Drivers of close supply chain collaboration: one size fits all?

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Abstract

Purpose – The purpose of this paper is to investigate the antecedents of close supply chain collaboration and to develop a multi-variable conceptual model of factors that drive the need for close supply chain collaboration.

Design/methodology/approach – A multi-variable conceptual model is developed based on literature and on a series of dyadic mini-cases in the electronics, fashion and consumer-packaged goods industry.

Findings – This paper confirms that close supply chain collaboration is influenced by a multitude of factors. It reveals a need to integrate findings from analytical and empirical disciplines that study supply chain collaboration. The results suggest that collaborative initiatives are predominantly initiated with suppliers and not with customers, and that close supply chain collaboration may lead to inertia in business relations.

Research limitations/implications – This paper is based on dyadic case studies in three different make-to-stock industries; future research may include a large-scale survey in more industries, including both make-to-order and make-to-stock environments.

Practical implications – Based on the findings, firms can make better choices in their collaborative initiatives; based on the conceptual model, firms can identify potential areas of close supply chain collaboration.

Originality/value – Findings from analytical and empirical literature are combined and such a combined perspective is deployed for the first time into a conceptual model of drivers of close supply chain collaboration.

Keywords Partnership, Supply chain management, Channel relationships

Paper type Research paper

1. Introduction

Over the last decades, co-operation between entities in a supply chain has become a topic of frequent discussion in the operations management domain. Different terms are used to denote this co-operative attitude, indicating varying levels of co-operative efforts. Authors speak about integration between parties (Bagchi et al., 2005; Frohlich and Westbrook, 2001; Pagell, 2004; Petersen et al., 2005; van der Vaart and van Donk, 2008), about supply chain collaboration (Cardnii et al., 2005; Holweg et al., 2005; Min et al., 2005;
Shirodkar and Kempf, 2006; Stank et al., 2001; Vereecke and Muylle, 2006), or about alliances (Stuart, 1997; Yang, 2008). Others talk about dyadic (e.g. buyer-supplier or buyer-manufacturer) relationships (Bensaou, 1999; Dwyer et al., 1987; Fynes and Voss, 2002; Goffin et al., 2006; Kozan et al., 2006; Szweczyewski et al., 2005; Wasti et al., 2006), collaborative relationships (Hoyt and Huq, 2000; Johnston et al., 2004), partnerships (Gadde and Snehota, 2000; Spina and Zotteri, 2000), supplier-retailer collaboration (Sheu et al., 2006) or supply side collaboration (Fu and Piplani, 2004). The fundamental rationale behind all these terms appears to be that companies cannot successfully compete by themselves and therefore seek establishment of arrangements with other entities in the supply chain.

Terms like integration, collaboration, cooperation and coordination are complementary to each other in a supply chain as they consist of similar elements (Arshinder and Deshmukh, 2008). We will use the term supply chain collaboration in the remainder of this paper to describe this collaborative attitude. Supply chain collaboration is often seen as a powerful instrument in achieving effective and efficient supply chain management (Fu and Piplani, 2004; Mentzer et al., 2000). However, the concepts for supply chain collaboration are not as well defined as they should be (Holweg et al., 2005). Supply chain collaboration can range from very shallow transactionally focused to highly integrated close relations (Goffin et al., 2006) from collaborative communication to supplier development (Oh and Rhee, 2008) or from inward facing to outward facing (Frohlich and Westbrook, 2001). Several authors have used portfolio models to identify relationship configurations. Bensaou (1999) uses buyer versus supplier-specific investments to discriminate between configurations and Olsen and Ellram (1997) use the importance of the purchase versus the difficulty of managing the purchase situation. One aspect that has been widely identified as typical of the most integrated, partnership style relationships is closeness (Goffin et al., 2006; Szweczyewski et al., 2005). We focus our paper on this highly integrated, partnership style relationship, which we will refer to as close supply chain collaboration. Close supply chain collaboration is characterised by the following aspects (Bensaou, 1999; Das et al., 2006; Duffy, 2008; Goffin et al., 2006; Holweg et al., 2005; Mentzer et al., 2000; Sheu et al., 2006; Spekman et al., 1998; Szweczyewski et al., 2005):

- a long-term business relationship between (independent) organisations;
- close co-operation and co-ordinated activities between business partners on aspects such as information sharing, joint planning, joint demand management and joint inventory management;
- bridging distinct groups within and across firms;
- shared/common objectives;
- shared perspective of the merits of close ties; and
- creating visibility.

Much of the literature has implied that close collaboration is always desirable (Goffin et al., 2006). Several studies have pinpointed advantages of such close ties, Monczka et al. (1993). However, it is recognised that not all relationships should be characterised by close collaboration (Goffin et al., 2006; Johnston and Kristal, 2008); close supply chain collaboration should not be considered a panacea (Johnston et al., 2004). The assumption of a need to always strive for close collaboration has not helped supply
chain collaboration research according to Goffin et al. (2006, p. 190): “[…] our understanding of supplier-manufacturer relationships has been clouded by the implicit assumption that partnerships are always desirable”. Das et al. (2006) argue that there are even diminishing returns in investments in integration between entities in a supply chain.

van der Vaart and van Donk (2008) provide a literature overview of survey-based research in this area, which they refer to as supply chain integration. They conclude that the majority of surveys report a positive relationship between integration and performance but also argue that it is questionable whether the nature of this relationship is well understood. Many studies have focused on the performance effects of collaboration (Bagchi et al., 2005; Das et al., 2006; Frolich and Westbrook, 2001; Johnston and Kristal, 2008; Ragatz et al., 2002; Rosenzweig et al., 2003; Stank et al., 2001); very few have focused on the factors influencing collaboration (Oh and Rhee, 2008). Terpend et al. (2008, p. 43) state, based on an extensive literature review of buyer-supplier relationships that: “The effects of many buyer, supplier and market characteristics, as well as product characteristics have yet to be explored.” The understanding of the nature of relationships in a supply chain remains limited and selection criteria for partners need to be better understood (Goffin et al., 2006; Sheu et al., 2006).

Before collaboration is possible, potential partners need to be targeted (Goffin et al., 2006). It is important to make accurate choices about who to work with closely as efforts in supply chain collaboration do not always lead to improvements (Vereecke and Muylle, 2006). Krause (1999) divides antecedent factors to supplier development into three categories: environmental factors that determine the potential of a partner, which consist of, e.g. competition or importance of the inputs to a firm; barrier factors, including supplier commitment, communication and other factors that represent conditions that need to be met in order to be effective; attitudinal factors that incorporate factors concerning attitude or perspective towards suppliers, such as trust. In our research, we focus on the environmental factors that determine the need for close supply chain collaboration. We focus on vertical collaboration between suppliers and buyers, rather than horizontal collaboration between companies at the same level in a supply chain.

The objective of our study is to develop a conceptual model for multi-dimensional factors influencing the need for close supply chain collaboration. For this purpose, we will develop propositions that we will verify based on mini-case-studies using different industry settings. Many studies in this area hardly build upon previous work (van der Vaart and van Donk, 2008). We build our research on a buyer-supplier collaboration framework developed by Bensaou (1999), which has been based on research in the automotive industry. This framework has been shown to be effective and has been applied by others as well, see for example Wasti et al. (2006). Bensaou distinguishes between three clusters of characteristics that influence the relationships between buyers and suppliers:

1. characteristics of the products exchanged and their underlying technologies;
2. characteristics of the market and the level of competition in a market; and
3. characteristics and capabilities of (potential) partners.

While the focus of the research by Bensaou has particularly been on investigating the configurations of different types of inter-organisational relationships in one industry
Our paper is structured as follows. In the next section, we discuss our research methodology. Section 3 develops the propositions based on a review of the extant literature on supply chain collaboration, while Section 4 reviews the results from the mini-cases to refine our propositions. In Section 5, we evaluate our propositions, and make our contribution explicit by means of a multi-variable conceptual model. We conclude in Section 6.

2. Research design
As antecedents of close supply chain collaboration remain unclear (Goffin et al., 2006; Sheu et al., 2006; Terpend et al., 2008), we deploy an exploratory research design to increase our understanding of these factors. For exploratory and theory-building research, case studies are often recommended (Eisenhardt, 1989; Handfield and Melnyk, 1998; Meredith, 1993; Voss et al., 2002). Although there are limitations to using case studies, we have followed well-established methodological guidelines (Eisenhardt, 1989; Flynn et al., 1990; Meredith, 1993; Voss et al., 2002; Yin, 1994) to increase the validity of our findings. We aimed to get a number of cases that is generally considered sufficient in a multiple case setting; our interviews have been structured based on the literature and we constructed the interview protocol using propositions that have been derived from literature; we have transcribed the interviews to increase content validity and respondents have reviewed the interview records. By incorporating multiple populations in our sample we improved generalisability.

Empirical research projects on attributes that influence close supply chain collaboration have often focused on one industry type or segment. Goffin et al. (2006) for example focused on the medium sized German engineering and electronics sector, with a strong representation of the automotive industry. Duffy (2008) researched fresh produce suppliers; Frohlich and Westbrook (2001) focused on the manufacturing industry of fabricated metal products, machinery and equipment; and Sheu et al. (2006) investigated the relationship between one manufacturer and five retailers in Taiwan. However, a range of companies is required in explaining the relationship between conditions and supply chain collaboration (Welker et al., 2007).

According to Fine (1998), industries with high “clockspeeds” are considered leading in supply chain initiatives. High-clockspeed companies have fast evolving products, processes and organisation structures and thus need to change frequently. They are therefore expected to be ahead in supply chain collaboration initiatives. We have therefore chosen to base the empirical part of our research in three fast-evolving “high clockspeed” industries: fashion, high-tech electronics, and consumer-packaged goods (CPG). First, fashion is synonymous with rapid change (Brun and Castelli, 2008). Furthermore, Ellram (1992) concluded that high-tech industries such as semiconductors had the highest propensity to form alliances. Last, Kulp et al. (2004)
found that the CPG industry has been a pioneering industry in developing mechanisms that facilitate collaboration between supply chain members.

Collaboration between partners cannot be looked at from only the buyer’s perspective as many do, but requires a dyadic perspective (Johnston et al., 2004). Few studies have incorporated data from both sides of a dyadic relationship (Wasti et al., 2006). We have therefore decided to incorporate both perspectives in our analysis. In all three supply chains, we investigated at least one manufacturer of the products and one retailer to get input from both buyer and supplier. We have selected internationally operating companies. The companies interviewed were located in The Netherlands, Germany and Denmark. Table I provides an overview of the companies and the roles of people interviewed.

Hence, our research design is characterized by multiple sectors, in high-clockspeed industries, with each case including a dyadic perspective.

Based on earlier results published in the literature, we have developed a series of propositions. We believe, we provide a unique perspective as we built our premises not only on prior empirical studies but we have also included the vast amount of analytical modelling studies into our study. These propositions, which will be presented in the next section, have been discussed in 1-1.5 hour interviews on-site with multiple respondents in purchasing, sales and/or supply chain management. During each interview, we first presented the propositions discussed in Section 3 to every respondent and asked every respondent whether he/she agreed with the proposition. While going through the questionnaire, for every proposition we asked the respondents to explain their answer, to describe the extent to which they experienced the issue described in the proposition and to provide an example that would support their argument. All interviews were setup as expert interviews, aimed at identifying reasons for choices of the specific company in the area of supply chain collaboration. Where required, telephone conversations have been held afterwards to discuss additional questions in more detail. Previous research has shown the added value of interviewing

<table>
<thead>
<tr>
<th>Industry</th>
<th>Manufacturer (role of interviewees)</th>
<th>Retailer (role of interviewees)</th>
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<tbody>
<tr>
<td>Fashion</td>
<td>Ladies apparel manufacturer (supply chain director)</td>
<td>General apparel retailer (supply chain manager; merchandising manager)</td>
</tr>
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<td></td>
<td></td>
<td>Underwear retailer (supply chain manager)</td>
</tr>
<tr>
<td>Consumer packaged</td>
<td>Food manufacturer (supply chain manager; account manager)</td>
<td>Grocery store chain (project manager supply chain)</td>
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<tr>
<td>goods</td>
<td>Beer manufacturer (supply chain director)</td>
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<td></td>
<td>Toy manufacturer (VP supply chain management; manager supply chain development)</td>
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<tr>
<td>High tech electronics</td>
<td>Semiconductor manufacturer (VP purchasing; account manager; supply chain development manager)</td>
<td>Electronics retailer (purchasing manager; merchandising manager)</td>
</tr>
<tr>
<td></td>
<td>Electronics assembly company (supply chain manager)</td>
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Table I. Overview of companies analysed in this study and roles of interviewees
multiple respondents in one firm (Goffin et al., 2006; Krause, 1999). We have interviewed 15 people at ten companies: three in the high-tech electronics supply chain, four in CPG and three in the fashion supply chain. All companies are considered leaders in their particular field and are well-known in Western Europe. For confidentiality purposes, the names of the companies are not disclosed.

3. Towards a conceptual model for drivers of close supply chain collaboration

3.1 Market characteristics

Uncertainty is acknowledged to play a pivotal role in supply chain collaboration (Childerhouse and Towill, 2002; Das et al., 2006; Davis, 1993; van der Vaart and van Donk, 2008), and particularly in analytical modelling research (Sahin and Robinson, 2002). Close collaboration in a supply chain under conditions of uncertainty is generally perceived as beneficial. Research on the well-known bullwhip effect (Lee et al., 1997) and studies on outsourcing by Kouvelis and Milner (2002) and Chen (2002) support this. Based on a case study at Royal Philips Electronics, de Kok et al. (2005) found that close supply chain collaboration is particularly effective in highly volatile markets. Cachon and Fisher (2000) developed a model to show that information sharing is meaningful in environments with unknown demand such as promotions or early sales of new products. Lee et al. (2000) discuss how a manufacturer can expect great savings from a partnership with a retailer if demand correlation from period to period is high as it enables a manufacturer to forecast more reliably, or if demand variance within each period is high, particularly if combined with long lead-times. However, Holweg et al. (2005) argue that collaboration reaps bigger benefits in the case of stable demand but that may be related to the fact that they only look at goods flow synchronisation issues. Their findings also seem to contrast with Ragunathan (2001) who shows that if the parameters of the demand processes are known to both the retailer and manufacturer (which may be expected in a situation of stable demand), the added value of information sharing is relatively limited.

Kouvelis and Milner (2002) found that greater supply uncertainty increases the need for vertical integration. The more supply is uncertain, as seen in, for example, lead-time uncertainty, the more companies partner. Chen and Yu (2005) show that the added value of sharing information on uncertainties in supply lead-times is significant. Huang et al. (2003) found, based on literature review, that smaller variance in lead-times leads to a greater benefit of information sharing. This contrast in findings may well be related to the fact that it is the content of what is shared which is important, and how that determines benefits (Li and Wang, 2007).

Not only the variability of demand but also the direction of this variation is important for supply chain collaboration. Kouvelis and Milner (2002) found that if markets are growing, firms are more likely to source internally if the growth is strong and the market is large.

Based on the above, we specify three market-related propositions (Table II).

3.2 Product characteristics

While demand characteristics have been primarily studied using analytical modelling techniques, the impact of product characteristics is the near-exclusive domain of empirical studies. It is generally acknowledged that item criticality plays a key role in
the design of buyer-supplier relations (Kraljic, 1983; Olsen and Ellram, 1997): the more critical an item is, the more a partnership is expected to develop. Item criticality is operationalised by several characteristics, such as importance in terms of the value added by product line, the percentage of raw materials in total costs and their impact on profitability, supply scarcity, pace of technology and/or materials substitutions, entry barriers, logistics costs or complexity, or by monopoly or oligopoly conditions (Kraljic, 1983). Item criticality is further characterised by technical complexity, novelty of technology, frequency of design changes and the level of customisation required (Bensaou, 1999), and short shelf-life and high-item value (Holweg et al., 2005).

Dyer and Ouchi (1993) indicate that partnerships are, amongst others, characterised by unique parts for customers. Dyer et al. (1998) propose a strategic partnership model for customised, non-standard products since this generally requires a relatively high percentage of non-redeployable capital equipment. Athaide and Stump (1999) and Bensaou (1999) found that firms are more likely to engage in bilateral relationships for customised products. Lemke et al. (2003) found that providing a special product, typically tailor-made, was a key partnership construct.

Based on the above, we specify the following product-related propositions (Table III).

### 3.3 Partner characteristics

Literature agrees that the more suppliers have recognized skills and capabilities, possess proprietary technology and are very active in research, the more strategic partnerships are desired (Goffin et al., 2006; von Corswant and Fredriksson, 2002). These capabilities consist of, for example, familiarity of a firm with technology, knowledge and competencies (Chiesa and Manzini, 1998) or technological and design capabilities (Oh and Rhee, 2008). Petersen et al. (2005) found that supplier process and product knowledge were the most important considerations in closely collaborating with suppliers on new product development projects. However, completely relying on

<table>
<thead>
<tr>
<th>Id.</th>
<th>Proposition</th>
<th>Key sources</th>
</tr>
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<tbody>
<tr>
<td>M1</td>
<td>The larger the demand uncertainty and the longer the lead-time, the closer</td>
<td>Cachon and Fisher (2000), Chen (2002), de Kok et al. (2005), Davis (1993), Fu and Piplani (2004),</td>
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<tr>
<td></td>
<td>the supply chain collaboration that is expected</td>
<td>Kouvelis and Milner (2002) and Lee et al. (2000)</td>
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<tr>
<td>M2</td>
<td>Greater supply uncertainty increases the need for closer supply chain</td>
<td>Chen and Yu (2005) and Kouvelis and Milner (2002)</td>
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<td></td>
<td>collaboration</td>
<td></td>
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<tr>
<td>M3</td>
<td>Market growth perspectives lead to less collaboration in supply chains</td>
<td>Kouvelis and Milner (2002)</td>
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**Table II.** Market-related propositions on close supply chain collaboration drivers

<table>
<thead>
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<th>No.</th>
<th>Proposition</th>
<th>Key sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>The more the items are critical, the more close supply chain collaboration</td>
<td>Bensaou (1999), Holweg et al. (2005), Kraljic (1983) and Olsen and Ellram (1997)</td>
</tr>
<tr>
<td></td>
<td>is expected</td>
<td></td>
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<tr>
<td>P2</td>
<td>The more products need to be customised and require unique technological</td>
<td>Athaide and Stump (1999), Bensaou (1999), Dyer and Ouchi (1993), Dyer et al. (1998) and Lemke et al.</td>
</tr>
<tr>
<td></td>
<td>expertise, the closer supply chain collaboration is expected</td>
<td>(2003)</td>
</tr>
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</table>
supplier capabilities bears a danger as well due to erosion of capabilities at a customer, as the collapse of the partnership between Rover and Honda suggests (Pilkington, 1999).

Literature is mixed on how power plays out in long-term relationships (Narayandas and Rangan, 2004). Olsen and Ellram (1997) and Cox (2001) argue that power of a supplier (or equally, a customer) hampers supply chain collaboration. In line with this, Jassawala and Sashittal (1998) found that a more equal distribution of power implies a more collaborative firm. More recently, Caniels and Gelderman (2007) concluded that even in situations that are considered as a strategic partnership, there may be an imbalance in power. In fact, power can be used to promote integration of a supply chain (Benton and Maloni, 2005). Arshinder et al. (2008) stipulate that often, the most effective supply chains have a dominating organisation that sees benefits of supply chain collaboration and forces the rest to comply.

Based on this, we have formulated the following propositions (Table IV).

4. Research findings
During our interviews, we presented the foregoing propositions to each of the interviewees. For each case, we developed a table containing each proposition, recording whether these propositions were agreed with or not, including supporting arguments. This information has been included in the interview records. These records were sent to the respondents for verification and comments. Follow-up telephone conversations have taken place with all respondents to receive comments and if necessary to further clarify answers on propositions.

After the interviews, we first performed data analysis within each case by analysing the findings on each of the propositions for each company. We constructed a table containing propositions, agreement or disagreement, supporting arguments and examples to visualise the interview findings and to determine which of the market, product and process characteristics were influencing close supply chain collaboration. We then performed a cross-case analysis where we first compared results between dyads within each of the three industries and then compared findings across industries. Proposition by proposition, we compared answers to our questions in search of similarities and differences in answers, which we used to describe our findings.

The remainder of this section discusses our findings grouped by market, product and partner characteristics.

<table>
<thead>
<tr>
<th>No.</th>
<th>Proposition</th>
<th>Key sources</th>
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</thead>
<tbody>
<tr>
<td>S1</td>
<td>The more capable a supplier is, the more supply chain collaboration will be</td>
<td>Bensaou (1999), Chiesa and Manzini (1998), Goffin et al. (2006), Petersen</td>
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<td></td>
<td>with that supplier</td>
<td>et al. (2005) and von Corswant and Fredriksson (2002)</td>
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<tr>
<td>S2</td>
<td>The stronger one’s competitive position and hence the dominance of one’s</td>
<td>Benton and Maloni (2005) and Caniels and Gelderman (2007)</td>
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<td></td>
<td>position, the more likely it is that there will be close supply chain</td>
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<td></td>
<td>collaboration</td>
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Table IV. Partner-related propositions on close supply chain collaboration drivers
4.1 Market

4.1.1 Proposition M1: the effect of demand uncertainty. All interviewees agreed that demand uncertainty drives a need for close collaboration. Both electronics manufacturing companies particularly mentioned the long-term uncertainty resulting from business cycles and the resulting drive for close supply chain collaboration to cope with these cycles. The high-tech industry is sensitive to business cycles (Terwiesch et al., 2005).

Both fashion retailers and the fashion manufacturer indicated that those items that are uncertain in demand are items that are manufactured only once and these normally require close collaboration.

The CPG manufacturers and the retailer all indicated that demand uncertainty is mainly caused by new products and by promotional activities, causing “lumpy demand”. One manufacturer said that the promotional activities could generate demand as high as 30 time normal demand. Both the CPG retailer and the CPG manufacturers indicated that they prefer close supply chain collaboration in those situations in order to better plan and manage their activities.

Long-lead times contrast with responsiveness (Fisher, 1997). The longer the lead times are, the less-responsive companies are to market changes. Considerable distortion of information in the supply chain may be the result (Lee et al., 2004). The fashion retailers and manufacturers, the electronics manufacturers and one CPG manufacturer indicated that they are confronted with long-lead-times in the range of 3-9 months between order and actual delivery. Both electronics manufacturing companies we interviewed clearly indicated that it is particularly the combination of long lead times – semiconductor manufacturing easily takes 75-100 days – together with high-demand uncertainty that causes them to be actively looking for close collaboration with partners. Both indicated that they therefore focused on sharing demand information with their partners as much as possible; one of the two manufacturers further indicated that they intended to setup account-focused teams to get to know their customers as well as possible. The fashion retailers indicated that although their lead-times are long, the collaborative efforts through, for example, exchange of forecast information with their suppliers is minimal, mainly due to the lack of capabilities of these suppliers.

The other companies interviewed received deliveries from manufacturer’s stock located in Europe and were hence not experiencing such long lead-times. The CPG retailer indicated that lead-times for ordering products from suppliers were mostly a matter of days.

4.1.2 Proposition M2: the effect of supply uncertainty. Supply uncertainty was only mentioned by the electronics manufacturing companies as an issue affecting supply chain collaboration. Both manufacturing companies indicated that in a situation of a market upturn, demand easily exceeds capacity. The result is that capacity needs to be rationed over customer demand, which leads to supply uncertainty for their customers. To avoid such situations, both companies indicated that they prefer collaborative planning activities together with customers. The semiconductor company specifically mentioned product yield uncertainty as an issue driving collaboration. Owing to the nature of their product, yield in semiconductor manufacturing is variable (Uzsoy et al., 1992) and therefore a source of uncertainty.

The fashion retailers indicated that they experience relatively high-uncertainty in timing of the deliveries compared to other industries. One retailer quoted that about
60 per cent of the deliveries arrive in the week planned; they considered this as a rather low delivery reliability typical for the fashion industry. However, supply uncertainty is no reason to collaborate more closely with suppliers as uncertainty in the quantity of supply of manufacturers is normally covered by means of safety stock or safety time.

In the CPG interviews, supply uncertainty was not mentioned as an issue. Delivery reliability was generally very high-between supply chain partners (the retailer quoted > 99 per cent on time in full delivery as normal, while the manufacturers indicated that 95 per cent of deliveries on time in full is considered normal).

4.1.3 Proposition M3: the effect of market growth. In situations with growing demand that exceeds capacity (the “upturn”), it is important to have agreements with suppliers and with customers about the capacity available and about order fulfilment procedures, according to the electronics manufacturers (Terwiesch et al., 2005). The electronics manufacturers also mentioned that in a “downturn” when demand is much lower than capacity (as in the year 2002-2003) the focus on close collaboration is not as intense as in an upturn as there is sufficient capacity available in the industry during downturns. In those situations, the focus is mostly on reducing costs. The high-tech retailer was not very concerned with the role of business cycles in close supply chain collaboration; companies further downstream in the electronics supply chain do not feel the negative effects of these business cycles as much as the companies upstream.

Market growth was not considered a driving force for collaboration for the CPG companies interviewed. Two out of the three manufacturing companies faced slight growth in their categories and did not experience less or more intense supply chain collaboration with suppliers or customers because of that. The third company faced considerable growth in some categories due to changes in assortment (from standard to much more fashionable); however, this was not considered a reason to collaborate more closely with suppliers.

In fashion, retailers as well as the manufacturer cited that since orders are mostly fixed a relatively long time beforehand and most products are ordered once, market growth does not influence the need for close supply chain collaboration.

4.2 Product
4.2.1 Proposition P1: the effect of product criticality. The high-tech companies all agreed that criticality of items is considered a key driver for supply chain collaboration. One manufacturer indicated that limited availability of alternative products as well as the technical capabilities required for manufacturing a product make an item critical. The high-tech retailer we interviewed indicated that items considered critical are those that do not have substitutes (because of certain technologies used, such as in coffee makers or shavers).

For CPG manufacturers, the critical supplies were either key ingredients or packaging materials. Supply chain collaboration with suppliers for these key items was very close. Suppliers were for example closely involved in developing new packaging materials. All CPG manufacturers covered critical item supply through long-term contracts with suppliers. Manufacturers as well as the retailer indicated that suppliers controlled the replenishment of these items through Vendor Managed Inventory agreements as much as possible.

The fashion retailers indicated they currently work more closely with suppliers of repeat purchase items that are part of the assortment for a long time (the so-called
never out of stock articles). These items were deemed critical and of strategic importance to the assortment.

4.2.2 Proposition P2: the effect of product customisation. Both electronics manufacturing companies mentioned that collaboration with suppliers of customised manufacturing equipment is very close. They indicated that working with equipment manufacturers is critical for the continuous development of new manufacturing technology, which is in turn critical for developing new products. Both manufacturers also indicated that every time their clients launch a new product such as a mobile telephone, this client has the choice to switch suppliers for the development and manufacturing of a product (the “design-in” phase). For example, chipsets need to be developed especially for a mobile telephone. For the duration of the life cycle of such a product, the customer is then “locked” into the supplier for the supply of chipsets. As they expect the probability of such lock-ins be increased when collaborating closely, suppliers try to keep strong relations with their clients in order to remain as supplier for future products. Since product life cycles are relatively short, there are many supplier selection opportunities.

Two CPG manufacturers indicated that particularly the packaging of their products is customised for private label brands, which was acknowledged by the retailer. Most raw materials used are standard products. The manufacturers indicated that it is particularly the uniqueness of the capabilities of a supplier required to customise a product that drive the need for close supply chain collaboration.

The fashion retailers and the manufacturer indicated that product customisation was not a specific reason to work closely with suppliers, but that was due to the fact that all products were considered customised as they were all private label brands.

4.3 Partner

4.3.1 Proposition S1: the effect of supplier capabilities. All companies interviewed indicated that supplier capability is a key factor for intense supply chain collaboration. In the high-tech cases, collaboration was important with suppliers of key products for which there was no expertise in house (e.g. masks or wafer steppers). Both high-tech manufacturers indicated that it is the uniqueness of capabilities combined with the availability of these capabilities that drives the need for close collaboration.

In CPG, all interviewees indicated that innovative capabilities of suppliers play a key role in the intensity of supply chain collaboration. One manufacturer indicated that they work very closely with those suppliers who can improve product packaging. Because of fast evolving packaging materials and packaging types, new technology is needed frequently to accommodate new packaging methods. Another CPG manufacturer indicated that considerable savings in supply chain costs could be achieved by optimising packaging design. Close supply chain collaboration with suppliers who can provide such innovative capabilities was therefore deemed critical.

In fashion, the retailers all mentioned that they perceive roughly two types of suppliers: innovative suppliers that have a strong influence on the product assortment of the retailer (they develop/design products) and the “capacity oriented” suppliers where design and development activities are initiated by the retailers (i.e. suppliers only “build to print”). It was indicated that it is the intent to have strong relations with innovative suppliers. One of the fashion retailers mentioned that the lack of capabilities of their suppliers was currently inhibiting close supply chain collaboration with them.
4.3.2 Proposition S2: the effect of competitive position and dominance. Interestingly, all manufacturers agreed that their customers were more powerful than they are themselves. In high-tech, it was indicated both by the manufacturers and the retailer that it is the downstream party who mostly initiates collaborative relationships. The two manufacturers indicated that they were undertaking efforts to involve customers in collaborative activities, though it was still in an early stage and not as elaborate as with their suppliers. It was perceived that it is easier to foster change with suppliers than with customers, as suppliers were perceived to be more easily accessible. One high-tech manufacturing company argued that a situation of power imbalance is preferred: power balance leads to interdependence between customer and supplier, which in turn may result in inertia since suppliers expect customers to help and vice versa. This inertia leads to situations where companies expect the other to start with changes – and nothing happens in the end.

In CPG, all companies argued that retailers determine the way in which collaboration is executed. Retailers go as far as describing protocols for ordering methods, exchange of information and other information and goods flow-related processes (see also for example the often described case of Wal-Mart (Gill and Abend, 1997). The manufacturers argued that particularly in the case of promotional actions, retailers want to collaborate with suppliers to make a plan together (which is also to prevent stock-outs on the shelves and therefore in the retailer’s interest). In fashion, the retailers indicated that they take the initiatives towards supply chain collaboration but suppliers are not always able to follow this up due to lack of collaborative capabilities. Also here, all interviewees argued that a situation of interdependence is not desirable but that a power imbalance is preferred to setup collaborative initiatives.

5. Discussion
5.1 What drives close supply chain collaboration?
The interview results and the subsequent synthesis show that a multitude of factors drive supply chain collaboration. For example, it is not only the criticality of an item that leads to close collaboration with suppliers; but also the competences and capabilities of suppliers play a role. Our study confirms that multiple interrelated factors are required in order to give satisfactory explanations, as suggested by Goffin et al. (2006) and Vereecke and Muylle (2006). These factors may have a direct or an indirect effect on supply chain collaboration and sometimes both. Section 4.3.1 discussed how unique supplier capabilities directly lead to close supply chain collaboration as suppliers have unique competences that are not available elsewhere. This also results in limited availability of product substitutes and hence to item criticality, which positively influences the need for supply chain collaboration. Dealing with this multitude of effects calls for a better integration of analytical and empirical studies: market characteristics are typically the domain of analytical studies whereas empirical supply chain collaboration studies mostly focus on partner and product characteristics.

Our research results furthermore provide an indication that close supply chain collaboration initiatives are predominantly targeted towards suppliers, instead of also customers. Although aspects such as power do not necessarily differ between relations with suppliers or with customers, our findings suggest that companies perceive it as easier to setup initiatives with a supplier than with a customer. This may be related to
a perceived ease of doing business with a supplier whom you pay for products and/or services compared to a customer to whom you need to sell products and/or services and collect money from. Further research on supply chain collaboration is required from the perspective of suppliers towards their customers as to-date most research initiatives are focused on collaboration from the perspective of a buying firm.

Finally, close supply chain collaboration may have adverse effects. We found that close supply chain collaboration between companies may lead to a level of comfort that can cause inertia: suppliers may wait for customers to take initiatives to improve, and vice versa – with nothing happening in the end. Such a lock-in reduces possibilities to switch partners in the case of performance that is not up to par. This finding supports the statement of Das et al. (2006) that there are diminishing returns in investments in integration between entities in a supply chain.

5.2 Conceptual model
The previous section identified the need to explain the inter-relationships that exist between close supply chain collaboration antecedents. There is a need to categorise the antecedents and to explain the interrelationships between them. We have therefore developed a conceptual model to explain the antecedents of close supply chain collaboration (Figure 1).

Our conceptual model is based on six core variables in three categories. The need for close supply chain collaboration is first influenced by market characteristics. The two central issues pertain to demand uncertainty (M1) and supply uncertainty (M2); trade promotions at retailers, which are common in CPG, lead to lumpiness in upstream

![Figure 1. Conceptual model of market, product and partner characteristics that influence supply chain collaboration](image)

**Notes:** "+" implies a positive relation between two variables; "−" implies a negative relation.
demand and therefore high levels of demand uncertainty. This is aggravated by long supply lead times, particularly if combined with short product life cycles, as for example in the high-tech industry where many products are sourced from, for example, Asia. In addition, the further a company is upstream in a supply chain the stronger the bullwhip effect will be (the first law of supply chain dynamics, Fine (2000)); upstream companies feel the negative effects of business cycles more strongly than downstream companies (Terwiesch et al., 2005). Therefore, the upstream position in the supply chain will also influence demand uncertainty. Supply uncertainty is driven by uncertainty in lead-times of supply, in yield (which is common in, for example, semiconductor manufacturing, Uzsoy et al. (1992)) and in situations where demand exceeds capacity. Market growth may entail in (temporary) situations of demand exceeding capacity and therefore the need to allocate capacity or output over customers in quantities different from that which has been ordered. This leads to uncertainty in supply for customers as their orders may deviate from the quantities shipped. Upfront collaboration in such situations has proven to be effective in order to mitigate lost sales and/or stock-outs as much as possible (de Kok et al., 2005).

It has been argued often that close supply chain collaboration is not meaningful for every product; only critical items should be the topic of a partnership (Kraljic, 1983; Olsen and Ellram, 1997); this is the first product-related driver (P1). Since literature has detailed aspects of item criticality extensively already, we have not detailed the drivers of item criticality in Figure 1. Our study showed for example the importance of supply materials in the end product as well as product innovativeness; in the semiconductor industry, high-mask quality is important for the quality of the end product and therefore masks are deemed critical. The second product-related driver of close supply chain collaboration is product customisation (P2): the more an item is customised by suppliers, the more that close supply chain collaboration is expected, as in the design of, for example, customised packaging for CPG manufacturers. However, this requires the necessary capabilities on the side of the supplier as well.

Bensaou (1999) indicated that the dominant partner characteristics mainly pertain to capabilities and skills of the suppliers (S1) in the process from development to manufacturing of products. There is a direct effect and an indirect effect: more capable suppliers not only lead to closer collaboration directly as in the case of for example the packaging materials in CPG we discussed, but also there is an indirect effect through dependence, which is the second key driver of close supply chain collaboration (S2). More capable suppliers lead to more dependence on these suppliers, which may be mitigated by the availability of multiple capable suppliers. Also, power influences dependence: in situations where there is a clear dominant partner one party takes the lead to develop collaborative initiatives, as for example in CPG. Last, situations where demand exceeds capacity lead to dependence on suppliers, as supplier output needs to be rationed over customers; this calls for close supply chain collaboration to avoid the potential negative effects of, for example, shortage gaming (Lee et al., 2004) that may occur in such situations.

6. Conclusions and recommendations
In this paper, we set out to define the context for close supply chain collaboration and to discuss how characteristics of products, partners and markets lead to the need for close supply chain collaboration. In general, there is no coherent view in the literature
as to the conditions for close supply collaboration, partnerships or terms alike. Though a large body of research has identified models with few variables explaining the potential for supply chain collaboration, this research further supports the suggestion that multiple variables are required to investigate supply chain collaboration as suggested by Goffin et al. (2006) and Vereecke and Muylle (2006). We have postulated a conceptual model that can be used as a framework for determining the appropriateness of close supply chain collaboration. Our research shows that there is not just one combination of market, product and partner characteristics that drives close supply chain collaboration; one size does not fit all, but rather, many different combinations may lead to close supply chain collaboration. Further research is necessary into which factors typically occur together in which combination, which may ultimately lead to a typology of collaboration situations.

Our findings call for an approach where the results of analytical and empirical studies are better integrated. Historically, analytical modelling research has focused on the effect of market characteristics on supply chain collaboration, notably demand and supply uncertainty. The effect of product and partner characteristics has been the focus of the empirical and more managerially oriented domain. Cross-fertilization between these research domains is necessary. Empirical models need to incorporate the role of, for example, uncertainty and analytical modellers should think about ways to incorporate aspects of products or partners into research, e.g. through modelling differences in capabilities of suppliers through lead-times differences or through variation in resulting product quality.

Furthermore, our research results suggest that there is a tendency to target close supply chain collaboration initiatives towards suppliers, but not towards customers. Given the strong focus of current supply chain collaboration research from the perspective of the buying firm, future research needs to incorporate the supplier perspective on supply chain collaboration more explicitly.

Finally, we have observed that there are limits to close supply chain collaboration, even when conditions are favourable. Owing to lock-in of partners, close supply chain collaboration may lead to inertia in a relationship and therefore lack of progress in a partnership. A situation where companies always have a choice between partners may keep parties more focused on their partnership.

Our research is limited by the fact that we have predominantly looked into collaborative efforts in make-to-stock (MTS) environments. Sahin and Robinson (2002) argue that information sharing in make-to-order (MTO) renders more savings than in MTS; it may well be therefore that in MTO environments factors that influence close supply chain collaboration are somewhat different. This requires further research. Furthermore, we have not elaborately tested our conceptual model using a large-scale survey in different industries; this could be a topic of further research. What we have not covered here either are the factors that determine collaborative success once a company has been identified as “potential partner”. As argued by Goffin et al. (2006), issues that then become relevant comprised, for example, cultural and behavioural aspects. Other prerequisites for success are that effective external collaboration requires effective internal collaboration first (Das et al., 2006; Stank et al., 2001; Takeishi, 2001).

Based on this research, firms can better understand the effect of environmental characteristics on the need for close supply chain collaboration. Choices for supply
chain partners can be better grounded if market, product and partner characteristics are taken into account.

References


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