Chapter 20
Supply Chain Collaboration or Conflict? Information Sharing and Supply Chain Performance in the Automotive Industry

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20.1 Introduction

Most supply chains are composed of independent companies with individual preferences (Fiala 2005). To coordinate supply chain activities and overcome supply chain dynamics, information sharing is widely employed as an essential tool to enable timely and accurate decision-making and supply chain collaboration (Sahin and Robinson 2002; Moberg et al. 2002; Chana and Chana 2009; Yigitbasioglu 2010).

Many studies have investigated different factors affecting information sharing and collaborative behaviour in supply chain management, such as trust and power (Yeug et al. 2008; Shou et al. 2013), trust and commitment (Kwon and Suh 2005), trust, commitment, reciprocity, and power (Wu et al. 2013), and conflicts (Simatupang and Sridharan 2002). However, few studies have investigated how the decision-making antecedents including organizational goals, inter-organizational

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conflict of goals, power, and trust (GCPT) interact with information sharing behaviour and how information sharing affects supply chain performance.

Although there has been a growing stream of studies on information sharing in supply chain management, the predominant approach of such studies is to simplify the industrial context so that the basic underlying trade-offs can be explained analytically using quantitative modelling. However, simplifying the industrial context compromises the external validity of the results by eschewing the realistic environments such as multi-echelon supply chains with multiple products (Sahin and Robinson 2002) and thus hinders cumulative theoretical development and further illumination of the underlying decision-making mechanism. Also, existing quantitative studies which mainly focus on hypothesis testing are limited in facilitating a better understanding of decision-making antecedents and therefore are not able to give better insights into the "black box" of supply chain decision-making process.

Based on the above we apply an exploratory multiple case study approach aiming to answer two research questions:

1. How do the decision-making antecedents and supply chain information sharing/retaining in the multi-tier supply chain of the automotive industry interact?
2. What is the relationship between information sharing/retaining and supply chain performance?

Due to the inherent complexities of the decision-making context, the case study examines four essential aspects of the decision-making context: organizational goals, inter-organizational conflicts, power, and trust (Handfield and Bechtel 2002; Johnston et al. 2004). It should be noted that the following are results of a case study considering a limited range of the decision-making context of information sharing/retaining. Other factors, such as incentives (Eisenhardt 1989) and relational norms (Heide and John 1992) may also have an impact on the information sharing/retaining behaviour but are beyond the study's research scope. The study focuses on the multi-tier supply chain relationship, as it best reflects the supply chain configuration in the automotive industry and avoids drawbacks of studying the dyadic relationship in a supply chain (Wu et al. 2010). Inter-organizational information sharing is treated as a multidimensional concept.

Drawing on supply chain management theory, this study aims to identify the relationship between decision-making context and information sharing/retaining behaviour as well as the impact of information sharing/retaining on supply chain performance. To achieve this objective, the remainder of the study is structured as follows: First, a review of the pertinent literature is conducted to set our theoretical background and thereby develop a preliminary research model. Second, the methodology of the case study is explained. Next, the findings and the resulting propositions are elaborated. Conclusions, limitations, and avenues for future research are presented in the final section.

20.2 Theoretical Background

This section starts with reviewing the literature pertaining to the course of investigation and then provides definitions of GCPT in the research model, as illustrated in Fig. 20.1.

A company's success depends on the interaction between five interlocking flow systems, namely the flow of information, materials, money, manpower, and capital equipment (Forrester 1958, 1961). The flow of information is often considered as a generic remedy for supply chain ailments (Forrester 1958; Lee et al. 1997) and its advantages have been intensively discussed (Cachon and Fisher 2000). Though important, some researchers have argued that information sharing, per se, is insufficient to enable significant supply chain performance improvements (Hong-Minh et al. 2000; Baihaqia and Sohalb 2013). Supporters of this argument claim that the significance of its impact on supply chain performance largely depends on which information is shared, when and how it is shared, with whom (Holmberg 2000) and how it is used. Companies may opportunistically use information without considering total supply chain goals and objectives. Other researchers adopt a different angle to view information retaining and claim that companies seem to have a built-in reluctance to share more than minimal information with their trading partners (Berry et al. 1994). Information transparency thus becomes the weakest link of the supply chain (Coleman et al. 2004). It is suggested that conflicting goals, divergent interests, local perspective, opportunistic behaviour of maximizing individual profit, and different ways of interpreting customer information may become obstacles for the efficient information sharing among supply chain partners (Simatupang and Sridharan 2002; Feldmann and Müller 2003).

To foster information sharing among supply chain partners, some researchers emphasize the importance of building trust, commitment, and system coordination (Christopher 2011; Sahin and Robinson 2005; Wu et al. 2013). Other researchers consider trust, commitment, reciprocity, and power the antecedents of supply chain information sharing and collaboration (Wu et al. 2013). We focus on four key

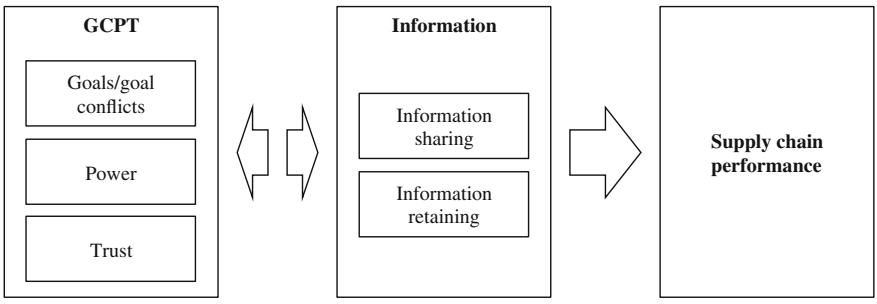

Fig. 20.1 Research model

aspects of the decision-making antecedents in this study—organizational goals, inter-organizational conflicts, power, and trust.

Based on the dimensions suggested in the sand cone model (Ferdows and De Meyer 1990), organizational goals in this study are examined based on quality, time, flexibility, robustness (Wagner and Bode 2006), and cost. It should be noted that the purpose of this paper does not correspond with the idea to study whether the manufacturing performances are related in a cumulative manner as the sand cone model implies, a trade off model (Skinner 1969; Slack 1991), or an integrative model (Clark 1996). As every company aims to achieve its own goals and gains the best position in the system, it does not always take into account any ethical principles or altruistic behaviour for instance (Crane and Matten 2010). Thus, inter-organizational relationships are established and maintained for causes of self-interests (Shook et al. 2009). The often conflicting goals of the supply chain members may pose many challenges for effective supply chain integration and information sharing (Sahin and Robinson 2002).

Conflict is defined as the circumstance in which a supply chain member's organizational goal is impeded by another and the supply chain performance is adversely affected (Gaski 1984). Although sources of conflicts on the supply chain level such as the incompatibility of the decision makers' underlying objectives, dysfunctional role definitions, and varying perceptions of the reality can hardly be directly observed or foreseen, they can be reflected by the decision outcomes (Blackhurst et al. 2008). Although a certain degree of conflict is inevitably inherent in all kinds of exchange relationships, not all conflicts are counterproductive (Anderson and Narus 1990).

As one of the main determinants of coordination and conflict among supply chain members, power refers to a company's ability to control the decision variables of other exchange members as a result of relative dependence between exchange members (Stern and El-Ansary 1992; Gaski 1984). As power results from asymmetricly distributed resources (Pfeffer and Salancik 1978), organizations with control over the demanded resource such as critical information consequently have more power (Hallen et al. 1991; Wu et al. 2013). Information disclosure can thus be considered as a potential loss of power. Companies fear that information may either leak to potential rivals or weaken their negotiation advantages (Li and Lin 2006). Examining the relationship between power and conflict, Gaski (1984) argued that conflict can be either a cause or a consequence of power, in other words, a non-recursive relationship. Because a company's potential power is less traceable and less measurable than the exercised power (Gaski 1984; Stern and El-Ansary 1992), we focus on the exercised power in this study.

Trust is a company's subjective state of positive expectations that its partner will perform an action to benefit the company's interests irrespective of the control on the partner (Mayer et al. 1995; Das and Teng 2001). There are two dimensions of trust: competence trust meaning a partner's ability to perform according to agreements, and goodwill trust meaning a partner's intentions to do so (Nooteboom 1996; Das and Teng 2001). Trust is a key element in cooperative relationships at the inter-organizational level (Ring and Van de Ven 1992). A high level of trust would

motivate partner firms to openly communicate and jointly take/share risks (Corsten and Kumar 2005; Kwon and Suh 2005).

Supply chain performance is largely determined by the achievement of the supply chain objectives, which are to provide value to the end consumer and for each supply chain exchange member to garner a profit (Sahin and Robinson 2002). To evaluate the impact of information sharing on supply chain performance, we focus on the type, accuracy, frequency, and timeliness of information sharing (Carr and Kaynak 2007).

20.3 Method

Due to the holistic nature of the investigated phenomenon and the exploratory nature of the research questions, an exploratory multiple case study approach (Eisenhardt 1989) is favoured, which allows a holistic study and comparative setting in seeking to answer "how" and "why" questions (Yin 2003).

The case study's main objectives are to examine the information sharing/retaining practice in the supply chain of the automotive industry, to learn about its underlying decision-making context and to investigate the relationship between information sharing/retaining and supply chain performance. Data was collected in semi-structured interviews, which were protocolled and, if permitted by the interviewees, also recorded, transcribed, and analysed by applying methods such as qualitative content analysis (Gläser and Laudel 2009) and data triangulation. The research framework follows a four-step logic path, as shown in Fig. 20.2.

An integral step before conducting qualitative research is the development of the interview guideline. To avoid biased data and to maintain data integrity, independent experts revised the interview guideline several times. In addition, the triangulation

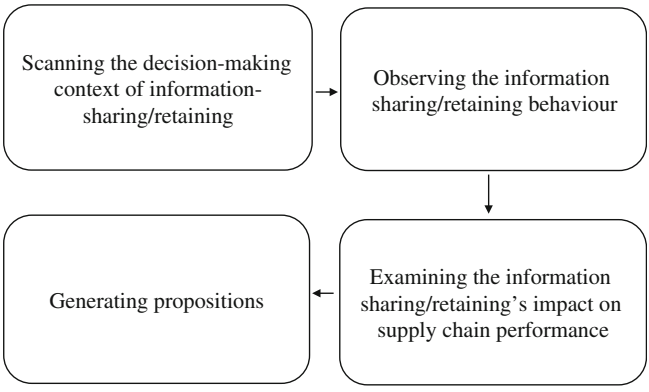

Fig. 20.2 Research framework

Table 20.1 General characteristics of the selected cases

Company (code)	Country of origin	Annual turnover	Job function of interviewees
OEM (T0–1)	Germany	>50 bn. €	Manager of spare parts logistics
1st tier supplier (T1–1)	Germany	>10 bn. €	Manager of strategic supplier management
1st tier supplier (T1–2)	Germany	>10 bn. €	Project manager of sourcing
1st tier supplier (T1–3)	Germany	>1 bn. €	Project manager of logistics
1st tier supplier (T1–4)	Germany	>10 bn. €	Manager of technical sourcing
2nd tier supplier (T2–1)	Germany	>1 bn. €	Manager of customer logistics
3rd tier supplier (T3–1)	Germany	>250 mi. €	Supply chain manager
3rd tier supplier (T3–2)	China	Not disclosed	Manager of customer support
Logistics service provider (LSP-1)	Germany	Not disclosed	Managing directors

approach (Webb et al. 1966) was adapted. Up to three facilitators interviewed a total of ten interviewees from nine different companies. These companies were selected based on their buying-supplying relationships in the supply chain, which consisted of a buyer, suppliers, suppliers' suppliers, and the logistics service provider of the buyer. The general characteristics of the selected cases are summarized in Table 20.1. In addition, data from secondary sources such as company archives, scholarly books, and articles were displayed. The two primary facilitators who guided all interviews in the field transcribed the recordings, coded the transcriptions and later performed a comparison of the coding results. We applied the software MAXQDA for qualitative data coding and analysis according to scientific qualitative data analysis techniques (Strauss and Corbin 1989; Gläser and Laudel 2009). The approach of methodological and multi-investigator triangulation ensures that the course of our investigation is not explored through one lens, but rather a variety of lenses. This allows for multiple facets of the phenomenon to be revealed and thus enhances confidence in our findings (Denzin 1970).

20.4 Findings

20.4.1 Observation of Inter-organizational Goal Conflicts

During our case study, we were able to observe manifold goal conflicts on the inter-organizational level. Goal conflicts where observable based on past decision processes where not all involved parties were content with the decisions' outcome. Intuitively, we could observe classical conflicts of goals among quality, flexibility, and cost between supply chain members. However, it seems that there is not always a trade-off between those highly interrelated goals, according to the interviewees.

> Interviewee from LSP-1: Quality and flexibility do not exclude each other; instead they belong to each other. If you are not able to keep up with quality concerning flexible action, you have lost already.

In the supply chain context, which includes multiple decision makers, it is not easy to foresee goal conflicts, since they are not easily identifiable on the goal level, but often only become apparent when a decision is made. This is complicated due to the fact that goal conflicts might change dynamically over time.

> Interviewee from T0–1: The potential for conflict outside the company is already very high.
> Interviewee from T1–4: But this is what I mean with conflict: The supplier has other goals than we have. Then it is all about recognizing this.
> Interviewee from T1–4: It is indeed the case that goal conflicts and the essence of conflicts shift dynamically over time, because the general business conditions are changing.

Thus, for effective mitigation, goal conflicts have to be identified early. Understanding how those antecedents are related to goal conflicts will facilitate the further development of conflict-mitigating measures.

> Interviewee from T2–1: And therefore, the conflicts should be mitigated beforehand, by securing some level of possibilities for reaction.

20.4.2 Impact of GCPT on Information Sharing/Retaining

While information exchange can facilitate the mitigation of goal conflicts, it might be the subject of goal conflicts themselves, since often, companies are not willing to pass on information in order to secure information asymmetries and to gain advantages from not sharing information like cost data and inventory data.

The information sharing/retaining behaviour among LSP, tier-2, tier-1 and OEM observed in our study confirmed the interaction effect of GCPT. Power effect can be reflected by information control (Shou et al. 2013). Similar observations have been found in our interviews. OEMs increasingly try to shift supply chain complexity and risk to their suppliers using coercive power. They trust in highly automated information exchange on the operational level and thus require their tier-1 suppliers to adopt the same operational standards (e.g. delivery concepts) and enforce them to implement robustness and flexibility-related strategies to absorb emerging volatility. The coercive power of OEM is found to fuel the information sharing of tier-1 suppliers with the OEM (Yeung et al. 2008). Nonetheless, provision of the right information at the right time to the right person cannot be enforced, as this behaviour largely depends on the trust between OEM and its tier-1 suppliers.

> Interviewee from T1–4: We wrote it as a requirement in the contract, that we need clear communication in this case (…). Even if he [the supply chain partner] signs this, there is of course still the question whether he does comply with it.

Proposition 1 The more a firm's decision-making is influenced by the power of a supply chain member, the more likely the firm will share information with its supply chain member.

While we did find a high level of competence trust on the level of OEM-tier-1 relationships, the observed goodwill trust is somehow limited. Tier-1 suppliers show reduced willingness to share information if the information could potentially weaken its competitiveness. In this case, tier-1 suppliers hold back information if they engage a strong position in the supply chain.

> Interviewee from T1–1: There has been an OEM initiative in order to gain knowledge which parts were sourced from which supplier. In this case, we have been really reserved. Our position permitted us to do so. So we could say: Our information, no way, our business.

For example, critical information on raw material prices and its sub-tier supplier network is rarely shared, even in a highly integrated and trustful cooperation. Several reasons why such information is considered sensitive could be identified: Suppliers fear being bypassed by their customer, which might in the future source directly from its' sub-suppliers. Suppliers also fear the erosion of margins due to sales price decrease and also, that with the provision of information on their sub-suppliers and underlying sourcing strategies, they might disclose potential supply chain risks to their partners.

Tier-1 suppliers in our study show limited competence trust in their suppliers, the majority of which are medium- or small sized companies. Therefore, tier-1 suppliers have to react on volatility by tightly integrating their suppliers on the informational level, making goodwill trust a key issue of those partnerships. Information provision is enabled through the high buying power towards the smaller tier-2 suppliers. Problematic in this area usually is the lack of advanced standards, capabilities and communication technologies of tier-2 companies that are required to share the right information.

Proposition 2 The more a firm's decision-making is influenced by the power of a supply chain member, the more likely the firm will share information with its supply chain member.

Proposition 3 The more a firm's decision-making is influenced by its trust in a supply chain member, the more likely the firm will share information with its supply chain member.

20.4.3 Impact of Information Sharing/Retaining on GCPT

We have seen that company-internal goal conflicts lead to ill-designed goals on the supply chain level impeding supply chain integration and leading to conflicts between supply chain partners. We could also observe suppliers knowing their

customers' processes better than themselves due to lacks of internal information exchange. Improved company-internal information exchange between departments like logistics, purchasing and production can therefore lead to better overall goal alignments and fewer conflicts. In practice, setting up internal documentation standards and guidelines, which e.g. define processes and responsibilities have led to reduced conflicts on the supply chain level.

> Interviewee from T1–4: Learning from a former conflict, we developed a logistics guideline. This is pretty important to us.
> Interviewee from T1–4: I don't want to rain on the OEM's parade, but the OEM probably has not the expertise. He just says "Well, this is what I demand".

Intercompany transparency can help decision makers to understand how their goals are conflicting with those of others leading to suboptimal supply chain solutions and in the end falling back on the initial decision maker. While shaping an understanding of goals and conflicts might be sufficient, transparency additionally enables companies to develop more integration-focused incentive systems focusing on overall supply chain performance.

Information sharing is not only seen as positive, because revealing too much information will reduce relational rents by giving more power to customers and allowing them to reduce the suppliers' margins or to exclude some of their suppliers from the supply chain altogether.

> Interviewee from T1–2: And there is always danger that the margin is affected [when sharing critical information].
> Interviewee from T1–1: Suppliers are often not happy to reveal information [about their suppliers] since they are afraid to be bypassed [by their customer] who then may directly approach the sub-suppliers.

Vice versa, information exchange can also be used by suppliers to gain more power over their customers in order to achieve an advanced position in the supply chain. One example in this case is a key tier-2 supplier, who uses its strategic importance in the supply chain to directly exchange information with the OEM, not including the tier-1.

> Interviewee from T2–1: And therefore it is important for us to directly exchange information with the OEM. It is helpful to directly talk to the OEM since the supply chain visibility is sometimes very poor.

Nonetheless, information-sharing on the personal level is one of the most important antecedents of goal congruence and trust observed during the case study.

> Interviewee from T2–1: I find information exchange at the personal level vitally important. I need to talk to my business partner face to face and get the feeling of his confidence level. This helps me to interpret his message.

But the relationship between trust and information exchange also has a reciprocal component. In a business relationship built on trust, when inaccurate/delayed information is shared, trust will be negatively affected which will also affect future

information exchange. On the other hand, intense and regular sharing of information will also be an antecedent of trust in the relationship.

> Interviewee from T0–1: In case of the distorted/delayed information provided, the contact will not be terminated. But you will be more cautious, for sure.

Proposition 4 The more efficient the information sharing is, the more likely the firm's decision antecedents will be positively influenced.

20.4.4 Impact of Information Sharing/Retaining on Supply Chain Performance

Previous research on information sharing in the automotive supply chains focuses predominantly on the function and impact of the information sharing content (Lee et al. 1997; Niranjan et al. 2011). Only few studies have identified the relevance of particular information items (Lee and Whang 2000; Lumsden and Mirzabeiki 2008). In the following, we first identify information items suitable for mitigating goal conflicts when shared among supply chain members. We will therefore build on the typology introduced by (Lee and Whang 2000) and differentiate information items into inventory, sales and demand forecast, order status, production schedule and capacity as well as supply chain network design related information. The following Table 20.2 summarizes information items shared among supply chain members and their relevance for mitigating goal conflicts and to increase the overall supply chain performance.

Supply chain members who exchange information efficiently can better understand the customer needs and hence respond faster to market volatility. The known effects, "bullwhip effect" and "double marginal effect" will be mitigated. Bullwhip effect refers to the amplification of demand order variations in supply chains moving upstream towards the original source. Double marginal effect means that the total profit of the supply chain under decentralized decision is less than that under centralized decision (Zhang and Chen 2013). Provision of information may enable better control of the supply chain. It supports a rapid response to deviations or changes and is the basis for aligning product and capacity availability.

The provision of inventory data supports both, suppliers and customers. During the case study, we could observe suppliers not willing to share inventory data since low inventory might suggest to customers a low level of robustness while excess inventory might be interpreted as a signal for low efficiency or low overall demand. Customers in some cases are also not willing to reveal inventory data, for example if they are willing to stockpile goods.

> Interviewee from T1–4: I was realizing that one of our customers was making false statements concerning his actual demand, his buffer inventory. He built up pressure and told us, that they could not serve their customer because of us. (…) (this was) just safety thinking. He wanted to get enough on the side for himself.

Table 20.2 Different information types and their relevance concerning supply chain performance

Information type	Information items	Relevance
Inventory	• Finished goods • In process inventory • Raw materials	Reduction of bullwhip effect by aligned inventory decisions
Sales and demand forecast	• Current sales • Future aggregated demand	Integrated master planning by alignment on inventory build-up and production scheduling
Order status/event management	• Status of current orders in production process • Early escalation of production errors and delays	Early adjustment of production capacities and readiness concerning business continuity measures
Production schedule and capacity	• Future availability • Current spare capacity/flexibility • Future spare capacity/flexibility • Production cost	Integrated master planning by alignment of production schedules and optimized network planning due to the use of capable suppliers
Production/process capabilities	• Production quantity capabilities • Production quality capabilities • Process capabilities • Quality/Quantity demands	Gaining transparency and aligning actual requirements with actual demand is the key for efficient supply chain management to avoid negative surprises
Supply chain network	• Supply chain configuration • Sourcing concepts • Upstream suppliers	Developing an optimum supply chain

But sharing individual inventory data can help to set the inventory goals right in the overall supply chain (e.g. by reducing the bullwhip effect) and therefore lead to overall cost savings and also to increased flexibility/timeliness (by optimized allocation, faster reaction) and increased service quality/robustness (by enabling secure supply).

Sharing sales and demand forecasts helps in a similar way, especially by supporting all supply chain members in allocating production capacity. Goal conflicts are becoming apparent through customers not forwarding (actual) demand data or by purposeful underestimation of demand in order to shift risk to the supplier. This induces additional volatility in the supply chain, especially affecting supply chain robustness.

> Interviewee from T2–1: (…) they only want to commit themselves to as few as possible buying quantities; they want as much flexibility from the supplier as possible. (…) We require highly precise demand forecasts from our customers.

Concerning the order status, the data supports customers especially on the level of early warning mechanisms so they are informed early in case of a disruption contributing to overall flexibility and service quality. Customers are willing to get status data deep from the production process while suppliers are in some cases not willing to share this data, referring to the low benefit of such data and to the high effort of preparation.

> Interviewee from T2–1: I don't want to give him such information. This has to be prepared manually and there are no resources to do this.

Concerning (future) production capacity, offering this information to supply chain partners would be a prerequisite for truly integrated and perhaps centralized supply chain planning and goal alignment. But parallel to inventory information, suppliers are often not willing to share that information since it e.g. might negatively affect negotiations with customers.

Information concerning a supplier's production capability concerns the supplier's ability to deliver the demanded product in the required quality and quantity in a given timeframe. While the lack of intra-organisational information flow might lead to contradicting requirements (see above) in order to fulfil conflicting goals of cost and quality, a supplier might issue wrong statements concerning its capability, in the end leading to higher overall supply chain cost.

> Interviewee from T1–4: I asked how the results from the first (reference) implementation were. And their answer was that that they postponed it for two years.

One of the most important and probably neglected information type is the network structure. Events like the tsunami at Fukushima have proven, that demands in supply chain risk management are increasing and that network transparency is a risk management prerequisite in order to safeguard against supply shortages. Information on network structure can therefore be used to optimize networks for supply chain robustness and flexibility and contribute to supply chain performance.

However, excessive information shared among members may decrease the visibility of the supply chain due to increased complexity and impede supply chain performance. For example, the overwhelming and sometimes conflicting data may overload or confuse managers, as the processing of the data may be very time-consuming. In addition, managers often feel challenged communicating with a vast number of inter- and intra-organizational stakeholders due to the growing complexity of the communication network.

> Interviewee from T0–1: The number of E-Mails is a catastrophe. The diversity and sometimes contradiction of the numbers strike you in a lot of cases. (…) This is impossible. What do you do? You don't read it at all!
> Interviewee from T1–4: It is an inflation of criteria. And today, focussing on the important ones, I like to say the vital ones, is missing a little bit.

Thus, the interviewed managers continuously work to improve existing information sharing systems, which should be fine-tuned according to the development of business requirements. In order to enable information sharing to increase supply chain performance, concepts of information logistics have to be implemented

ensuring the availability of the right information at the right time in the right format and at the right place (Sandkuhl 2008).

Interviewee from T0–1: Transparency does mean to exchange the right information.

Identifying the right information is not quite easy due to the unequal distribution of information on the company and supply chain level. Therefore specific processes and standards need to be defined, describing who is in charge of which process and who is holding which information. Those processes and standards need to be made available broadly in the form of shared documents and company- or supply chain-wide guidelines.

Also, in some cases, the facilitation of horizontally integrated workgroups among OEM, tier-1 and vital tier-2 suppliers can enable the exchange of relevant information. In order to ensure the information availability at the right time in the right format in times of ever-growing amounts of data, new processing technologies are required.

Based on those observations, it's becoming clear that while information sharing holds huge benefits for all supply chain partners, it also bears additional costs, especially for setting up new information systems and building standards/process documentations. But also, increased efforts on the personal level as well as potential risks like exploitation that come with increased cooperation have to be considered.

Proposition 5 The more efficient (higher quality and lower cost) the information sharing is, the more likely the supply chain performance will be positively influenced.

20.5 Discussion and Conclusion

In this paper, we explored the interdependent relationship between information sharing and its decision-making antecedents and the impact of information sharing on the supply chain performance based on a multiple case study approach.

Our research contributes to a better understanding of information sharing in supply chain management and yields practical insights for practitioners to better understand the "black-box" of decision-making Our findings show that GCPT and information sharing are highly interdependent and interactive. On the one hand, goal congruence and trust significantly influence both the behaviour and quality of information sharing positively. While power might be an enabler of information sharing in some cases, exercising power does not guarantee the quality of information shared. Goal conflicts often lead to information-retaining behaviour. On the other hand, efficient information sharing behaviour indicates a positive impact on building trust, reconciling goal conflicts, and rebalancing power. However, supply chain members seem to treat information sharing/retaining very cautiously, although it is widely agreed by companies that in order to deliver the right product to the right place at the right cost (Zhang and Chen 2013), they must coordinate decisions and probably share sensitive

information. The role of goal conflicts on the organizational level and its impact on the supply chain is also widely ignored in research and practice. Especially with growing complexity and a growing disintegration of supply chain related functions, comprehensive standards, documents and guidelines can facilitate goal alignment and reduce confusion on the supply chain level.

Concerning the possible impacts on supply chain performance, managers should not take the impact of information sharing for granted. Information sharing does not guarantee better supply chain performance per se. Informal, frequent, and bi-directional information sharing on the personal level seems to be a more effective enhancer of supply chain performance compared to IT systems and technology-based approaches, at least concerning decisions on the mid-term and long-term level. Only effective information sharing can strengthen cooperation and also alleviate goal conflicts. In terms of selecting suppliers, buying firms should not only consider cost, quality, and time of delivery, but also make an effort to understand the corporate goals and trustworthiness of the supplier, as dysfunctional goal conflicts and opportunistic behaviour decrease the willingness to share information and compromise the longevity of relationships. If there is a lack of goal congruence or trust, the buying firm should cautiously exercise its power. To improve the quality of information sharing, buying firms should invest on building long-term relationship and trust.

The study also has several limitations, which open up avenues for further research concerning future research directions as well as further methods to be implemented. The provided understanding of relationships between the surveyed antecedents can build the foundation for further exploration and development of explicit measures and tools to mitigate goal conflicts. E.g. the suitability and applicability of measures like incentive systems, intercompany workgroups, information standards, guidelines, and information systems, has to be further investigated. Also, the case study was limited in only providing a first understanding of underlying mechanisms. Structural modelling in combination with the collection of broad empirical data can be used for further hypothesis testing, to support and extend our study's results. Finally, since there was only one Chinese company in the sample, we did not examine the cultural dimension in our study. Future study can deepen our understanding of information sharing by taking the influence of culture into account.

References

Anderson JC, Narus JA (1990) A model of distributor firm and manufacturer firm working partnerships. J Mark 54(1):42–58

Baihaqia I, Sohalb AS (2013) The impact of information sharing in supply chains on organisational performance: an empirical study. Prod Plann Control: Manage Oper 24(8–9):743–758

Berry D, Towill DR, Wadsley N (1994) Supply chain management in the electronics products industry. Int J Phys Distrib Logist Manage 24(10):20–32

Blackhurst J, Wu T, Craighead CW (2008) A systematic approach for supply chain conflict detection with a hierarchical Petri Net extension. Omega 36(5):680–696
Cachon GP, Fisher M (2000) Supply chain inventory management and the value of shared information. Manage Sci 46(8):1032–1048
Carr AS, Kaynak H (2007) Communication methods, information sharing, supplier development and performance: an empirical study of their relationships. Int J Oper Prod Manage 27(4): 346–370
Chana HK, Chana FTS (2009) Effect of information sharing in supply chains with flexibility. Int J Prod Res 47(1):213–232
Christopher M (2011) Logistics and supply chain management: creating value-adding networks, 4th edn. Financial Times Prentice Hall, Harlow, England, New York
Clark K (1996) Competing through manufacturing and the new manufacturing paradigm: is manufacturing strategy passe. Prod Oper Manage 5(1):42–58
Coleman J, Lyons A, Kehoe D (2004) The glass pipeline: increasing supply chain synchronisation through information transparency. Int J Technol Manage 28(2):172–190
Corsten D, Kumar N (2005) Do suppliers benefit from collaborative relationships with large retailers? An empirical investigation of efficient consumer response adoption. J Mark 69(3): 80–94
Crane A, Matten D (2010) Business ethics: managing corporate citizenship and sustainability in the age of globalization. Oxford University Press, Oxford
Das TK, Teng BS (2001) Trust, control, and risk in strategic alliances: an integrated framework. Organ Stud 22(2):251–283
Denzin NK (1970) The research act in sociology. Aldine, Chicago
Eisenhardt KM (1989) Agency theory: an assessment and review. Acad Manage Rev 14(1):57–74
Feldmann M, Müller S (2003) An incentive scheme for true information providing in supply chains. Omega 31(2):63–73
Ferdows K, De Meyer A (1990) Lasting improvements in manufacturing performance: in search of a new theory. J Oper Manage 9(2):168–184
Fiala P (2005) Information sharing in supply chains. Omega 33(5):419–423
Forrester JW (1958) Industrial dynamics. Harv Bus Manage 36(4):37–66
Forrester JW (1961) Industrial dynamics. MIT Press, Cambridge
Gaski JF (1984) The theory of power and conflict in channels of distribution. J Mark 48(3):9–29
Gläser J, Laudel G (2009) Experteninterviews und qualitative Inhaltsanalyse, 3rd edn. Wiesbaden
Hallen L, Johanson J, Seyed-Mohamed N (1991) Interfirm adaption in business relationships. J Mark 55(2):29–37
Handfield RB, Bechtel C (2002) The role of trust and relationship structure in improving supply chain responsiveness. Ind Mark Manage 31(4):367–382
Holmberg S (2000) A systems perspective on supply chain measurements. Int J Phys Distrib Logist Manage 30(10):847–868
Heide JB, John G (1992) Do norms matter in marketing relationships. J Mark 56(2):32–44
Hong-Minh SM, Disney SM, Naim MM (2000) The dynamics of emergency transhipment supply chain. Inter J Phys Distrib Logist Manage 30(9):788–815
Johnston DA, McCutcheon DM, Stuart FI, Kerwood H (2004) Effects of supplier trust on performance cooperative supplier relationships. J Oper Manage 22(1):23–38
Kwon IWG, Suh T (2005) Trust, commitment and relationships in supply chain management: an path analysis. Supply Chain Manage: Int J 10(1):26–33
Lee HL, Whang S (2000) Information sharing in a supply chain. Int J Technol Manage 20: 373–387
Lee HL, Padmanabhan V, Whang S (1997) Information distortion in a supply chain: the bullwhip effect. Manage Sci 43(4):546–558
Li S, Lin B (2006) Accessing information sharing and information quality in supply chain management. Decis Support Syst 42(3):1641–1656
Lumsden K, Mirzabeiki V (2008) Determining the value of information for different partners in the supply chain. Int J Phys Distrib Logist Manage 38(9):659–673

Mayer RC, Davis JH, Schoorman FD (1995) An integrative model of organizational trust. Acad Manage Rev 20(3):709–734
Moberg CR, Cutler BD, Gross A, Speh TW (2002) Identifying antecedents of information exchange within supply chains. Int J Phys Distrib Logist Manage 32(9):755–770
Niranjan TT, Wagner SM, Aggarwal V (2011) Measuring information distortion in real-world supply chains. Int J Prod Res 49(11):3343–3362
Nooteboom B (1996) Trust, opportunism and governance: a process and control model. Organ Stud 17(6):985–1010
Pfeffer J, Salancik GR (1978) The external control of organizations: a resource dependence perspective. Harper & Row, New York
Ring PS, Van de Ven AH (1992) Structuring cooperative relationship between organizations. Strategic Manage J 13(7):483–498
Sahin F, Robinson EP (2002) Flow coordination and information sharing in supply chains: review, implications, and directions for future research. Decis Sci 33(4):505–536
Sahin F, Robinson E (2005) Information sharing and coordination in make-to-order supply chains. J Op Manage 23(6):579–598
Sandkuhl K (2008) Information logistics in networked organizations: selected concepts and applications. In: Filipe J, Cordeiro J, Cardoso J (eds) Enterprise information systems. Springer, Berlin, pp 43–54
Shook CL, Adams GL, Ketchen DJ Jr, Craighead CW (2009) Towards a "theoretical toolbox" for strategic sourcing. Supply Chain Manage: An Inter J 14(1):3–10
Shou Y, Feng Y, Zheng J, Wang G, Yeboah N (2013) Power source and its effect on customer-supplier relationships: an empirical study in Yangtze River Delta. Int J Prod Econ 146(1):118–128
Simatupang TM, Sridharan R (2002) The collaborative supply chain. Int J Logist Manage 13(1): 15–30
Skinner W (1969) Manufacturing—missing link in corporate strategy. Harv Bus Rev 47(3): 136–145
Slack N (1991) The manufacturing advantage. Mercury Books, London
Stern LW, El-Ansary AI (1992) Marketing channels, 4th edn. Prentice Hall, London
Strauss A, Corbin J (1989) Tracing lines of conditional influence: matrix and paths. Paper delivered at the annual meetings of the American Sociological Society, San Francisco, California
Wagner SM, Bode C (2006) An empirical investigation into supply chain vulnerability. J Purch Supply Manage 12(6):301–312
Webb EJ, Campbell DT, Schwartz RD, Sechrest L (1966) Unobtrusive measures: nonreactive measures in the social sciences. Rand McNally, Chicago
Wu IL, Chuang CH, Hsu CH (2013) Information sharing and collaborative behaviours in enabling supply chain performance: a social exchange perspective. Int J Prod Econ 148(2):122–132
Wu Z, Choi TY, Rungtusanatham MJ (2010) Supplier-supplier relationships in buyer-supplier-supplier triads: implications for supplier performance. J Oper Manage 28(2):115–123
Yeung JHY, Selen W, Zhang M, Huo B (2008) The effect of trust and coercive power on supplier integration. Int J Prod Econ 120(1):66–78
Yigitbasioglu OM (2010) Information sharing with key suppliers: a transaction cost theory perspective. Int J Phys Distrib Logist Manage 40(7):550–578
Yin RK (2003) Case study research: design and methods, 3rd edn. Sage, Thousand Oaks
Zhang J, Chen J (2013) Coordination of information sharing in a supply chain. Int J Prod Econ 143(1):178–187