mature series production process. The supplier sends initial samples out of series tooling to the responsible quality engineer for evaluation. Parts have to pass three phases of evaluation with note 1; dimensional, material and functional/ assembly. The Production Trial Series (PTS, 6 months before SOP) and Zero Series (0S, 3 months before SOP, see Attachment 1) are built using the required series production facilities under production of series conditions. This way, the OEM is able to perform all the tests with the cars at series standards. The supplier, in turn, has to provide series capacity 6 months before start of series production.

A final assessment of the product and the process may include a *two day production try out*, in the presence of a representative from the QA, at the facilities of the supplier, to evaluate capability for production under series condition.

[7] This philosophy was implemented by Jose Ignacio Lopez.

After SOP, the QA carries out quality measures during the manufacturing of the series. Several cars are chosen daily for product-audits and defects are categorized in A, B or C faults (see Attachment 3). The auditors also differentiate whether the defects appeared during final assembly, stamping, body production or due to failure of buy parts. If the defect is supplier related, depending on the category of the defect, action has to be taken, by the QA, regarding the supplier. For evaluation of the supplier performance, the QA keeps a database with the audit points of defected components each supplier has delivered. Some suppliers have resident engineers at the OEM plant for joint problem solving and faster reaction times.

5.1.5. Engineering Changes

Once a component is defined and released by the R&D, it can only be modified through an Engineering Change (EC). Modifications may concern the product itself (design, function, material, etc.) or the process (manufacturing, logistics, etc.). ECs can be requested by the departments of the OEM (e.g. R&D, QA, and Production) or by the supplier. After an EC is requested (ECR), its feasibility has to be judged by the R&D and Production departments of the OEM. After feasibility approval, the ECR is sent to the Purchasing department. The Purchasing department then evaluates the ECR together with all divisions that are affected by the change (e.g. Finance, QA, Logistics, etc.). The final approval is decided later by Product Management for that vehicle project, based on the overall impact of the EC on the vehicle (quality, cost, etc.). After final approval, the R&D adapts the drawings and specifications to the demands of the EC and then provides the new PR. With the new PR the Purchasing department requests that the supplier implement the change in his production. After the implementation is completed, the supplier is required to send initial samples of the “new” part to the respective quality engineer for evaluation. Once accepted by the quality engineer, the supplier starts the series production

of the changed part (see Attachment 4). The whole process takes about 3 months but can take up to one year (values based on experience from informant).

5.2. Sub Unit of Analysis 1: Decorative Films

The OEM SP-Model 2 is a special model of the current OEM Model, fabricated at OEM Inc., a production unit of the OEM, located in Europe. The idea was to build an image of a loud sports car i.e. “the evil of OEM” and to stimulate the life cycle of the OEM’s A-segment mixture of a sporty hatchback and a coupe. The car should continue the characteristics of the OEM SP-Model 1 from 1982, through placement of decorative films and nostalgic features like the ball shift knob, among others. The focus of this case is on the decorative films, which are relatively simple in product and process technologies, but have to meet high quality and esthetically demands.

Following suppliers were involved in the project:

Supplier 1 is initially nominated to supply decorative films. Located in Central Europe, Supplier 1 has advanced manufacturing and developing capacity of design products and labeling solutions for the automotive and non-automotive area. Supplier 1 supplies scuff-plates for all current models of OEM Inc. In this process, Supplier 1 receives the raw material, cuts and combines it to the desired dimensions and color combinations, according to the specification from the R&D department.

Sub-supplier 1 supplies the raw material to Supplier 1 in preparation for series production. Sub-supplier 1 is also a supplier of OEM for type and specification decals.

Supplier 2 is later nominated to be the supplier of the decorative films. Supplier 2 already supplies decorative films to two production units of different brands of the OEM. Supplier 2 is a small company specialized in cutting and combining decorative films.

Sub-supplier 2 is a leading company in vehicle surface solutions and a global player in industries like, among others, healthcare and fire protection. The company supplies through Supplier 1 two other production units of the OEM Group with similar products.

The purchasing release for the decorative films was given in December of 2011 by the R&D. Thereafter, Supplier 1 and Sub-supplier 1 were nominated by the CSC to supply the decorative films of the SP-Model 2. The main reason for the nomination was the cheaper A-price of the components. (A meeting minute showed that in a Kick-Off meeting[8] held in February 2012, OEM Inc.'s Product Manager enquired from the Purchasing representative, as to why Supplier 1 was chosen and was advised that the decision was purely price related. The Product Manager's reply was: *"what a pity, I thought that it was due to experience".* In conversation with the CEO from Supplier 2 we established that Supplier 2, at the sourcing process, could not lower the price).

In preparation for series production, Supplier 1 and OEM Inc. developed an application chamber, a special room with low air circulation and cupboards for the foils, special light and anti-static suits for anyone who enters. OEM Inc. carried out workshops with Supplier 1, to train those involved in the application process. OEM Inc. is the first production unit of the OEM integrating these stripes in the series production. Other production units have "after sales" solutions.

[8] Kick-Off meetings are held to ensure a common project definition between the functional departments involved.

In April of 2012, Supplier 1 failed to achieve the delivery date, defined by the Pre-series Logistic department of OEM Inc. for the initial samples, due to bottleneck problems with Sub-supplier 1.

In June of 2012, some non-conformances regarding the dimensions, colours and material were identified. Master samples for colour measuring and material structure, signed by R&D (foil glued on body steel) were not available (company records). Production department initiated an ECR, to change the dimensions of the foils. Supplier 1 and QA agreed that the base material was the most critical issue and suggested other suppliers, e.g. Sub-supplier 2 (company records). However, R&D accepted the surface characteristics after comparing it with raw-material from other suppliers, and the ECR dimensions. Sales and Marketing Department of the OEM Group prepared, with Supplier 1, a "Photo Car" and announced the car as already available for the sale.

In July of 2012 Quality Manager of OEM Inc. did not approve the structure of the base material when the 0-series cars were built and the issue was escalated to the OEM's top quality management. A few days later, all activities were cancelled.

Supplier change – Series Production

In **August of 2012,** CSC nominated Supplier 2 and Sub-supplier 2 to be the series suppliers for the project SP-Model 2.

After SOP of the SP-Model 2 in November 2012, some of the stripes supplied to OEM Inc. were defective. OEM Inc. rejected several such sets and returned these to Supplier 2 to evaluate the defects identified. Due to the situation (stripes were already glued and ripped off the car) Supplier 2 and Sub-supplier 2 were not able to analyse the defects. The application specialist of Sub-supplier 2 claimed that the damage of the scratched rejected parts was due to the wrong application (conversations with quality engineers and company records).

In **February 2012** a meeting between quality representatives from OEM Inc. and OEM, Supplier 2 and Sub-supplier 2 was held to openly discuss questions relating to failed analysis and the lack of feedback from the supplier. Representatives from R&D and Purchasing did not attend the meeting. The suppliers suggested carrying out further workshops to train the application personnel to guarantee a high level of quality during the application process as well as a three days stay of the suppliers at the OEM Inc. installation to analyse the defects, the suppliers being compensated by the OEM Inc. The idea was rejected, and OEM Inc. claimed that they had all the competencies they required for the film application. Instead, OEM Inc. insisted that Supplier 2 and Sub-supplier 2 rent external installations to analyse the failures together with representatives from the Quality Department and to set up a failure/ defects catalog. Sub-supplier 2 indicated that in foil projects, failures or defects could appear through the whole process chain, which means production (Sub-supplier 2 and Supplier 2), logistics and application (OEM Inc.). The suppliers requested better quality control (Quality Gate at OEM Inc.).However, as the *zero defect strategy* challenges the supplier to send only good parts, except a ppm target concluded with the supplier, this proposal was not accepted by OEM Inc. Sub-supplier 2 also pointed out that the supplied quality satisfied the standards of the current projects at the OEM.

Usually, rejected parts are scrapped and the supplier is fined for rejections, for disturbing the production process of the manufacturer. In this case, due to a bilateral agreement with the OEM Inc.'s Quality Department, Supplier 2 was exempt from paying these fines.

In April, a second meeting was held with the suppliers. The CEO from Supplier 2, as well as the Key Accounts Manager and Application Specialist from Sub-Supplier 2 met with the quality manager, engineers from production and exterior buy parts department, as well as representatives from logistics from OEM Inc., in an attempt to find a common agreement

regarding the non-conformance of the series process. A breakdown of the scrapped parts showed that 18% were parts delivered with defects, 55% due to process failures and 27% relating to FCP[9] rejections, i.e. acceptance criteria of Application Supervisor is different from that of the QA Auditors.

The main problem in the application process in OEM Inc. engineers' opinion is dust. The application specialist from Sub-supplier 2 highlighted the fact that another production unit in the OEM Group is located close to a volcano, resulting in large amounts of dust in the atmosphere. Nevertheless, the complaints are minimal compared to OEM Inc.

In the opinion of the application specialist of Sub-supplier 2 some rejected parts with defects like scratches would not be visible after application and training of the operators was suggested by the suppliers to distinguish parts to be applied and parts to be rejected. This was not accepted by the exterior buy parts engineers.

Sub-supplier 2 also stressed that OEM Inc. should hold sufficient stock to be able to handle bottleneck problems in Supplier 2's manufacturing process. E.g. OEM Inc.2 holds a two month stock of décor films. Logistics representatives indicated that a six month production forecast is sent to suppliers who should, therefor, plan their stock holding accordingly since the maximum stock allowed by the OEM Group is two days. Sub-supplier 2 insisted that a *handcraft* part should not be included in inventory decisions like ordinary production parts, and that its recommendation is based on experience. Sub-supplier 2 wants to ensure that OEM Inc. does not run out of stock.

The application specialist of Sub-supplier 2 requested permission to analyse several defective parts with a microscope, to elaborate a defect catalogue intended for use by the whole group.

[9] FCP: Final Check Point, Quality Audit.

Sub-supplier 2 had already compiled a training manual for another OEM Inc. and it was his intention to standardise the application across the plants of the OEM Group.

The application specialist from Sub-supplier 2 called for a gentlemen's agreement with OEM Inc. regarding the rejection of parts, since the films could not be analysed after having been removed from the liner. Cost sharing for defective parts was agreed with the QA. Supplier 2 and Sub-supplier 2 would also, at certain intervals meet at OEM Inc. to examine the scrapped parts together with the latter's quality engineers. However, an adaptation of the logistical company rule regarding the maximum stock could not be achieved.

5.3. Sub Unit of Analysis 2: Sliding Door Module

Supplier A is a concept supplier of side-door actuators of OEM Inc.'s Multi-Purpose Vehicle (MPV). Located in Central Europe, the supplier created, in 1925, the first automobile side-door latch and since then developed over 200 lock families with up to 96 latch variants. Supplier A supplies a wide range of automotive manufacturers, up to F-segment cars and has patents of electrical solutions for sliding door modules.

The MPV was launched in 2010, the first non-commercial vehicle from the OEM with a sliding door, which is available for customers on both sides of the car. In the concept stage, two different solutions were presented to R&D by the supplier; one for the left and the other for the right sliding door (company records and conversation with responsible engineers). In the concept of the component, the gravity of the electric motor minimizes the play between the actuator and the driving screw. Condition for this characteristic is that the electrical motor is fitted ahead of the actuator. R&D approved both modules however, afterwards, the Purchasing department agreed with R&D to introduce only one type of sliding module in the series, in order to reduce the A-price. Due to this decision, the fixing point of the motor changed and the

electric motor of the right sliding door was placed underneath the actuator, which resulted in a gap between the actuator and the driving screw.

Several months after SOP of the MPV, car owners complained about abnormal noises on the right sliding door. Car owners called for rectification under warranty conditions.

Supplier A was invited to discuss the problems at a round table meeting at OEM Inc.'s premises. The first meeting took place in November 2012. Representatives from senior management, QA and Production departments from both sides discussed the issues.

The specification for noise level was and is 60 dB. The noise level complaint was slightly over 50 dB. The component's technical requirement also indicates that no disturbing noises are to be heard inside the car. The OEM has special acoustic requirements, a standard that must be fulfilled by the device to be developed, e.g. window lift, control motor relay, pump and valve. This specification mentions several norms to test the noises of the devices. The specifications state that *"Accessory device starting automatically with combustion engine switched off must not exceed 55 dB"*. The supplier indicated that during the last visit by OEM Inc.'s representatives to the installations of the supplier, the control plan had been examined several times without significant problems.

The main problem, in terms of Supplier A, is not the processes but the concept and additional requirements added to the approved concept after the start of series production (component is in its 38th generation, which means that it was changed 38 times after preparing for series production).

To test noises, the supplier uses a whole MPV body to measure the total sound pressure level of the motor when it is in use. Supplier A developed, for this purpose, a software to measure

the total sound pressure, vibration, natural frequency and frequency peaks at end of line testing.

The body however does not include the interiors. As the car owners claimed to hear the noises mainly when the car was parked inclined towards the front, the test center from Supplier A used a hoist to lift the rear end, to simulate the situation (see Attachment 5)

Supplier A stated that it had invested in an ongoing improvement process, without having received from the OEM the whole budget for the project. The supplier indicated that the parts are spec wise. Supplier A's End of Line tests revealed no dB difference in the analysed actuators, but in the assembled cars, the right hand side was noisy. During the following week, Supplier A was to present improvement and quality control proposals, in order to solve the issue. These proposals would then be evaluated in terms of cost, feasibility and timings by OEM Inc. and R&D from OEM Group. Thereafter Supplier A should perform try outs during a whole production week at OEM Inc. in order to evaluate the noise levels in road tests. The requests from OEM Inc. were not fulfilled and Supplier A reduced communication with OEM Inc.

At a second meeting in April 2013, two cars were shown to Quality Managers from Supplier A. Several proposals were made by both sides and it was decided to implement four technical solutions. Supplier A was to present 200 modules, with the four hypothetical solutions having been implemented in equal numbers.

The supplier also claimed that the touch area should be changed or isolated, but OEM argued that several tests regarding this issue had previously been carried out without improvement. As

200 modules was a considerable investment for the supplier, Quality Manager from OEM Inc. recommended that the supplier should request a Deviation Permit[10] from R&D.

The supplier indicated that the project was evaluated by the QA of OEM Inc. with note 3 (conditional acceptance). Due to note 3, Supplier A only received 70% of the project budget, and the running changes and an increase in production was not funded. The rest of the project would be funded by the Purchasing Department once Supplier A received note 1 from the QA. For this reason, the supplier reduced to a minimum its support for the project.

Resulting from the meeting, Supplier A should be attributed note 1, in order to receive the shortfall. The modules, with the Deviation Permits, were to be tested and the chosen best improvement implemented in the process through an EC. Again, the modified parts would be evaluated according to the normal first sample evaluation process. Once the "new" parts received note 1, the shortfall would be paid to the supplier by the Purchasing Department. On the basis of this decision, the supplier would be able to meet the requirements regarding module optimisations.

6. Analysis

Q1: How can a non-accomplishment of functional specifications of the product and the process, reflect the relationship between the actors (e.g. maintenance or changes in the transactional or collaborative attitudes – trust, commitment, adaptation, communication and conflict)?

[10] A Deviation Permit is requested from the R&D to produce a limited number of components departing from the specifications. This measure is used for large scale tests to define improvements which afterwards may be implemented through ECs.

A non-accomplishment of a functional specification and the way it is resolved reflect the way a relationship between customer and supplier is built on. In our sub units of analysis, a non-accomplishment occurred due to missing mutuality, i.e. deviations in the perception of common goals and interests (Ford et al. 1986). These divergences in perception of common goals can occur between the different functional departments of the organization or at business level, i.e., between the customer and the supplier (Anderson and Narus, 2004). Common goals are direct outcomes from trust and commitment between the parties (Morgan and Hunt, 1994). Guarantee and pledge, from the parties involved, are necessary to build commitment and trust (Anderson and Narus, 2004). In the development and sourcing stages, trust and commitment are unlikely to evolve due to a more or less isolated development process and the incompatibility of price oriented bidding. The process creates barriers to commitments and its related synergistic benefits (Håkansson and Senhota, 1995), since this kind of sourcing process does not guarantee the supplier a life supply (Dyer, 2000). New suppliers are allowed to provide quotations during the series production process, which prevents long term contracts with suppliers and an early supplier involvement. Since the emphasis is on the price, it is difficult to establish long term relationships. It may also be a barrier of dedicated investments and suppliers may not be willing to share valuable knowledge with the OEM, since the risk of spreading the knowledge is high. Communication happens mainly on an informal basis between representatives of some of the functional departments.

Some functional departments of the customer tend to be more collaborative with suppliers when it comes to non-accomplishment of functional specifications in the preparation for series production or during series production, i.e. on the shop floor. In order to improve process and product quality, specific functional departments and the suppliers make dedicated investments and adapt gradually certain company rules and processes to each other. These adaptations on

the shop floor reflect reciprocal willingness for commitment and trust building (Hallén et al. 1991).

Once a conflict arises out of the e.g. divergent perception of common goals (Rosenberg and Stern, 1970), they tend to aggravate when communication is impacted by one of the parties. For conflict resolution, OEM uses a method called round table meetings. The idea is to discuss openly and without domination and confrontation, emerging conflicts between OEM Inc. and the supplier. Invited are representatives from different functional departments of the OEM Group, as well as supplier's management representatives. Despite the QA having highlighted the need of representatives from departments like Purchasing and R&D being present, neither sent representatives to these meetings. All parties represented in this type of meetings are supposed to be on equal level; however, suppliers were often at a disadvantage. The meetings lead to good results when both parties contribute with ideas and knowledge in order to solve non-conformances. Nevertheless, when the customer in meetings unilaterally demands improvement from the supplier, benefits may not arise.

Q2: how can a non-accomplishment of functional specifications of the product and the process reflect the division of labour in the specification generating process and product development?

The specifications are generated exclusively by OEM Group's R&D in the development phase. The supplier has to fulfil these specifications failing which business may be lost or failing to receive the budgeted amount he invested for producing the component. Therefore, suppliers can be described as *Child* suppliers (Kamath and Liker, 1994). The components (films and sliding modules) of our analysis are *Detail Controlled Parts* (Clark, 1989). Even if

the supplier is responsible for the development, ha has no influence in the integration of the component in the final system.

When a supplier is given development responsibilities, they are supervised by the R&D department and do not necessarily become the series suppliers. For this reason, the parts cannot be called *Black-Box Parts* (Clark, 1989). When a supplier does not become involved in the product development process, he has no influence in the specification generation process.

A non-accomplishment of functional specifications also reflects a fragmented division of labour within the organization.

The SET work does not include the suppliers, since at this stage the supplier has not been nominated. Mutual adaptations of technical issues are hard to obtain at this stage of the product creation process, since the supplier is not present in SET (Håkansson and Senhota, 1995). These adaptations would be essential for the function of the product itself and the integration in the whole system to prevent future car owner dissatisfaction. Interfaces to suppliers' resources are established from the R&D and Purchasing department, and tend to be from *Standardized* to *Specified.* Engineering changes are costly and time consuming processes, which could be reduced by receiving inputs from the supplier at development stage.

Yet, at more complex systems, QA and R&D engineers of the SET are in close informal contact with potential suppliers. In the forward sourcing stage, the supplier is requested to present himself to R&D to demonstrate its development capabilities. However, since it runs the risk of being replaced by a cheaper supplier before or during the series production, the supplier may not reveal his most sophisticated skills (Nellore et al., 2001).

The sourcing process is carried out by the Purchasing Department, centralized at OEM's Head Office, emphasizing the price of the product. The potential suppliers are though audited by OEM Group's auditors in terms of quality and capabilities. Generally the sourcing department sources the cheapest component based on the customer's specification.

Quality engineers often claim that the Purchasing and R&D departments should be present at quality meetings held to clear out surging nonconformance issues arising during series production on the shop floor. The QA is in fact the area which has close contact with the supplier, and where the competences of all involved parties converge. Mutual adaptations commence more or less in the preparation for series process or even after SOP. Suppliers act a source of new ideas and share resources with OEM Inc.

Q3: how can a non-accomplishment of functional specifications of the product and the process, influence and reflect the relevance of the formal evaluation of suppliers by the customer company?

The empirical study illustrates a variety of perspectives and experiences with suppliers, which leads unavoidably to a distributed supplier evaluation of different functional departments of the customer company (e.g. Purchasing, QA, R&D). This phenomenon is to be expected (Ford et al. 1986; Frederiksson and Araujo, 2003), as well as the presence of *"different managerial agendas, functional balkanization, and different reward and control systems […]"* (Araujo et al., 1999, p. 506). It is to be recalled that, in one of the units of analysis, a supplier was selected by the Purchasing department due to a cheaper price, while the Product Manager would rather have emphasized the supplier´s experience. Emphasizing a single dimension, i.e. the price, in the supplier evaluation process can lead to increased expenses throughout the whole product development process. These expenses become particularly clear in the

preparation for- and series production. This statement is supported by the fact that the foil supplier had to be changed due to non-satisfying quality in the QA's point of view, as well as the need for Engineering Changes of the sliding door module.

To deal with this kind of problems, it is necessary to develop an integrated vision of internal and external resources and company politics about the way these resources and competences are combined in the product development and series production process. Such practices are not new, having these been referred by various authors of industrial network approaches (e.g. Axelsson et al., 2005; Dyer, 2000; Ford, 2011, Gadde, 2000), and correspond to a great extend what Anderson and Narus (2004) designate as Supply Management Orientation. As a result, the formal evaluation, although being the responsibility of a single functional department, could integrate, at least in part, the local and distributed learning which occurred in the *Extended Enterprise* (Dyer, 2000).

7. Conclusions

In an important sense, what a supplier is willing to do for and with the customer depends to a large extent on the relationship between the parts (Fredrikson and Araujo, 2003). As suggested by several authors, improving efficiency and innovation can be done by early supplier involvement, combining internal with external resources and long-term partner relationships and integrating other functional groups within the company in the purchasing decision (Anderson and Narus, 2004; Axelsson et al., 2005; Gadde, 2010). In this context, supplier evaluation need to be seen as a systematic effort to promote the sharing of different perceptions and experiences generated through time within specific supplier-customer relationships. In fact, our study suggests that overlapping perspectives of supplier evaluation

help to provide a common understanding of goals and targets in between functional departments of a customer company. With strong emphasis on the price and global sourcing, close relationships may be difficult to establish, and suppliers might not be willing to share valuable knowledge with the customer. However, departments like QA interact with suppliers in order to resolve non-conformances on the shop floor. Empirical evidences from the shop floor show clearly suppliers' disposition in making adaptations and the related dedicated investments, as well as in sharing resources and competences. This disposition should not be blocked by company rules but considered for future sourcing decisions. Consequently, representatives from Purchasing and R&D need to be in close contact with surging non-conformances on the shop floor. We suggest therefore a continuing SET process, beginning from the project definition and accompanying the series production.

Interfaces of resources and its long term benefits will become more and more important to customers. The automotive industry tends to adopt in an increasing extend modular approaches, sharing the same modules between cars of different segments. This approach requires the highest quality demands, since problems with one module would affect multiple models. Through *Translation* and *Interactive interfaces* of resources with suppliers, the customer mobilizes valuable knowledge and technology which reduce such risks. The suppliers also should be involved in integrating the modules into the whole systems, to avoid future car owner complaints due to disturbing interferences between the systems.

We suggest the interconnection between modular approaches and sourcing management to have high potential for future researches.

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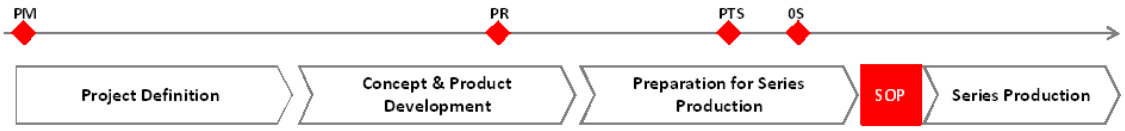
Due to confidentiality, internal company guidelines are not being referred in the references.

Attachments

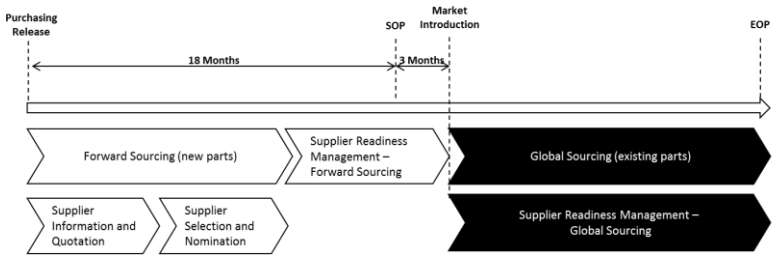
Attachment 1: simplified Product Development Process



PM:	Product Mission	48 months to SOP
PR:	Purchasing Release	18 months to SOP
PTS:	Product Trial Series	6 months to SOP
0S:	0 – Series	3 months to SOP

Source: adapted from internal company guidelines

Attachment 2: OEM's sourcing process



Source: adapted from internal company guidelines

Attachment 3: Audit Defect Categories

Defect category	A-Failure		B-Failure		C-Failure	
Audit points	140	80	60	40	20	10
Evaluation	Safety risk; break down	Extreme surface failures	Strong influence in function and design	Unpleasant, out of requirements	Noted by demanding client	
Effect on client	Not available for client	Immediately to workshop	Client will claim the failure at the next service appointment		Client criticises quality	
Detectable by	Every client					
	Average client					
	Demanding client and trained auditor taking into account the internal quality standards					
Actions	Failure has to be corrected, it must be assured that car will not get to the client; 100% firewall of stock					
Preventive actions	Initiation of actions in series process to prevent repetition of failure				Observe and avoid downgrade	

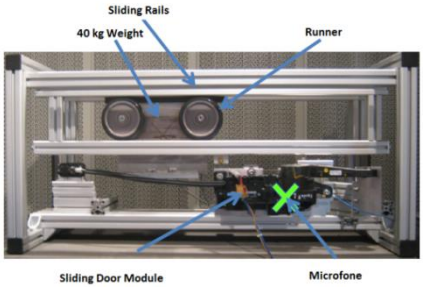
Source: adapted from internal company guidelines

Attachment 4: Engineering Change Process & involved parties

1	2	3	4	5	6
Engineering Change Request (ECR)	Feasibility evaluation & approval	Evaluation & approval by divisions	Adaption of specifications	Purchasing release	EC implementation
Divisions of OEM or Supplier	R&D and Production department	Purchasing department & Divisions of OEM	R&D department	R&D department	Purchasing department, Quality assurance & Supplier

Source: adapted from internal company guidelines

Attachment 5 Testing Work Bench / MPV Body with Inclination / End of Line Tester



Source: company records