Supplier Innovation & Strategy: Performance Implications of Dependencies and Trust in the Supply Chain

Abstract

Suppliers are specifically confronted by contingencies downstream the supply chain. We research how dependency of the manufacturer and up-stream directives influence suppliers' performance and their opportunities to follow own strategies. We also research the role trust plays in the nexus of dependency, up-stream directives and strategies. Our empirical study on 249 IT companies reveals that relative power reduces the formulation and implementation of innovation and collaboration strategy. However, trust in the relationship between the supplier and the manufacturer can enable strategies and improve performance.

1 Introduction

The creation of value through supply chain integration has become an important avenue for the achievement of competitive advantage and improvement of performance, as competition often occurs stronger among supply chains as between organizations (Li, Ragu-Nathanb et al. 2006). Supply chain partners are increasingly interested in innovation investment (Gilbert and Cvsa 2003) and have extended their new product development (npd) activities across organizational boundaries (Quinn 2000; Wagner and Hoegl 2006). Recent research shows that innovation in supply chains is increasingly based upon suppliers' activities (Huemer 2006). In the pursuit of performance and innovation, manufacturers as such are increasingly turning to suppliers to access product or technology and complement their supply chain with innovation. Studies show that

greater involvement of suppliers improves the producers' innovation (Afuah 2000) and increases manufacturer's financial performance (Carr and Pearson 1999).

Especially firms who are not self-sufficient with regard to their resources (Pfeffer 1982; Sheppard 1995) can improve innovation processes up- and downstream in the supply chain by utilizing the specific expertise of supply chain partners. The inclusion of partners across the value-stages permits appropriate and timely feedback to the product design that allows the innovation process to increase both in speed and market success. Despite these benefits, firms in supply chains have to overcome several problems. For example, strategic supply chains may encounter performance "glitches" or the inability to meet customer demand (Hendricks and Singhal 2003).

Even though SCM potentially creates value for all members in the chain (Flint, Woodruff et al. 1997) the value varies among partnering chain members (Agrawal and Pak 2001). In this regard, most of the existing literature on supplier involvement has focused on the (mostly operational) implications for manufacturers (e.g. Holland et al., 1992). Research has so far greatly neglected both the implications of increased supplier integration in supply chains on the supplier as well as its potential dysfunctional effects (Macbeth 1994; Brennan 1997).

Suppliers are specifically confronted by frame-setting activities of manufacturers that are set up to coordinate a multi-partner supply process. Manufacturers need to manage the integration of numerous components from different suppliers to a coherent innovation. New product concepts have to be aligned with existing interfaces in both directions of the supply chain (up- and downstream) in order to successfully diffuse into the market. In the pursuit of achieving coherent innovation, manufacturers formulate precepts related to product and process objectives, frame specifications, and target prices. These presets can range from more informal and flexible suggestions to tight and formal precepts on up-stream suppliers. We refer to up-stream directives

as the tight and formal precepts on suppliers. Coordination through up-stream directives facilitates the integration of innovations delivered by several firms into a manufacturer's product concept. On a more general level, manufactures can aim on increasing their relative power over suppliers. Higher dependency of suppliers on the manufacturers increases the freedom of action and performance of manufacturers. As such, suppliers are not self-determined or acting in autarky but are dependent on the supply chain context.

Up-stream directives and dependency can hinder the unleashed idea generation, expertise, and experimentation activities of suppliers. This can be dangerous as firms in the supply chain need more than mere product improvements. They need qualitatively good innovations, which rely on encouraged members in the innovation supply chain for their generation (Desbarats 1999). A prominent example of the innovation-inhibiting effects of supply chain integration on suppliers is provided by the hard-disk drive case (Christensen and Bower 1996): The historical analysis shows how established suppliers regularly failed against market entrants in case of disruptive innovations because of their focus to addressing incremental needs of existing customers. Accordingly, suppliers may inherit their championship position only for the duration of a product life cycle. The fulfilment of ex-ante defined innovation goals by up-stream directives and increased by relative power of the manufacturer reveals not be sufficient to ensure long-term success, because customer as well as supply-chain requirements may change over time.

Still, prior research has neglected the existence of such rigidities of the supply chain on suppliers' performance. This study aims to reduce this research gap; we will investigate the effects of up-stream directives and relative power on suppliers' performance. We not only examine the supply chain rigidities-performance-link but as well the intermediate effect of supplier's strategies as we

argue that suppliers can pursue a more inward and/or and more outward strategy when they want to manage the supply chain rigidities.

2 Theory

This study follows a contingency theory approach to explore how supply chain contingencies may influence strategies and performance of suppliers. Literature suggests that trust relations and power dependence are the two dominant and distinct dimensions in buyer-supplier-relationships (Tangpong, Michalisin et al. 2008) and that they jointly exert a counter-balancing influence on efficient supply-chain collaborations (Handfield and Bechtel 2002; Ireland and Webb 2007). This states the scope of our investigations as a) the relative power position of the manufacturer on the supplier; b) the level of specific up-stream directives, which manufacturers set over the innovation targets of the supplier, c) and the level of trust between supplier and manufacturer as a counter-balancing force and enabler for supplier action. First, we investigate the limiting effects of both modes of dependencies within the supply chain. Following this, we discuss the possibly counterbalancing effects of trust as enabler for strategic options of suppliers.

2.1 Innovation Dependencies within the Supply Chain

Processes in the supply chain include those involved in producing a final product or service by suppliers and delivering it downstream the supply chain to manufacturers, distributors, and consumers. The supply chain aims for increased value at less cost to all participants (Christopher 1998; Jüttner, Christopher et al. 2007). Innovation generation in a supply chain involves changes in product, process, or service (Makhija 2003; Roy, Sivakumar et al. 2004). Innovation

performance in the supply chain hinges on the supplier's resources and capabilities as well as the relationship and coordination between collaborating firms (Wagner and Hoegl 2006). With the integration of suppliers into the innovation process, innovation improves through sharing of technological expertise and by timeliness of information. In this regard, manufacturers have established formal or semi-formal links to their suppliers to better predict and control resource flows and therefore manage self-sufficiency (Stock 2006). As manufacturers often use their relative power over the supplier to channel the link to suppliers, we specifically research the perceived dependency of the supplier on the manufacturer on a general level as well as the effects of specific up-stream directives on the innovation activities of suppliers.

2.1.1 Relative Power Position

Relative power is the ability of the first actor to induce the other actor to change its actions or decision in favor of the objectives of the first actor (El-Ansary and Stern 1972; Ganesan 1994). In a supply chain setting, the manufacturer's (buyer's) relative power has been defined as the amount of influence the manufacturer has on the supplier's operation. This subsumes the extent to which the manufacturer can command conditions to the supplier and the degree to which the supplier yields to the manufacturer's recommendations (Morgan and Hunt 1994).

The more the supply-chain relationship is governed by manufacturers´ use of power and the supplier perceives dependency respectively, the less collaborative and more restricted the relationship is perceived by suppliers (Dwyer, Schurr et al. 1987; Frazier, Grill et al. 1989). Perceived dependence on single manufacturers is likely to foster new product development tailored to their specific needs, which in turn leads to more incremental solutions (Fischer and

Reuber 2004) and ultimately causes a more passive view on innovation activities from the supplier. Thus it has been shown that a high dependency on single customers exerts a negative impact on their own independent new product development activities (Yli-Renko and Janakiraman 2008). In addition, there are manifold cases which report a high reluctance of suppliers to actively engage in innovative activities in case of (negatively) experienced power dependencies (Sako and Helper 1998; Maloni and Benton 2000). Especially transactional behavior of powerful manufacturers led to supplier resentment and a lack of synergistic improvement within the supply chain.

Hypothesis 1a: The stronger the dependency of the supplier on the manufacturer, the less innovative is the supplier.

A weaker power position and a high dependency on manufacturers initiatives can thus lead to a negative reinforcement loop: suppliers may reduce their level of innovation initiatives due to perceived restrictions, thus leading to decreased own value contributions and finally a loss of uniqueness in their products and services. Both effects may well lead to arms-length relationships between suppliers and manufacturers in which products and services of the supplier become inter exchangeable. In such a setting, business relationships between both parties are likely to obtain a less relational and more transactional character, leading to a decreased customer loyalty (Kaufman, Wood et al. 2000).

Hypothesis 1b: The stronger the dependency of the supplier on the manufacturer, the smaller is the customer loyalty perceived by the supplier.

2.1.2 Directives

Relative power of the manufacturer as such may limit the supplier's actions in general and in innovation processes in specific. In this regard, manufacturers may well go one step further in exerting operative influences on supplier activities by laying down specific precepts for new product development outcomes.

Within the idea of supply chain management, consumer expectations define the activities of design, re-design, and innovation along the supply chain (Christopher 1998). Manufacturers are generally closer to downstream partners and consumers than suppliers and therefore conceptualize product designs. Even though suppliers have expertise and give inspiration for new technology, most often a manufacturer's product concept guides the formulation and selection of components delivered by suppliers. When bridging innovation components across organizational boundaries, manufacturers have to synchronize the inputs from different suppliers. When improving up-stream innovation and seamless fit, manufacturers exert precepts such as objectives, orders, and guidelines related to technology, design, interfaces, and product logics to their suppliers. We refer to tight and formal precepts as up-stream directives. The up-stream innovation process includes pre-contract meetings (Dwyer, Schurr et al. 1987) in which directives are set. Manufacturers translate the latent or virulent expectations of consumers into a product concept that is decomposed and integrated into up-stream directives. Up-stream directives results from the manufacturers' need to manage the integration of numerous components from different suppliers to a coherent innovation. Up-stream directives manage the resource interface and interdependency with suppliers (Pfeffer 1982; Sheppard 1995) and help to coordinate the multi-supplier innovation process.

Up-stream directives might allow suppliers to bundle their strength and straightforwardly integrate their components in manufacturers' products designs reducing unnecessary sidetracking and cost. Harmonized tasks and procedures that are planned suitably in advance and within the whole supply chain will increase suppliers' performance. Up-stream directives force suppliers to accept responsibility for development, design, integration, manufacture, qualification, delivery, target performance and quality of their particular systems, subsystems or airframe items according to the targets (Wagner and Hoegl 2006). This can improve the performance of suppliers.

Hypothesis 2a: Well-specified up-stream directives increase the competitive performance of suppliers.

The increased coordination through up-stream directives facilitates the integration of innovations delivered by several firms into a manufacturer's product concept. The innovation then provides benefits along the entire supply chain (Gilbert and Cvsa 2003). Such pre-specification of innovation outcomes by up-stream directives support the diffusion of innovations, as it ensures a fit of component properties as well as its interfaces. This is especially relevant for OEMs who function as system integrators, as e.g. the IT or automotive industry. The corridors or targets set up through up-stream directives help to line up and synchronize the technological developments from several suppliers. However, when suppliers perceive up-stream directives it can hinder their unleashed idea generation, expertise, and experimentation activities and as such radical innovation. Radical innovations are dramatically new developments of knowledge in terms of product performance, process technology, or substantial cost-saving technology and include a high amount of new knowledge, risk and uncertainty (Utterback and Abernathy 1975); Liefer et al., 2000). Such innovations require creative new ideas. Up-stream directives can restrict and

narrow a supplier in his pursuit of technological breakthroughs thus limiting the exploitation of their technological development expertise and in turn reducing the likelihood of achieving radical innovation. The perception of up-stream directives can also generate a climate of domination and distract suppliers from their creative processes. This may constitute a severe backslash as creativity has been described as the cornerstone of organizational change and as a key to organizational effectiveness (Woodmang, Sawyer et al. 1993; Amabile, Conti et al. 1996).

Hypothesis 2b: Well-specified directives decrease the innovativeness of supplier product developments.

2.1.3 Trust as an Enabler for Strategic Options of Suppliers

Trust is a widely researched and well recognized enabler of inter-organizational processes. The slow and sustained process of trust building improves interactions in firms' relationships (Gambetta 1988). The degree of trust specifically influences the scale and scope on which organizations interact (Dodgson 1993; Athaide, Meyers et al. 1996). Moreover, as Gundlach et al. (1995) stresses, firms which pursue "stable, long-term exchange relationships have to evolve a governance approach that avoids the uncertainty, conflicts, and opportunism of market transactions.'' Relational norms and trust are such governance elements which can increase the commitment of supply chain partners. Relational norms, predominantly trust, are critical to solidifying the relationship across supply chain partners and lay the foundation for continued interaction. High trust establishes a solid exchange relationship and a reduced risk of opportunistic behaviour of the partner. The positive effects of trust on inter-organizational relations and on supply chain performance are widely recognized (Currall and Inkpen 2002; Koka and Prescott 2002; Cousins and Menguc 2006). Trust functions as a "relational lubricant" to

enable interorganizational innovation processes with various aspects like knowledge transfer and joint learning (Nahapiet and Goshal 1998). Trust does affect collaboration outcomes directly and furthermore acts as an enabler of inter-organizational processes. In this regard, empirical studies show that trust is not only linked to enhancing joint operational processes but as well as to strategic processes as shared planning (Johnston, McCutcheon et al. 2004). According hereto, we expect trust to operate as an enabler of strategic action of supplier.

Hypothesis 3a: Trust within supplier-manufacturer relationships enables suppliers to manifest strategies for their business activities.

We argue that suppliers can improve their performance and the alignment with supply chain if they follow formal strategies. Two strategies are of major importance in this case. An inward orientated innovation strategy and an outward orientated collaboration strategy. The innovation strategy allows a supplier to develop more novel products and thus be less dependent from a specific supplier. A collaboration strategy instead is formed to improve the relationship and exchange with the manufacturer.

We assume that trust acts as an enabler of both inward orientated innovation strategy and outward orientated collaboration strategy. The importance of inter-organizational trust is clearly evident for creating collaboration strategies as it constitutes a precedent of joint action. While innovation strategy gains from trustfully input from the customer side in order to ensure market orientation, this aspect is however less important for specifying company-internal R&D objectives. Nonetheless, trust supports the foundations of innovation strategies: while explicit customer knowledge may be transferred without trust, the transfer of tacit components requires partner trust (Sherwood and Covin 2008). Trust is particularly relevant if a mutual understanding on

process-related issues is needed, which regularly existent in integrated supply chain product development. Accordingly, relational embeddedness showed a positive effect on suppliers' new product development which even offset negative effects of suppliers´ dependency on single key customers (Yli-Renko and Janakiraman 2008). To conclude we expect that trust is needed for both modes of strategy formulation but that the effect from trust on the strategy-building capabilities of suppliers differ between strategy types:

Hypothesis 3b: The enabling effect of trust on strategy formulation is larger for the design of collaboration strategies than for the definition of innovation strategies of a supplier.

2.2 Innovation Strategy

Innovation activities are inherently risky undertakings. Yet, commercially successful radical innovations are often the foundation of firm performance and growth (O'Connor et al., 2004, p. 34). Thus, innovation is a core strategic endeavour: High degrees of freedoms coincide with the possibility of radical changes, thus calling for a broad perspective in goal setting. Planned courses of action have to encompass both a variety of environmental factors as well as cross-functional integration of capabilities within the company. Finally, resources have to be allocated while tasks are less structured and of higher uncertainty than routine work.

Firms can improve their innovation outcome by following an explicit innovation strategy. We refer to strategy as a pattern in a stream of decisions that include a commitment to actions and resources (Mintzberg 1978). Like other strategies, an innovation strategy can be regarded as a timed string of conditional resource allocation decisions to achieve specific goals (Ramanujam and Mensch 1985). Commonly, an innovation strategy is understood as a description of a firm's

innovation position with regard to its competitive environment in terms of its new product and market development policies (Dyer and Song 1998). It can provide a lasting guideline for innovation activities, ensuring its market orientation and its fit with overall business objectives. By this means, it should contribute both to new product success and to customer satisfaction, leading to an overall increase in company performance.

Hypothesis 4a: A stronger innovation strategy improves the performance of suppliers.

Trust was assumed to increase the potential for suppliers´ innovation strategies. Instead, up-stream directives will have opposite effect on development, formulation, and pursuit of an innovation strategy by the supplier. Up-stream directives cover specific presets of new products and development process. Managers accordingly state that they are "in a constant struggle with dominant customers to maintain control over the direction of innovation" (Fischer, Reuber 2004, p. 691). Suppliers that obey up-stream directives have to invest time and resources to closely follow the precepts that deviate from the cornerstone of their own strategic innovation activities. Ultimately, the supplier may become "customer compelled" (Day 1999) by strictly obeying current and short-term customer wishes, even at the expense of company's long-term product portfolio. Under conditions of binding directives the supplier has thus few chances to follow his own strategic innovation targets.

Hypothesis 4b: Well defined up-stream directives limit suppliers' innovation strategy.

2.3 Collaboration Strategy

Studies indicate positive effects of supply-chain collaboration on manufacturer's radical innovation (Afuaha and Bahram 1995; Afuah 2000). Positive effects on performance, innovation and customer orientation emerge in different stages of integration: If manufacturers involve the

supplier early in the innovation process, (Petersena, Handfieldb et al. 2005) it is generally less costly and difficult to make changes to the specifications of components than later in the innovation process (Crawford and Di Benedetto 2006). Moreover, the supplier involvement by the manufacturer in the design stage allows the supplier firm to assure that it will be able to deliver the required components, and to invest in equipment, tools, and training when necessary. The close interaction of manufacturers and suppliers in product design further reduces the risk of design errors, and the danger that the supplier will have to make costly changes downstream in the innovation process. Increased supplier and manufacturer interaction in the testing stage is an additional option to improve the innovation, as is allows to implement better information about the needs of the customer and to implement changes that increase customer satisfaction (Bleakley 1995). A formal collaboration strategy ensures that suppliers achieve higher and better interaction with the manufacturer. As buyer-seller relationships develop over time and experience, action steps need to be coordinated in order to achieve long-term positive feedback loops (Dwyer, Schurr et al. 1987). A collaboration strategy orchestrates suppliers´ action and ensures its positive support on overall company objectives and improves the supplier-customer interface that will, as stated before, improve innovation, customer loyalty, and performance of suppliers.

Hypothesis 5a: A stronger collaboration strategy improves the performance of suppliers.

Even though trust is a fundamental and enabling factor of a collaboration strategy, the effect of relative power on supplier's freedom to develop a collaboration strategy is not clear. On the one hand side, greater dependency increases the need of suppliers to improve the relationship with their manufacturers. A vehicle to improve interaction is a collaboration strategy which defines coordinated action steps in vertical relationships. On the other hand side, higher relative power that reduces the freedom to operate of the supplier will limit a trust-laden collaboration strategy

and will hinder the strategic relationships between suppliers and manufacturers. We consider both effects and assume that the negative effect of relative power on the collaboration is dominant.

Hypothesis 5b: Greater dependency of the supplier on the manufacturer will limit suppliers' collaboration strategy.

3 Empirical Study

3.1 Sample and Data Collection

The population for the survey consists of 249 supply companies operating in the German IT industry. We selected this particular industry for several reasons: it is a fast moving industry in which firms have to be continuously innovative; product life cycles in the IT industry are becoming shorter and firms have to provide major innovations in decreasing intervals to sustain their competitive advantage; the use of supply chain management is common in the IT industry, so it is predestined for our research.

Prior to the data collection in 2008, we discussed and readjusted our scales on strategies and up-stream directives in a workshop with 12 academics and 7 supply chain managers. Afterwards, the items were used in a pilot study of 17 executives of small and medium sized suppliers in the IT industry. These steps induced changes of our scale. We then presented our questionnaire to middle managers in the R&D field. Respondents were asked about their firms´ interactions with their most prominent manufacturing client. We restricted our mailing to small and medium sized suppliers. After we received responses from R&D middle managers, we asked the respondents about second informants in their firms knowledgeable of the firms' performance, typically senior executives. Not every firm answered to our second request.

3.2 Measures

We used a multi-measure approach to operationalize our theoretically derived constructs. Our model incorporates the supply-chain dependencies by three exogenous constructs, suppliers´ strategy by two intermediary constructs and resulting suppliers´ performance by three distinct success measures. Depending upon the assessed complexity of the construct and its establishment, three to five indicator variables were used to measure the specific construct (see also table 3). All responses were provided on five-point Likert-type scales.

We regard to dependency as the perceived power of the manufacturer on the supplier in the exchange relationship (Tangpong, Michalisin et al. 2008). We used three items in order to assess the relative strength respectively weakness of suppliers´ power position within exchange processes: The extent of suppliers´ unique contributions within the supply chain indicates a strong power potential. The perceived relative bargaining position in client negotiations investigates ongoing power interactions between both partners. Finally, a strong sign of one-sided dependence is provided by coercive reactions, i.e. if the supplier needs to follow his client's precepts even if they seem inappropriate for him. In sum, these measures add up to a power assessment from the perspective of the supplier. The scale was estimated with a Cronbach´s alpha of .577.

Manufacturers have to set up-stream directives such as targets, frame specification, objectives and guidelines to ensure the fit of the supplier's input to the final product. We were interested in how much the supplier's scope of action is limited by manufacturer's up-stream directives. We

differentiate clients-driven product determination as technical, design-driven versus encompassing the whole concept of the product. As we were not interested in loose suggestions but only in specific directives, we sharpened the statements to ensure that respondents understood the very binding nature of the directives. The items were pre-tested in a pilot study to check their content validity and terminology. The scale was estimated with a Cronbach´s alpha of .870.

Our construct of trust refers to the inter-organizational trust in a vertical alliance. We base on a categorization specifically applied in supply-chain collaborations (Johnston et al, 2004) which differentiates clients´ benevolence and dependability as focal dimensions of trust. We assess benevolence both from an ex-ante perspective, whether the client seems to have an honest interest that the suppliers´ business is successful, and from an ex-post perspective of experienced trustworthiness. Dependability is assessed by the degree that the client keeps up with his promises and that he always acted reliable in prior transactions. The scale was estimated with a Cronbach´s alpha of .893.

Our construct of innovation strategy directed the extent to which the firm follows an explicit and formal innovation strategy. Due to a lack of research on innovation strategies in the supply chain management, we created a new scale in the expert workshop. We pre-tested these items in a pilot study to check their content validity and terminology. The final six items refer to: How strongly do you agree on: a) we have definite innovation targets, b) we have a clear innovation strategy, c) our innovation activities are embedded in a long term strategy, d) we derive innovation targets from a systematic analysis, d) we derive our innovation project from our innovation strategy, and e) our idea management is guided by our innovation strategy. The scale was estimated with a Cronbach´s alpha of .896.

Our construct of collaboration strategy directed the extent to which the supplier follows an explicit and formal vertical collaboration strategy. In order to compare both strategy types, we referred to the items applied to assess innovation strategy. Four items could be identically mirrored. The fifth item (e), which stressed a typical deficiency of innovation strategy, needed a different focus: While idea management was perceived to be of special importance for guiding the innovation strategy, the need to systematically control and adjust collaboration strategy was perceived as strategic aspect for collaboration strategy. This again was discussed in a workshop and pretested in a pilot study. The scale was estimated with a Cronbach´s alpha of .905.

We define innovation success as the extent that fundamental changes in new products were achieved. We purposefully excluded incremental innovations as they are likely to be specifically designed for the manufacturer clients and thus are unlikely to provide potential for a long-term positioning of the supplier. We follow concepts of Dewar and Dutton (1986), Tushman and Anderson (1986), and Ettlie et al. (1984) and Salomo et. al. (2008) to assess major changes and asked how strongly respondents agree with following statements: The majority of our innovations a) are breakthrough developments, b) are difficult to be substituted by products of other firms, c) are new technological developments, which make old technology obsolete, d) have idiosyncratic benefits over those of competitors. The scale was estimated with a Cronbach´s alpha of .785.

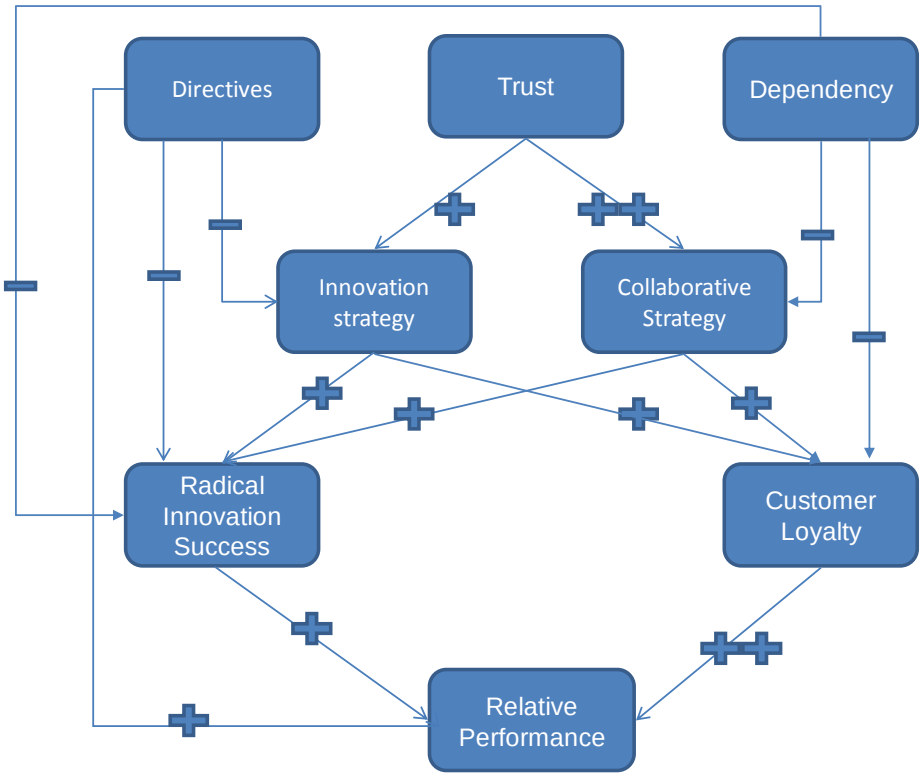
Our construct of achieved customer loyalty bases on three indicators. To address the current customer satisfaction, we asked whether products and services fully meet clients' expectations (Lam, Shankar et al. 2004). The mid-term market performance is indicated by the experienced loyalty of customers (Zeithaml, Berry et al. 1996). Finally and more far reaching, one item

measures the degree of acquired reputation at the client (LeBlanc and Nguyen 1995). The scale was estimated with a Cronbach´s alpha of .756

A firm's performance is multidimensional in nature and scholars have expressed the need to use multiple measures (Venkatraman and Ramanujan 1986). For that reason our performance measure probed subjective and objective data. For the subjective performance data we drew on the scale by Deshpandé, Farley and Webester (1993). The senior executives were asked to evaluate the firms' performance in comparison to their principal competitors' performance with regard to their a) sales volume, b) market share, c) return on investment, and d) the whole competitive position. Additionally the executives were asked to give precise quantitative, objective data measured as a) sales, b) growth in sales and c) return on investment. Unfortunately the executives were more open to questions on subjective than specific or objective data. For that reason we tested the model using the subjective data on firms´ performance derived from the senior executives. Many researchers have found a high correlation between subjective and objective data (Venkatraman and Ramanujan 1986). The scale was estimated with a Cronbach´s alpha of .849.

3.3 Method

We verified our hypotheses by Structural Eqution Modelling (SEM). Figure 1 presents our hypothesized model to examine our postulated hypotheses that is in the standard shape of LISREL models by (Joreskog 1996).



Before we tested our hypotheses, it was necessary to evaluate the measurements of our constructs. The measurement analysis was conducted by confirmatory factor analysis. The data were subjected to a testing process including a series of reliability and validity assessments. All correlations between the constructs are below 0.4, so there is no apparent evidence for multi-collinearity (see table 1).

Table 1: Correlations

	Depen-dency	Up-stream Directives	Trust	Innovation Strategy	Collaboration Strategy	Innovation	Customer Loyalty	Relative Performance
Dependency	1							
Upstream Directives	.365**	1						
Trust	,073	.221**	1					
Innovation Strategy	-.092	-.111	.254**	1				
Collaboration Strategy	-.060	.168*	.473**	.285**	1			
Innovation	-.212**	-.127	.070	.319**	.243**	1		
Customer Loyalty	-.130*	-.053	.195**	.233**	.180**	.158*	1	
Relative Performance	-.005	.113	.156*	.194**	.148*	.161*	.300**	1

**. Correlation is significant on p= 0,01

*. Correlation is significant on p= 0,05.

We evaluated our measurement model using several overall goodness-of-fit indices. In general the overall goodness-of-fit indices are divided in three different groups: absolute measures, parsimony measures and incremental measures (Hair, Black et al. 2006). Absolute fit indices present the most basic evaluation of how well the model specified by the researcher reproduces the observed data (Kenny, Kashy et al. 1998). Parsimony fit indices consider the fit of the model specified by the researcher relative to its complexity. We use RMSEA as an index for absolute fit measures. According to the rule of thumb, below 0.08 is an acceptable (Browne 1993) and 0.05 a good (Byrne 2001) threshold for RMSEA. The normed $\chi 2$ as index for parsimony fit measures is defined as the ratio of $\chi 2$ to the degrees of freedom. When $\chi 2$ is less than three times the degrees of freedom a good fit exits (Carmines and McIver 1981). Finally we use CFI as index for incremental fit measure. CFI is the improved version of the NFI (Bentler and Bonett 1980), one

of the original incremental fit measures. It additionally includes the model complexity (Bentler and Weeks 1980) and should exceed the threshold of 0.9 (Bentler and Bonett 1980; Byrne 2001). Altogether the fit measures indicate an excellent overall model fit for our measurement model with (see table 2).

Table 2: Multiple goodness's of fit measures

χ^2	*DF*	χ^2/DF	*CFI*	*RMSEA*	*NFI*
639.258	419	1.526	.936	.046	.837

We rigorously checked discriminant and convergent validity. Discriminant validity covers the extent to which a construct in a model is truly distinct from other construct in that model. It can be tested using procedures outlined by Fornell and Larcker (1981). The average variance extracted of one construct should thus be greater than the highest squared intercorrelation of that constructs with any other construct in the model. The Fornell-Larcker-Ratio indicates satisfactory discriminant validity by not exceeding the critical value of 1 (Fornell 1981). Then we calculated Average Variance Explained (see table 3).

Table 3: Convergent and Discriminant Validity

Construct	Item	Std. factor loadings[a]	Indicator Reliability	α_{Cr}	Composite Reliability	AVE	Fornell Larcker
Dependency	Our client has a strong relative bargaining position over us.	.496	.246	.577	.776	.541	.530
	Our client does not perceive major differences between our products and those of competitors.	.628	.395				
	We have to follow our clients´ precepts even if they are inappropriate	.551	.304				
Up-stream Directives	Our client determines the technical functions of our new products in detail.	.825	.681	.870	.869	.689	.416
	Our client provides specific requirements about the design elements of our new products.	.834	.695				
	The whole concept of our new products is pre-specified by our client.	.846	.716				
Trust	Our client always keeps up with his promises	.765	.585	.893	.911	.721	.397
	Our client has an honest interest that our business is successful,.	.864	.747				
	Our client is trustworthy,	.876	.767				
	Our client has always acted reliable in prior transactions	.775	.600				
Innovation strategy	We have a clear innovation strategy.	.824	.678	.896	.909	.627	.457
	Our innovation activities are embedded in a long term strategy	.837	.701				
	We have definite innovation targets.	.786	.618				
	We derive our innovation project from our innovation strategy..	.683	.467				
	Our idea management is guided by our innovation strategy e.	.692	.479				
	We derive our innovation project from our innovation strategy.	.729	.532				
Collaboration strategy	We systematically control and adjust our collaboration strategy	.813	.661	.905	.918	.693	.413
	We have clearly defined collaboration targets	.822	.675				
	We derive collaboration targets from a systematic analysis	.872	.761				
	We derive our collaboration projects from our collaboration strategy	.771	.594				
	Our collaboration activities are part of a long term strategic endeavour.	.764	.584				
Radical Innovation Success	Typical innovations from our company are breakthrough developments	.640	.409	.785	.861	.610	.469
	Typical innovations from our company are difficult to be substituted by products of other firms.	.775	.600				
	Typical innovations from our company are new technological developments, which make old technology obsolete.	.684	.468				
	Typical innovations from our company have idiosyncratic benefits over those of competitors	.669	.447				
Customer loyalty	Our products and services fully meet clients' expectations .	.697	.486	.756	.810	.588	.487
	We are very satisfied with the loyalty of our client	.669	.447				
	Our firm has a very good reputation at our client.	.779	.607				
Relative Performance	We achieved a higher sales volume as compared to our principal competitors.	.891	.794	.849	.838	.646	.443
	We achieved a higher market share as compared to our principal competitors.	.927	.859				
	Our whole competitive position was stronger than our principal competitors.	.619	.383				

[a] All Factor Loadings are significant at p<.001

4 Results

This study researched a web of effects around relative power and trust on strategic options and performance of suppliers in supply chains. For all measures of the hypothesis also see table 4. Our first hypotheses addressed the effects of suppliers´ overall dependency on the manufacturer. Based on our theoretical explanations, we expected negative effects of a weaker power position both on the internal as well as relational positioning of the supplier. We find that dependency decreases both innovativeness (H1a) and customer loyalty (H1b). The corresponding path coefficients are -.207 and -.179. The empirical support for both H1a as well as H1b indicates that a high dependency on clients counteracts against both a relational as well as a competence-based positioning of the supplier within the supply chain. Dependency thus indirectly deteriorates suppliers´ performance and calls for managerial solutions.

Well specified up-stream directives from manufacturing clients were assumed to inherit both negative as well as positive effects on suppliers. In accordance hereto, we find that greater up-stream directives increase suppliers´ competitive performance (H2a) but reduce suppliers' radical innovations (H2b). The corresponding path coefficients are 0.158 respectively -0.180 As we find simultaneous support for H2a and H2b we conclude that up-stream directives can be both positive and detrimental to suppliers' performance. This indicates that suppliers may be better able to cope with specific up-stream directives than with generic inferior power positions, as they may be able to utilize the direct positive effect on performance, while counter-acting against a reduction of their innovative potential.

The enabling effect of trust was researched in hypothesis 3a and 3b. We find empirical support for both aspects: Trust within supplier-manufacturer relationships enables suppliers to manifest strategies for their business activities (H3a). The enabling effect of trust on strategy formulation is visibly larger for the design of collaboration strategies than for defining innovation strategies (standardized regression weights of .543 respectively .286) (H3b). For a statistical proof, we conducted a Chi-square difference test of two alternative models: Our base model which estimates both path coefficients separately is compared to an alternative model which fixes both path coefficients to be of equal value. While the base model achieves a Chi-square value of 639.3 (df = 419), the alternative model leads to a Chi-square value of 646.2 (df = 420). The resulting difference of 6.9 is significant (in comparison with the theoretical Chi-square value of 3.84 at a 5% level). This leads us to conclude that inter-organizational trust improves the formulation of relational strategies stronger than the set-up of a firm-internal innovation strategy.

Antecedents and consequences of supplier's innovation strategy are addressed by hypotheses 4a and 4b. Hypothesis 4b proposed that a suppliers´ innovation strategy is limited by the extent of up-stream directives. This is strongly supported by the data (path coefficient 0.224), highlighting the potential limitations of independent innovation strategies within the supply chain. However, we find evidence that a stronger innovation strategy is worthwhile to pursue as it improves the performance of suppliers (H4a) in terms of various performance aspects: Innovation strategy directly effects innovation output (path coefficient: =0.267) as well as customer loyalty (b=0.253) and thereby enhances firms´ performance indirectly (path coefficient: = 0.344 and 0.159).

Finally, the antecedents and effects of a supplier's collaboration strategy are investigated. As expected, a greater dependency of the supplier on the manufacturer limits suppliers' collaboration strategy (hypothesis 5b). However it could only be confirmed on a 10% significance level. The corresponding path coefficient is -0.143. Still, the freedom to follow a vertical collaboration

strategy is limited by a greater dependency. Hypothesis 5a which postulates that a stronger collaboration strategy improves the performance of suppliers could be confirmed for innovation (path coefficient: 0.23). The effect on customer loyalty was significant as well (path coefficient: 0.156). Anyway we could question if a collaboration strategy itself attracts clients sufficiently. However, it can be used to direct and enhance one´s own competencies and capabilities.

5 Discussion

The last decade has emphasized supply chain integration as a vehicle to improve organizational performance (Hult, Ketchen et al. 2004). Supply chains represent a framework where organizations are linked to their suppliers, with every customer being a supplier to the next downstream organization until the final product get through to the end-user (Hult, Ketchen et al. 2007). Prior studies focused on the performance of the manufacturer which integrates suppliers (e. g. (Deshpandé, Farley et al. 1993) . Recently studies begun to research the innovation process within buyer-seller relations (Roy, Sivakumar et al. 2004). However in our understanding a number of critical gaps are still existent of supply chain innovation.

This study was set up to research the very important performance implications of suppliers through supply chain integration. Given the trans-organizational nature of supply chains, we researched the effects of vertical rigidities. This study focused on specific aspects of the vertical relationship. We researched perceived dependency of the supplier on the manufacturer, up-stream directives, and the enabling role of trust in the nexus of suppliers' strategic options, and performance effects. In adopting this focus, our study adds to the limited knowledge but critically important area of supplier performance and the contingencies of the supply chain, managerial

actions, and performance. It also contributes to a contemporary buyer-manufacturer relationship: the reduction of the supplier base by manufacturers that potentially increase integration of the manufacturer.

The results of our study show that the supplier-manufacturer relationship involves formal links built by up-stream directives and a social structure, which can include dependency and trust among organizations. In this study we find several negative effects by increased dependency of the supplier on the manufacturer. Greater dependency directly decreases customer loyalty, innovation, and thereof suppliers' relative performance. Furthermore it reduces a supplier's freedom to follow a collaborative strategy that otherwise would increase performance. The negative overall effect of dependency on suppliers´ performance stays in line with previous findings from an analysis of the manufacturer-dominated supply chain management (Arend and Wisner 2005) who stress that SCM has negative effects SME on performance.

Interestingly, the more specific formal links by innovation up-stream directives do not only bear negative effects. Even though they exert detrimental effects on innovation and on internal innovation strategy, up-stream directives improve relative performance. Up-stream directives seem to assist suppliers to concentrate their strength and integrate their components in manufacturers' products designs reducing avoidable cost. Harmonized tasks and procedures planned in with respect to the whole supply chain increase suppliers' performance. An additional explanation is that manufacturers are likely to formulate costly up-stream directives for selected important and more successful suppliers, leading to a self selection bias in this analysis.

A converse force to dependency is trust. Trust generally describes the belief that the other can be relied on and does not pursue moral hazards. Our results indicate that trust enables the inward orientated innovation strategy and the outward orientated collaboration strategy of supplier both of which improve innovation and customer loyalty. Accordingly suppliers will improve their performance when they invest in the development of trust in the manufacturer relationship. The relational embeddedness of trust increases the openness, the knowledge transfer, and the expectation for suppliers to reach a fair agreement. Greater mutual trust will also reduce the uncertainty of manufacturers. We reason that manufacturers do not exert power on suppliers solely to experience power over another organization. Higher relative power behaviour can be rooted the risk aversive manufacturers' desire to have reliable suppliers that deliver a compatible component in time.

Future studies might research the interaction effect of trust and dependency. We found opposite effects of trust and dependency. (Laaksonen, Jarimo et al. 2008) show how interorganizational trust and dependence co-evolve through different phases of customer-supplier relationships. They provide insights on how to distinguish cooperative actors from those who will behave opportunistically. The paper by (Shin, Collier et al. 2000) assumes that a reduced supplier base, which increases the relative power of the manufacturer, will improve trust. Their logic is that a reduced supplier base improves communication between the supplier and the buyer. Future empirical work might therefore also control for the communication scope and quality among suppliers and manufacturers. Close links to manufacturer customers should thus be used to enhance one´s own innovation outcomes and not only to better fulfil actual demand as of today. A similar finding was obtained in a survey of purchasing managers: While shared planning (a consequence of an in-depth collaboration strategy) did not influence long-term customer

satisfaction, flexible and innovative responses to changing demand did exert an positive effect on it (Johnston, McCutcheon et al. 2004).

Generally we find that suppliers need managerial activities to react on the dependence and up-stream directives of manufacturers. From the results of our study, suppliers do have three possibilities. They can improve their inward orientated innovation strategy, their outward orientated collaboration strategy, and can improve the trust generation. However, both strategies are not per se open to suppliers: greater dependency and up-stream directives limit the formulation of strategies. Suppliers have to actively extent their strategies. Greater trust will act as an enabling force, yet has to be nurtured.

6 Conclusion

The literature has shown an increase of supply chain integration and a decreasing supplier base of manufacturers in the past years. This paper closes a serious omission on the performance of suppliers that are integrated in supply chains. We research the nexus of supply chain rigidities on the suppliers, their strategic options, and performance effects. Results of our empirical study show that suppliers experience relative power and up-stream directives of their manufacturers. Increasing dependency on manufacturers reduces suppliers' performance in various ways. Suppliers can improve their performance by an inward orientated innovation strategy or an outward orientated collaboration strategy.

However, the restraining forces of dependency have to be conquered. First of all, a weak relative power position per se limits supplier actions. Up-stream directives which contain specific innovation presets laid down by manufacturers have largely equivalent to dependency on the manufacturer restrictive effects. Yet, the specific innovation presets of up-stream directives help to line up the development processes with respect to the desires of the client. While this supports relative performance, it also restricts suppliers' own strategic action. To overcome those limitations, suppliers should proactively invest into mutual trust in manufacturer relationships. Trust increases the freedom of suppliers and enables them to follow innovation or collaboration strategies that improve different performance dimensions.

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Appendix

Table 4: Standardized Regression Weights and Statistics of Effect Estimates

			Estimate	S.E.	C.R.	P	Label
Radical Innovation Success	<---	*Dependency*	-.207	.138	-2.109	.035	
Customer loyalty	<---	*Dependency*	-.179	.099	-1.767	.077	
Relative Performance	<---	*Up-stream Directives*	.158	.079	2.084	.037	
Radical Innovation Success	<---	*Up-stream Directives*	-.180	.058	-2.335	.020	
Innovation strategy	<---	*Up-stream Directives*	-.224	.068	-3.121	.002	
Innovation strategy	<---	*Trust*	.286	.090	3.939	***	
Collaboration strategy	<---	*Trust*	.543	.093	7.220	***	
Radical Innovation Success	<---	*Innovation strategy*	.267	.062	3.452	***	
Customer loyalty	<---	*Innovation strategy*	.253	.043	3.224	.001	
Collaboration strategy	<---	*Dependency*	-.143	.148	-1.689	.091	
Radical Innovation Success	<---	*Collaboration strategy*	.237	.061	3.074	.002	
Customer loyalty	<---	*Collaboration strategy*	.156	.044	1.956	.050	
Relative Performance	<---	*Customer loyalty*	.344	.165	4.153	***	
Relative Performance	<---	*Radical Innovation Success*	.159	.112	1.974	.048	