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Designing and Monitoring a Supply Network

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ABSTRACT

In this paper, we present and discuss different frameworks for initiating a supply network. Thus, we try to understand how a firm designs a process of establishing a supply network and monitoring the network in the start-up phase, i.e. we study a firm's effort at initiating and operating a supply network. Furthermore, we discuss different opportunities and problems that a firm may encounter in the process of designing a supply network. The paper is based on a case study of a main contractor (within the building industry) which during a period of time has changed its sourcing strategy and tried to establish and stabilise a supply network.

KEYWORDS

Supply networks, Strategising in networks, Sourcing strategies, Construction industry

INTRODUCTION AND PURPOSE

During the last decades empirical studies have shown that industrial markets can be characterised by the existence of long-term customer and supplier relationships (Håkansson, 1982; Lamming, 1993), and that these relationships in turn are both complex and vary with regard to content and dynamic aspects (Gadde and Mattsson, 1987). With that as a starting point several concepts and frameworks have been developed which have contributed significantly to our understanding of how business relationships can be characterised and perceived, both in relation to suppliers and customers. For a detailed description of some of these concepts, see for example, Dwyer et al., 1987; Frazier et al., 1988; Powell, 1990; Håkansson and Snehota, 1995; Möller and Wilson, 1995; Lamming et al., 1996; Gadde and Snehota, 2000; Gadde and Håkansson, 2001; Ford, 2002 and Ford et al., 2003.

Even though the above-mentioned theoretical developments as well as the empirical studies could be taken as a starting point for discussing how to combine single relationships into larger structures (networks), very few contributions have look beyond the focal relationship, and into the context of the buyer-supplier relationships. Lamming et al. (1996) point out that while buyer-supplier relationships have undergone a number of developments over the last 30 years, the existing models for analysing supply networks are not very sophisticated. Furthermore, Harland et al. (2001, p. 21) argue *“To date much of the research specifically examining supply networks has been observational and descriptive...”* and *“... there has been little guidance ...of operating in different types of supply network and appropriate management action in different network contexts”*. In a similar vein Gadde and Håkansson (2001) argue that firms not only need to develop close relationships with important suppliers, they need to extend their efforts further. *“A buying company might benefit substantially from encouraging co-operation **among** its suppliers...Therefore, efficient and effective purchasing requires a supply network perspective”* (Gadde and Håkansson, 2001, p. 16, emphasis added). Thus, studying firms’ attempts at initiating and operating a supply network, and the opportunities and problems they encounter in the process, are of great interest.

The purpose of this paper is twofold. Firstly, we aim to understand how a firm designs a process of establishing a supply network and monitoring the network in the start-up phase, i.e. study a firm’s effort at initiating and operating a supply network. Secondly, we aim to discuss different opportunities and problems that a firm may encounter in the process of designing a supply network. The paper is based on a case study of a main contractor (within the building industry) which during a period of time has changed its sourcing strategy, and thereby tried to establish and stabilise a supply network.

THEORETICAL BASE

It is often pointed out that the issue of sourcing strategy has become more important. However, there is still little research and few publications which explicitly discuss strategies related to how firms could or should initiate and manage their supply network. One important exception is the research carried out at Centre for Research in Strategic Purchasing and Supply (CRiSPS) at University of Bath who has carried out numerous purchasing and supply research projects themselves as well as in co-operation with other universities in the UK. In their publications, researchers at CRiSPS address e.g. (a) the creation and operation of supply networks, (b) strategies related to how to managed these supply network, and (c) different ways of classifying types of supply networks, see e.g. Harland, 1996; Zheng et al., 1998;

Lamming et al., 2000; Johnsen et al., 2000; Harland et al., 2001. CRiSPS researchers have suggested the following definition of supply networks: “*Supply networks are nested within wider interorganization networks and consist of interconnected entities whose primary purpose is the procurement, use, and transformation of resources to provide packages of goods and services. Supply networks comprise chains through which goods and services flow from original supply sources to end customers*” (Harland et al., 2001, p. 22).

The Industrial Marketing and Purchasing approach (IMP) is another grouping of researchers which has contributed to our knowledge on (a) the features and development of industrial networks, (b) the concept of network context, managing in networks, and – of particular important to this paper – (c) a supply network perspective on strategic purchasing issues. In their latest book, Gadde and Håkansson (2001) address the issue of developing supply network strategies. They discuss building supply networks as a process of networking, i.e. “*networking relates relationships to each other by finding and utilizing connections. These network connections may be activity links, resource ties and/or actor bonds in relationships*” (Gadde and Håkansson, 2001, p. 171). Thus, ‘supply networking’ concerns how firms initiate and activate relationships with and among their suppliers to become more efficient and innovative.

Although some contributions have discussed the management of the supply networks as an important issue, few articles or books have reported on empirical studies following a firm’s attempts at designing a supply network. There are, however, some exceptions. One example is the article by Harland (1996) which describes initial research into the formulation of supply network strategies and uses a case from the health care sector in order to illustrate this. Her aim is to develop a framework that may improve the network position of a buying company and she presents a model containing four main elements (Harland, 1996):

- Decision elements of supply network strategies
- A supply network strategy process
- Supply network strategy hierarchy
- Supply network strategy implementation

The last element is, furthermore, divided into a four-stage model for implementation of the supply network strategy. *In Stage 1* the supply network is in internal crisis, and the network is only loosely connected. *In Stage 2* the actors in the supply network are resolving issues of conflict, but they do not feel that they have a shared destiny. *In Stage 3* the actors in the supply network have identified end-customer needs and have formulated and implemented a strategy. *In Stage 4* the supply network provides a sustained competitive advantage (Harland, 1996, pp. 186-187).

Building on the work by Harland (1996), Zheng et al. (1998) presents a conceptual model for the creation and operation of supply networks. This model contains eight different types of networking activities that firms can perform to manage supply networks. The nine elements are:

- Partner selection, i.e. which and how many suppliers to select and kind of relationships to develop within the supply network
- Resource integration, i.e. which degree of human, site and physical asset specificity should be aimed at within the supply network
- Information processing, i.e. which and how information should be exchanged, shared and managed within the supply network

- Knowledge capture, i.e. how collective learning processes within the supply network can be promoted and organised
- Social coordination, i.e. how trust, fine-grained information transfer and joint problem solving can be improved by enabling social interaction
- Risk and benefit sharing, i.e. how a fair and balanced division of benefits can be reached for companies in the supply network
- Decision making, i.e. how joint or co-ordinated decision making can be facilitated within the supply network
- Conflict resolution, i.e. how (emerging) conflicts, which co-exists with co-operation in the supply network, can be handled or mitigated

The model builds on models developed within the IMP approach as well as on models developed within the field of operations management. The model is primarily intended as a first step towards understanding networking for the purpose of supply and the authors stress that future research need to address “*whether firms can manage relationships within a network or whether a focal firm can try to manage the network as a whole, and under what conditions and in which ways this may be possible*” (Zheng et al., 1998, p.610).

Hines et al. (1998) present and discuss a lean logistics approach to the development of a supply network. Their work is based on a prescriptive contingency approach, “*as a wide range of options (contingencies) are open in how to manage your purchasing (a prescription of a functional activity)*” (Hines et al., 1998, p. 235). The article is based on a case study of a distributor (of electronics, electrical and mechanical components and instruments) and focuses on how this firm – through a supplier integration process – has succeeded in developing a supply network. On the basis of the case study, Hines et al. (1998) develop a framework comprising the following elements:

- Mapping the value stream, i.e. identifying the value adding and wasteful activities
- Setting up the support structure, i.e. establishing different tier system of management
- Establishing joint improvement methods, i.e. aligning the buying firm’s and the selected suppliers’ suggested improvement methods
- Rolling out the programme, i.e. developing a framework for involving more suppliers in the supply network.

Another contribution with a logistical point of departure is the article by Romano (2003) which discusses co-ordination and integration mechanisms to manage logistics processes across supply networks. The article contains a multiple case study of three supply networks (in footwear, semiconductors and textiles). Romano (2003, p.120) presents the aim of the article as to “*highlight how co-ordination and integration mechanisms interact with the managerial variables needed to be addressed to design and control logistics processes across the supply network*”. The conceptual framework presented contains the following three elements:

- Drivers, i.e. variables managers can address to design and manage key business processes. Examples of drivers are: network structure, work flow/activity structure, risk and reward structure etc.
- Co-ordination mechanisms which consist of the informational structure and the decision-making process
- Integration mechanisms, which consist of intra-company integration, inter-company dyadic integration, and overall supply network integration.

The last contribution we have looked into is the book about ‘Supply Network Strategies’ by Gadde and Håkansson (2001). This contribution is part of a large body of literature within the IMP approach, as described above. The IMP approach focuses on networks of connected relationships and stresses the importance of examining single business relationships in the context of the other relationships the involved firms may have. Studies have shown that firms (and relationships) do not exist in isolation, but rather that they are connected to a network context through direct and indirect relationships (Blankenburg and Johanson, 1992; Anderson et al., 1994). This implies that single relationships both are affected by and affect developments in other relationships. Thus, any business relationship exists both *per se* and is embedded in a context through connections to other relationships. While the early work within the IMP approach was primarily descriptive or conceptual, issues of managing and strategising in networks have been paid increasing attention in later years. The concept of managing in networks has been discussed by Ford et al. (2003), and the concept of strategic business nets has been introduced by Möller et al. (2003). Strategising in networks has also increasingly been discussed, for example in a special issue of Industrial Marketing Management, see e.g. Gadde et al. (2003), and Holmen and Pedersen (2003).

Drawing on these developments within the IMP tradition, Gadde and Håkansson (2001) discuss how a firm can build a supply network. They state that “*the complexity in building as well as evaluating the existing supply network is obvious. However, some key issues can be identified*” (Gadde and Håkansson, 2001, p. 171). These issues are:

- Organise the activity structure
- The information flows in the activity structure
- Stimulate experimentation with resource combinations
- The number of participants in development projects
- Choosing partners for a powerful supply networks

Based on the literature review above, we conclude the following. Firstly, there is still of dearth of studies which provides us with insight into how supply networks are initiated, designed and operated. This has also been suggested by Harland et al. (2001, p. 22) claiming that there is “*...limited empirical research on supply network operation*”. Secondly, Åhman (2001) suggests that we investigate the supply network from the buyer’s as well as the different suppliers’ perspectives. Thus, we need to take into account how a buying firm’s designing of its supply network affects the suppliers, and how a buying firm can synchronise its strategy with the strategies of its suppliers.

Hence, there is a need for frameworks which (a) take both the buyer and the suppliers into account, (b) pay explicit attention to the relationships between buyers and supplier, (c) conceptualise interdependencies between such relationships, and (d) view the strategic efforts of single firms over time in the context of the efforts of other firms (and relationships) related to the single firms.

METHODOLOGY

As mentioned earlier, the purpose of the research underlying this paper is to understand (a) how a firm designs a process of establishing a supply network and monitoring the network in the start-up phase, and (b) different opportunities and problems that a firm may encounter in the process of designing a supply network. Based on Pettigrew (1997), we argue that such insights may best be gained through processual case studies which are real-time, theory-led, and contextual. Therefore, in making the single-case study, which we report on in this paper,

we have used such a methodology. Furthermore, most studies of establishing and operating supply networks focus on firms in various manufacturing industries, see e.g. Harland et al. (2001). As firms in the construction industry are frequently criticised for their lack of long-term supplier relationships and sourcing strategies, there is a need to investigate some of those exceptions – where construction firms do attempt to design and operate supply networks.

Our focal firm is one of the largest main contractors in Norway. The empirical material for the case study was gathered in real-time, over time, and multiple sources of empirical evidence were used. For example, we have:

- taken part in the main contractor's supply network project (described below),
- carried out a number of semi-structured, personal interviews with people from both the contractor and the subcontractors,
- taken part in various internal seminars, workshops and field trips (to construction sites),
- read various company documents, and
- supervised a number of (master) students writing their theses with the contractor as the focal company.

Hence, by means of this in-depth study of the main contractor's attempts at establishing a supply network, and subsequently monitoring the supply network during a start-up phase, we aim to contribute to the understanding of supply network strategising.

EMPIRICAL BASE

Background

The empirical basis of the paper is a project aimed at developing a supply network for one of the largest construction firms in Norway. In 1995, this firm started up a strategic process called "Value creation in Collaboration", which focused on value-creating co-operation with customers, suppliers, and between employees and divisions within the firm. As a part of this process, a business unit within the Building Division of the firm, in 1998, started up a project called; "Networks with technical sub-contractors", i.e. suppliers of three types of technical services: Electrical services, Ventilation services and Plumbing services. The aim of the project was: *"To develop a method for choosing and organising co-operation partners which will enable the firm to achieve competitive advantages. This should enable the firm to become better at: (1) choosing 'optimal' technical solutions for their customers, (2) handling interfaces among technical subcontracts and (3) utilising advantages stemming from co-operative relationships."*

Developing a 'Supplier library'

Based on the aim of the project, the firm classified all the suppliers of the chosen business unit in the Building Division into a catalogue called 'the Supplier library'. In the library, all the business unit's current suppliers were classified according to the materials they produced and/or the service they delivered, for example timber frames, steel, plumbing services etc. The Supplier library is shown in table 1:

Table 1: Categories and number of preferred suppliers in the Supplier library

Consulting engineer – construction	5	Painter	5
Architect	6	Frame supplier	2
Consult. eng.–electrical, fire, plumb.	3	Machine contractor	4
Sub-contractor for plumbing services	4	Steel contractor	3
Sub-contractor for electrical services	5	Roofing supplier	4
Sub-contractor for ventilation services	5	Tinsmith	2
Bricklayer	3	Kitchen/bath	3

As appears from table 1, the Supplier library contained 2 to 6 preferred suppliers within each category. For each supplier, the main contractor had information about the name and address of the supplier, the main contact person, the different areas within construction projects the contractor had experiences from working with the supplier, and the contractor's opinion of the supplier's willingness to co-operate with the contractor. The reason for developing this library was a desire to reduce the number of suppliers used by the business unit. To select the preferred suppliers, the purchasing department discussed each supplier with foremen, site managers, and project managers within the business unit. The selection was based on the following criteria:

1. that the supplier was financially 'viable'
2. that the firm had good experiences from working with the supplier in all phases of building projects
3. that the supplier was willing to co-operate with the firm on several organisational levels.

Selecting the suppliers for the supply network

On the basis of the Supplier library, the suppliers of technical subcontracts were singled out: Electrical services, Ventilation services and Plumbing services. The selection process was carried out by a team including; the purchasing manager, project managers, site managers and foremen. In the selection process, the suppliers were interviewed regarding:

1. Internal matters (i.e. organisation structure, routines, market strategies, focus in technological development)
2. The supplier's co-operation partners, mainly customers and suppliers
3. Competitors (firms the selected suppliers would recommend as co-operation partners)
4. Ability and willingness to co-operate with the construction firm
5. Further plans in relation to the construction firm.

Following the interviews, a final selection took place. The original idea had been to select nine suppliers, three for each type of technical subcontracts. During the selection process it became clear the one of the suppliers for Plumbing services was not suitable for the supply network due to financial problems. Thus, eight suppliers were selected.

Examining potential new suppliers for the supply network

Based on the selection process described above, the main contractor carried out an analysis of the selected suppliers' capacity to determine if the suppliers were able to meet the demand of

the main contractors both in the short and the long run. The conclusion was that the capacity of the selected suppliers was not satisfactory. Thus, a second round of interviews was carried out, this time with suppliers with whom the main contractor had had very little or no previous experience. These suppliers had either contacted the main contractor themselves because they had heard about the supply network project, or they were suggested as reliable partners by some of the other selected suppliers. Based on these additional interviews one supplier of Plumbing services was selected.

Co-educating in the supply network

When all nine suppliers had been selected, the main contractor organised a number of seminars and discussions between people from the suppliers and the main contractor. Top management, project managers and foremen from the sub-contractors as well as top management, the purchasing manager, project managers, site managers and foremen from the main contractor attended these seminars. It was important for the main contractor to explain to the suppliers (a) the reasons for establishing a supply network and (b) the expectations regarding the suppliers and the supply network. In a similar vein, the suppliers presented their views on and their expectations to the main contractor and each other.

Piloting the supply network through 'real' exchange situations

Furthermore, the designed supply network was to be tried out in a number of actual construction projects through which it was assumed that the supply network would develop substance within single relationships as well as connections between relationships. Therefore, the business unit identified a number of construction projects, in which the designed supply network was to be tried out. In these projects different constellations of the nine subcontractors worked together as 'sub-networks' with electricians, plumbers and ventilation installers. In each pilot project the following activities were carried out:

1. A 'kick-off' meeting (setting aims and expectations)
2. A midterm evaluation (filling out evaluation forms and discussing negative and positive experiences)
3. A final evaluation (same as for midterm evaluation, but carried out after each of the pilot projects were finished).

In this way the different suppliers were given the opportunity to become more familiar with the personnel from the other suppliers, as well as different people from the main contractor.

Monitoring the outcomes on different levels

Through this process, the way in which the business unit related to its technical subcontractors changed dramatically. For example, the purchase of electrical services from the three chosen technical subcontractors tripled during this period (without any major change in turnover). Out of the business unit's total purchase of technical services in 1999, approximately 95 % were from the nine selected suppliers.

Furthermore, the designed supply network was monitored during the start-up phase (the first period of time after the establishment of the network). The outcomes which were derived through a discussion between the main contractor and the nine suppliers were classified in the

following way: (1) Outcomes related to the business unit in the construction firm, (2) Outcomes related to the suppliers, (3) Outcomes related to single supplier relationships, and (4) Outcomes related to the supply network of technical subcontractors.

Outcomes related to the business unit in the construction firm

As mentioned above, the main contractor now purchases from a small number of selected technical subcontractors, and the purchases from these suppliers have increased dramatically. This process has also led to an increased consciousness regarding which subcontractors are the preferred ones and the consequences of using these suppliers.

The pilot projects carried out within this project have shown positive financial results for the main contractor. The co-operative co-ordination between the technical suppliers has been very satisfactory seen from the main contractor's point of view, with very little re-work, few fault corrections etc., and none of the pilot projects have been delayed. This has led to fewer extra-costs for the main contractor, and has also inspired the firm to improve internal procedures regarding co-ordination and planning.

Since the business unit of the main contractor is among the first Norwegian construction firms to develop relationships with suppliers, the firm has been able to choose among 'the best' subcontractors within the different technical specialisms. The suppliers have been enthusiastic and have spent much time and effort on the project, which the main contractor interpreted as a positive signal from the suppliers. Furthermore, many of the involved parties (employees in both the line and staff organisations) have acquired new knowledge about co-operative (supplier) relationships and how they can be handled. Thus, many of them have experienced personal development during the project, better working conditions at the construction site since the pilot projects were on time, and the quality standards were fulfilled.

Outcomes related to the suppliers

The pilot projects carried out within this project have also shown positive financial results for the involved subcontractors, and they were satisfied with the way the pilot projects had been carried out. Furthermore, the suppliers agreed that there had been little re-work, few fault corrections and few delays, and that the work at the construction site had progressed according to the plans drawn up jointly at the beginning of the projects. Jointly, these aspects have led to lower administrative costs for the suppliers as they used less time on organising and follow-ups both during the start-up and the production phase of the pilot projects. Another effect seen from the subcontractors is that they have become better acquainted with the main contractor's different routines. This relates, for example, to invoicing, meetings at the construction site, health, environment and safety issues where the main contractor has specific requirements both for subcontractors and their own employees. Working closer with people from the main contractor made it easier for the suppliers to bring up issues relating to routines, which they had never understood.

The suppliers in each of the three technical areas have become better acquainted with project managers and foremen from the two other technical areas. The project managers working within the same field of technical service (e.g. plumbing) were fairly acquainted with each other, but had seldom met managers from other guilds. This possibility to meet brought about

an increased understanding of various aspects that needed clarification and co-ordination across the different sub-contracts, furthermore, this co-ordination could be done in an informal way instead of reporting it to the site managers from the main contractor and waiting for them to handle it.

Outcomes related to single supplier relationships

The most significant effect related to the relationships between the main contractor and the nine different subcontractors was the development of strong personal relations. During the project, project managers and foremen from the sub-contractors and the purchasing manager, project managers, site managers and foremen from the main contractor met regularly both at the main contractor but also on the different construction sites, evaluating the progression in the production phase of the pilot projects. This made them become better acquainted with each other, and a better personal chemistry developed enhancing trust and mutual orientation.

Technical sub-contracts are a strategically important purchasing area for the main contractor, since this area accounts for the largest part of the total purchasing cost. The project showed different possibilities for cost reductions through developing close long-term relationships with subcontractors. Positive effects arose from involving the suppliers in the early phases of the construction project, both regarding the total costs as well as the choice of technical solutions, thus taking the suppliers' competence into account. For example, the administrative cost were reduced by collaborating with the suppliers in the start-up phase of the construction project, thereby making sure the same activity was not done twice (both by the main contractor and the suppliers). Furthermore, simplification of some routines was possible when the main contractor and the subcontractors had become more familiar with each other, and knew each other's way of organising different administrative activities.

Outcomes related to the supply network of technical subcontractors

The next step, to develop the relationships to the nine suppliers from a set of individual relationships into 'sub-networks', was the most difficult task during the project. But after working together in different combinations on different construction projects and having been through different midterm and final evaluations together, the 'sub-networks' from the pilot projects acquired a 'team spirit'. By the end of the project, the project managers at the subcontractors were very motivated and committed to this co-operative way of working and they even suggested working this way in other construction projects of the main contractor, i.e. construction projects which were not part of the supply network initiative.

In addition, the 'sub-networks' would like also to co-operate together towards other construction firms in Norway, i.e. competitors of the main contractor. This can be seen as a network effect, where the way of working in co-operative supply networks can spread to other firms in the construction industry. Co-operating in more projects may give the suppliers more experience with this way of working and enhance the collaboration among them.

Final report

After the chosen construction projects had been carried out, a summary report was made of

the supply network project. The intention was that the report and the actual experience gained would enable maintenance and further development of the supply network over time.

DISCUSSION AND CONCLUSIONS

From the case presented above, we can see that the supply network project has enabled a reduction in the number of subcontractors and development of long-term relationships and a supply network between the main contractor and its selected suppliers. Looking back at the different supply network frameworks presented in the theoretical part few of them start with a thoroughly examination of the existing supply base. Based on our case study we suggest, however, that existing suppliers are important as a basis for the process of selecting partners for a supply network. This is also argued by Lamming et al. (1996) in their model for assessing single relationships, by de Boer et al. (2001) in an extensive review of methods supporting supplier selection, and by Sarkis and Talluri (2002) which develop a model for strategic supplier selection. The case firm went through a three stage process of (1) developing a Supplier library of existing suppliers, (2) selecting suppliers for the supply network, and (3) examining potential new suppliers and doing the final selection. As we can see from the case description above, the suppliers were heavily involved in both step (2) and (3). This aspect is also mentioned by Hines et al. (1998, p. 245) stating that “... *one important part of the work has been to remove this perceived fear of upsetting suppliers. The views of the suppliers towards the work have been very positive and in many cases the initiatives and drive is coming from the suppliers...*”.

Moving on to the next step in the process of designing a supply network, the case firm organised different meetings, seminars and workshops in order to enable extensive interaction with the selected suppliers. In these meetings different employees from different levels in the firms took part. This process of co-educating each other from both the suppliers' and buyer's side, was important for building mutual expectations as well as trust and commitment. The importance of this is also stressed by Harland (1996) in stage 3 of her implementation phase (supply network strategy implementation). Furthermore, Gadde and Håkansson (2001, p. 170) argue that the 'glue' in networks are “...*a sense of trust and reciprocity in the system*”. Thus, joint learning/teaching processes become a way of 'gluing' the network together.

The last two steps in the process – trying out the supply network in 'real' exchange situations and monitoring the outcomes on different levels – have much in common with the implementation phase by Harland (1996), and the 'rolling out the programme' phase by Hines et al. (1998). Furthermore, Gadde and Håkansson (2001, p. 171) argue the following “*A supply network should be evaluated in terms of how efficient the activity pattern is, how innovative and value creating the resource constellation is and how powerful the established actor web is*”. If we look at the case above, we can see that main identified outcomes are cost-reductions achieved by better co-ordination of activities across firm boundaries. We have seen examples of lower supplier-handling costs for the main contractor related to the reduction in the supplier base and the use of preferred suppliers for Electrical services, Ventilation services and Plumbing services. Furthermore, both the case firm and the suppliers achieved lower administration and co-ordination costs both within and between the firms. This is also indicated by Gadde and Håkansson (2001, p. 9) claiming “*Even in their administrative routines, buying firms experience problems. ...It thus becomes more a matter of developing procurement routines that secure long-term efficiency.*” Although Gadde and Håkansson (2001) discuss this issue in relation to the purchasing function, the argument

applies equally well to relationships and supply networks. Bringing down extra-costs for corrections and re-work, and removing some overlapping functions at the main contractor and the suppliers in the early phases of the construction project, are other outcomes of the project. Such changes also represent ways to improve economic efficiency in relationships by better co-ordination of activity links across firm boundaries.

Another effect of working together in co-operative supply networks is increased predictability for the suppliers. Increased predictability regarding use of capacity is important since stock production is impossible in the construction industry. Furthermore, the suppliers have become part of a quite closely coupled web of actors, who have developed trust and mutual orientation. Gadde and Håkansson (2001, p. 54) argue that *“The people involved develop relationships, in which the presence or absence of trust is of crucial importance to the nature and development of the relationship”*.

In short, the paper has shown a process of designing and monitoring a supply network for a single firm in the construction industry. However, since it is impossible to assess the transferability of the results which, furthermore, pertains only to co-operation in the initial phases (the design and the start-up phases) of the development of a supply network, there is a profound need for more studies of efforts aimed at establishing and operating supply networks in different industries and settings.

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