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STABILITY AND CHANGE IN SUPPLY NETWORK:
Supply network as a means to reorganise the supply base?

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Abstract
Increasingly, attention is paid both to supply base management and to supply network management. By means of a literature review and a case study, we look into what these two concepts comprise and how they are related. We conclude that the two concepts are rarely discussed in combination. Furthermore, based on our case, we conclude that a supply network initiative can be transient means for restructuring part of the supply base.

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Introduction and purpose

During the last decades, purchasing has become more important because the amount spent on purchased goods and services comprises a larger amount of a firm's turnover. Figures of 60-80 percent are not uncommon as companies increasingly focus on their core competences and outsource activities based on other competences to suppliers (van Weele 2000). Due to the increased importance, purchasing has gradually become supply management and the focus on supply management has increased (Kraljic 1983; Baily and Farmer 1990; van Weele 2000). Supply management has been discussed in relation to a number of different concepts such as supplier relationships, supply networks and supply base etc. Supplier relationships and supply networks have become more important because companies often reduce their supply base and make use of a small number of suppliers, making the buyer more dependent on the suppliers' technical skills, development ability, capacity, cost efficiency etc. (Gadde and Snehota 2000; Handsfield and Nichols 2004).

Hence, within the field of supply management, increasing attention has been paid both to supply base management and to supply network management. In this paper we look into the concepts of supply network and supply base. We investigate how these two concepts are or can be related to each other by means of a processual case study. The case study concerns the efforts of a main contractor (within the building industry) who changed its sourcing strategy, initiated the development of a supply network, and restructured part of its supply base.

Theoretical background

Within purchasing and supply literature the focus on strategic sourcing has increased over the last 10-15 years. This has contributed to more research and discussion on concepts such as supply base and supply network. If we start with the concept of **supply base**, it has been argued that the size and shape of the supply base are becoming increasingly important issues (Baily and Farmer 1990; Lamming 1993; Gadde and Snehota 2000; van Weele 2000; Gadde and Håkansson 2001; Handsfield and Nichols 2004). Gadde and Håkansson (1994, p. 28) have dealt with the topic of supply base as one of three important strategic purchasing issues, and defined the supply-base structure as *"... the number of suppliers to use, as well as how the suppliers should relate to one another"*. Quite similarly, van Weele (2000, p. 144) defines supply base management as *"... how many suppliers will be dealt with, [...] what conditions and qualifications the best-in-class suppliers should meet and how the best suppliers will be selected."* In a recent article by Dubois, Gadde and Mattsson (2003, p. 410) they claim that *"a supplier base consists of a range of short, medium, and long-term relationships and changes over time as new suppliers enter and established relationships are dissolved."* From these contributions we can conclude that important issues comprise:

- the number of suppliers in the supply base,
- how the suppliers are selected,
- how the suppliers are organised (for example in tiers)
- the nature of the relationship between the buyer and the suppliers and among the suppliers

Based on the contributions above stating that management of the supply base is an important issue, we have looked into a few articles which have reported on empirical studies either in the form of surveys in different industries or in the form of case studies following the development of a single firm's supply base over time.

Cousins (1999) reports on a study of change in firms' supply bases through deliberate supplier reduction strategies. He uses a cross-sectional survey which covers buyers within a wide range of industries. Cousins (1999) claims that whilst firms have significantly reduced the number of suppliers over the last years, such strategies have not lead to the rewards that were first expected. The author argues that the results of the study give cause for concern, since *"firms appear to be adopting supplier reduction strategies without a thorough consideration of the market dynamics and firms appear to be pursuing supplier reduction without a clear assessment of the costs and benefits involved"* (Cousins, 1999, p.153).

While discussing how suppliers in the supply base may be assessed, Schmitz and Platts (2004) discuss inter-organisational performance measurements. Their article is based on an empirical study of four automotive manufactures. In order to investigate the supply base performance, these manufacturers use performance measurements at the interface to their suppliers in the area of logistics. Schmitz and Platts (2004) claim that managing the supply base is a complex issue which requires new measurement systems and frameworks. Furthermore, they point out that *"... we investigated the use of supplier performance measurement ... only from the OEMs perspective. Future studies should therefore aim to ... take into considerations the suppliers' perspective..."* (Schmitz and Platts 2004, p. 242).

Investigations of the suppliers' perspective of changes in the buyer's supply base are reported in some publications. One example is Lilliecreutz (1998) who take into account how a buying firm's restructuring of its supply base affects the suppliers, and how a buying firm can synchronise its strategy with the strategies of its suppliers. Lilliecreutz (1998) has carried out a longitudinal in-depth case study of several manufacturers within the automotive industry and their suppliers. He claims that suppliers need to develop their own strategies as a consequence of buying firms' growing interest in restructuring, rationalisation and development of their supply base. He concludes that the suppliers' ability to orchestrate the resource base, role and position is of great importance. In a similar vein, Calabrese (2000) focused on suppliers in the automotive industry. He studied 25 small and medium sized car suppliers and looked into the strategies they adopted in order to handle changes initiated by the car manufactures, for example reorganisation of the supply base.

One example of a study which has followed the development of the supply base for a very long period of time is the recent published study by Dubois, Gadde and Mattsson (2003). In the article they report on a single-case study of a vehicle manufacturer's supply base from 1964 to 2002. Their main finding is that whether or not a firm's supply base is characterised by continuity or change may, to a large extent, depend on the number of years being considered. *"There are few changes of suppliers from one year to the next, which indicates a strong continuity of the supplier base as a whole. However, these minor changes from one year to another amount to substantial cumulative restructuring over time, thus illustrating the dynamics of the supplier base"* (Dubois, Gadde and Mattsson 2003, p. 412). In the article the authors discuss drivers of change in the supplier base related to the ten components (both standardised and customised) they have studied from 1964 to 2002. These are summarised in the following table (table 1):

Table 1: The drivers of change in the supplier base (Dubois et al. 2003, p. 419)

		Components affected									
		1	2	3	4	5	6	7	8	9	10
	Frequ	C	S	S	C	C	S	C	C	S	C
Change reasons	**ency**	**5**	**3**	**4**	**6**	**8**	**5**	**8**	**6**	**10**	**6**
Purchasing policy	***(26)***										
Price reduction	**20**					X	X	X	X	X	X
Avoiding dependency	**3**	X							X		
Consolidation	**3**		X		X						
Relationships driven changes	***(24)***										
Supplier performance	**12**	X				X		X	X		X
Supplier initiatives	**7**		X	X	X				X		
Customer requirements	**5**		X	X							
Technical modifications	***(11)***										
Design and manufacturing	**6**	X				X		X			
New models and variants	**5**				X				X		

When it comes to the concept of **supply networks**, there is no single agreed-upon definition of the concept. Furthermore, other concepts such as 'extended enterprise' (Dyer 2000; Kinder 2003), 'organisational networks' (Liu and Brookfield 2000), and 'knowledge-sharing networks' (Dyer and Nobeoka 2000) are also frequently used when discussing networks with suppliers. Harland, Lamming, Zheng and Johnsen (2001, p. 21) have defined supply networks in the following way: *"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."* Furthermore, in a recent article Harland, Zheng, Johnsen and Lamming (2004, p. 1) claim that *"...firms [...] externalize the focus of their management of operations beyond the firm boundary, upstream into their suppliers, into suppliers' suppliers, and downstream into their customers and customers' customers; here these extended webs of operational relationships are termed 'supply networks'."* They also consider how a supply network can be delimited in space and argue that *"... we could examine the total supply network for a firm that could be represented by the set of upstream and downstream organizations it deals with, either directly or indirectly, from original source of raw material or service creation, to ultimate end customer. This would provide a map of all relationships within that firm's supply network"* (Harland et al. 2004, p. 2). From these contributions we can conclude that important issues concern:

- interconnected actors, i.e. relationships among the suppliers
- the nature of the relationships
- how the supply network extends in both directions, e.g. both upstream to suppliers but also downstream to customers.

In the literature on supply network management, several streams of research can be identified. One such stream 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, they address e.g. (a) the creation and operation of supply networks, (b) strategies related to how to manage these supply networks, and (c) different ways of classifying types of supply networks, see e.g. Harland (1996), Lamming et

al. (2000), Johnsen et al. (2000) and Harland et al. (2001). In a recent article (Harland et al. 2004) they summarise their findings based on eight in-depth case studies in a number of different industries and a survey of 58 focal firm networks. They develop a conceptual model which contains 'networking activities' for supply network creation and operation as well as factors affecting the 'network context'. The networking activities are the following: (1) partner selection, (2) resource integration, (3) information processing, (4) knowledge capture, (5) social co-ordination, (6) risk and benefit sharing, (7) decision-making, (8) conflict resolution and (9) motivating. The network context is described by: (1) market environment, (2) product/service package and process, (3) supply network structure and (4) supply network strategy.

Another stream of research pays particular attention to Toyota's supply network as the archetypal supply network. Among the researchers who have studied and conceptualised this supply network, we find Dyer (2000) and Dyer and Nobeoka (2000) who pay particular attention to knowledge management in Toyota's supply network(s). Dyer and Nobeoka (2000) investigate Toyota US' supply network, and relate it to Toyota's supply network in Japan, with the particular aim to examine how sharing of (explicit and tacit) knowledge is enabled within these networks. Dyer and Nobeoka (2000) aim to understand how a core firm can successfully create and manage an efficient, knowledge-sharing network. Towards that end they describe the evolution of the network in three phases. First, the development of weak ties between the buyer and the different suppliers in the network. The use the term 'weak' to point out that the relationships were new and the frequency and intensity of the interaction was low. Second, the development of strong ties between the buyer and the suppliers, where Toyota transferred know-how of for example production technologies. Third, the development of strong ties among the suppliers, enabling the suppliers to create sub-networks within the full network to maximise the willingness to share information and knowledge.

In the abovementioned contributions, the focal concept is the concept of supply network. However, in other contributions the concept of supply network is discussed although it is not the focal concept. One example is Hines et al. (1998) who present and discuss a lean logistics approach to the development of a supply network. 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. Based on the study, Hines et al. (1998, p. 245) conclude 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…"*. Another contribution with a logistical point of departure is the article by Romano (2003), who 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). Roman (2003) develops a conceptual framework containing three elements and concludes that the process has lead to intensified interaction and communication both at a dyadic level, but also at an overall supply network level.

Based on this small literature review we can conclude that a lot of the empirical studies both of supply bases and supply networks has been conducted in or related to the automotive industry. This has also been observed by Kinder (2003) who claims that the creation and management of supply networks have first and foremost been studied in automotive settings, originating in Japan and transferred to other (automotive) manufacturing countries. In a

similar vein, Harland et al. (2001, p. 21) claim that *"… most of the cases to date have focused on large, powerful assemblers, centrally positioned in relatively high-volume, low-variety supply networks, and describe their influence over these types of network"*. Thus, there is a need to observe and discuss supply base and supply network management in other industrial settings, including those organised by projects. We can also conclude that none of the reviewed contributions discuss the relation, interplay or differences (if any) between the concepts of supply base and supply networks. In fact the two concepts are seldom combined within a single study or article.

An inquiry into the relation between supply base and supply network may take primarily a theoretical or an empirical route. In this paper we opt for the empirical route. Hence, in the empirical part of the paper we shall look into the *interplay between 'supply base' and 'supply network' over time* as we follow a main contractor who tries to develop a supply network of technical subcontractors.

Methodology and empirical base

In order to *empirically* investigate if and how the supply base and the supply network of a firm are related, and possibly influence one another, it is useful (a) to study both at different points in time and (b) to study if and how either or both change over time – in relation to each other, or separate from one another. This is so because some properties of and relations between the supply base and the supply network may be possible to identify only in periods of change and/or over time (cf. Jönsson 1999, p.24). Insight of these types may best be gained through processual case studies which are real-time, theory-led, and contextual (Pettigrew, 1997). Therefore, in making the single-case study, which we report on in this paper, we have used such a methodology.

The focal firm in the study is a large main contractor. As mentioned earlier, most studies of supply base/supply network strategies focus on firms in various manufacturing industries. Thereby, the study adds to our awareness of varieties of supply network initiatives. Furthermore, firms in the construction industry are frequently criticised for their lack of long-term supplier relationships and sourcing strategies. Therefore there is a need to investigate some of those exceptions – where construction firms do attempt to restructure their supply bases.

The empirical material for the case study was gathered in real-time, over a period of six years, and multiple sources of evidence were used. For example, we have:
(a) taken part in the main contractor's supply network project (described below),
(b) carried out approx 40 semi-structured, personal interviews with people from the contractor as well as the subcontractors,
(c) taken part in various internal seminars, workshops and field trips (to construction sites),
(d) read various company documents, and
(e) supervised a number of (master) students writing their theses with the contractor as the core firm.

Empirically, we have followed a large main contractor in its efforts at reorganising and reducing the supply base of the firm and structuring part of the base as a supply network. This process started in 1997 and we have followed the firm in the period 1997-2003. First, the firm organised its efforts by means of a sourcing project (and a project group) with the aim to

design a supply network within the Building Division of the firm. The project was called; 'Network with technical subcontractors', and the supply network consisted of subcontractors 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."*

Based on the aim of the project, the firm classified all the suppliers (the supply base) of one chosen business unit in the Building Division into a catalogue called 'the Supplier Library'. In the library, all the business unit's current preferred 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 2:

Table 2: 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 2, 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.

Since the sourcing project mainly focused on designing a supply network of technical subcontractors, the subcontractor subset of the supply base was singled out, i.e. suppliers delivering Electrical services, Ventilation services and Plumbing services. In total, nine suppliers were selected, three for each type of technical subcontract. The selection process was carried out by a team including; the purchasing manager, project managers, site managers and foremen. After 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 other customers and suppliers
3. Competitors (firms which the suppliers would recommend as co-operation partners)

4. Ability and willingness to co-operate with the main contractor
5. Further plans in relation to the main contractor

Following the interviews, a final selection took place. One of the subcontractors, who had originally been chosen, was left out partly due to available information on the financial solidity of the firm and partly because of problems which arose in the relationship to the focal firm at the time when the supply network initiative was started up. One of the chosen ones was not interested. Thereby, the supply network initiative proceeded with seven subcontractors. The focal firm organised a number of seminars and discussions between people from the selected subcontractors and the contractor. Top management, project managers and foremen from the subcontractors as well as top management, the purchasing manager, project managers, site managers and foremen from the contractor attended the meetings.

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 (creating a network). Therefore, the business unit identified a number of construction projects, where the designed supply network was tried out. In these projects the subcontractors were divided in different constellations which were to work 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 had ended).

Through this process (beginning of 1998 to end of 1999), 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 designed supply network. 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. In addition to studying the strategic sourcing project and changes of the contractor's supply base of technical subcontractors during the above-mentioned construction projects, we have made some follow-up studies focusing on what has happened to the main contractor's supply network during the first years (2000-2003) after the initial sourcing project (including the construction projects) ended.

Analysis and discussion

In order to address the purpose of the paper, we have analysed the empirical material from different angles. First, we have looked at the subset of the main contractor's supply base which was explicitly designed as a supply network. We have analysed this subset – comprising technical subcontractors – during three time periods. *Period one* covers the period up and till the supply network initiative is started up. At the end of this period, subcontractors are chosen for the supply network project in 1997. The chosen ones were generally those subcontractors in the supply base who had been used most frequently in the years before the supply network initiative was taken. *Period two* covers the supply network project, i.e. during 1998-1999. In this period explicit initiatives aimed at creating and substantiating the supply network are carried out. *Period three* covers the first years after the supply network project had ended, i.e. during 2000-2003. In this period we can identify which subcontractors are used after the explicit initiatives have stopped. The periods are shown in table 3, at the end of the paper.

Based on table 3, we can observe that there have been a lot of changes in the 'supply network' of technical subcontractors over the time periods in question. In the middle of 2003 (when the empirical observations ended) only four of the originally selected subcontractors in 1997 were used. (Two of the subcontractors which were part of the same larger industrial group merged in 2000.) In order to analyse and understand these changes we have tried to present in table 4 the supply network and the supply base at three different points in time (1997, 1998-99 and 2003). In the table, the supply network is divided into two groups: those subcontractors who are used and those who are not used. In addition, the table comprises subcontractors *outside* the supply network but *inside* the supply base and which are *used*.

Table 4: Different uses of subcontractors across three time periods

	1997		1998-1999		2003	
Not part of supply network	11,12		12,13		9,10,12, 13,14,15	
Part of supply network	1,2,3,4,5, 6,7,8		1,2,3, 5,6,7, (11)	4,8	2,3/4, 6,7, (11)	1,5,8
	Used	Not used	Used	Not used	Used	Not used

If we look at the situation by the end of 1997 (at the start of the supply network initiative) all the selected subcontractors were used. In addition, a few other technical subcontractors were used which were not part of the supply network. Since one of the aims of the sourcing project was to reduce the supply base, we could expect that these additional subcontractors were not to be used in the following years.

When we look at the period 1998-99 we can see some changes taking place in the designed supply network, e.g. that subcontractor 4 is not used at all and that subcontractor 8 has been removed from the network in the beginning of the period. Both these changes are related to *internal factors related to the buyer* (main contractor). Internal changes in sourcing policy or strategy (see e.g. Dubois et al. 2003), change of personnel (purchasing or project managers),

different type of projects (activities), outsourcing/insourcing decisions etc., all affect the stability of the supply network over time. In our empirical material, the change in the use of subcontractor 4 represents such a situation. The main contractor had used subcontractor 4 for a number of years in small and medium sized projects, but at the time of the supply network project the main contractor did not have any project for which it was suitable to use subcontractor 4. Another example is that subcontractor 8 was abandoned in the beginning of the supply network initiative due to financial problems. These problems had been visible for a while but when the buyer began to emphasise that subcontractors should be 'financially viable' the outcome was that the relationship with subcontractor 8 ended. In this situation, however, that change (by the main contractor) affected another *relationship* as well, i.e. the relationship to subcontractor 11. This subcontractor is a supplier which the contractor had worked with for some years but which, for various reasons, was not part of the selected supplier network in 1997. However, when the relationship to subcontractor 8 ended, the relationship to subcontractor 11 became closer (because the main contractor had too few plumbing suppliers), thereby affecting the stability of the main contractor's designed supply network.

If we look at the situation in 2003, we can observe some additional changes. At this point in time the main contractor no longer buys from subcontractor 1 and 5 for various reasons. These changes, on the other hand, are primarily related to *changes made by the suppliers* thereby influencing the stability of the supply network. These changes could be related to shifts in specialisation and strategy towards customers, change of personnel, the size and type of project involved in, prioritising between different customers' projects etc. The situation for subcontractor 1 represents such a situation. By the end of period two (beginning of 2000), the subcontractor decided that they would reorganise and downsize the firm, and concentrate on smaller construction projects – especially focusing on private housing. The main contractor was very satisfied with the co-operation with subcontractor 1, as they had been involved in a lot of successful construction projects together. But the contractor could only respect the decision of the subcontractor. Another example is the merger between subcontractors 5, 13 and 14 forming a large technical subcontractor group (covering electricity, ventilation and plumbing). The new relationships within this subcontractor group affected subcontractor 5's *relationship* with the main contractor, since the main contractor was not satisfied with the new group and how it handled some of the specific construction projects it was involved in. Therefore, the contractor stopped using subcontractor 5 and instead initiated a new *relationship* with some former employees from subcontractor 5 who had left this firm and subsequently formed a new subcontracting firm – subcontractor 10. Thus, changes in subcontractor 5's other relationships were the cause of instability of the main contractor's supply network.

Summing up, we can observe that factors *internally* in the buyer or the supplier (i.e. subcontractor), or in the buyer's and the suppliers' *relationships* can bring about changes in the firm's supply network over time.

In the following we shall focus on the interplay between a firm's supply base and supply network. From the discussion above we have observed that the main contractor has gone through a tremendous change both in how the firm relates to its suppliers (subcontractors) but also how the supply base for technical services is structured. If we go back to the structure of the supply base for technical subcontractors (TSC) in 1997, the relationships between the buyer and its suppliers were characterised by short term, arm-length transactions. Furthermore, these relationships changed from one construction project to the next depending

on who had the lowest price for a given a technical subcontract. The suppliers were primarily classified according to the technical service they delivered, for example plumbing services. This is illustrated in the upper part of figure 1 (at the end of the paper).

After the supply network project started the main contractor makes a major shift in its approach towards the suppliers which partake in the project. The selected suppliers are visited by a group from the main contractor, they are invited to 'relationship building seminars', they learn how to work in sub-networks with other subcontractors (one from each of the different trade) etc. All these efforts are part of the supply network project to build trust and commitment first between the buyer and the different suppliers and furthermore among the different suppliers. This is similar to the process of creating a knowledge-sharing network described by Dyer and Nobeoka (2000). The structure of the supply base of technical subcontracts at this stage is depicted in the middle part of figure 1.

After the supply network project ended in the beginning of 2000 the network, as it originally was envisioned, gradually starts to dismantle. Some originally-selected subcontractors are less (or not at all) used in new construction projects, while some 'new' subcontractors are selected for large new projects. The interesting part with these changes is that it is not random who is selected. In one example the main contractor selects a new ventilation subcontractor which has been established because two employees left one of the subcontracting firms in the designed supply network (after a merger and a lot of changes in that firm). In that way this new subcontractor (subcontractor 10) already has a strong relationship to the buyer as well as to some of the other subcontractors. Another example is that one of the suppliers in the designed supply network has a partnership agreement with a subcontractor outside the network. When the main contractor develops a new construction project with that subcontractor (subcontractor 6) they also use its partner firm (subcontractor 12). The new structure of the supply base – or supply network – is illustrated in the lower part of figure 1.

As we can see from figure 1, the structure of the supply base of technical subcontractors has changed quite dramatically. In period three, the designed supply network is not so visible any more, and the supply network initiative is much less explicit. However, the whole supply base now has the structure of a network. Based on these observations we may ask if a supply network initiative, and supply network design, are ends in themselves or if they are more usefully regarded as means to restructure the supply base?

Results and management implications

Our research indicates that no (construction) firm can design a stable supply network and expect it to come into being and persist over time. Even if the supply-network sourcing strategy of the buyer does not change, minor or major changes in (a) the contexts of the various suppliers (subcontractors) as well as (b) the context of the buyer may lead to the buying firm's supply network to wither or to change dramatically. In short, if a (construction) firm wants to obtain such benefits which allegedly can be achieved from a designed supply network, the firm needs to (re)assess and take into account the emergent match between the changing contexts of its suppliers and the changes of firm's own context over time.

In a similar vein, a supply network initiative or projects may change over time, or be brought to an end. Some particular initiatives may be useful for creating a supply network, whereas others may be more useful for maintaining it. Our case shows that it may even be that explicit

network initiatives are discontinued when it is assumed that the new supply structure, which has arisen in part due to the supply network project, contains elements ('motors' or 'drivers') which enable a sufficient maintenance and development of connections among the involved firms even without costly 'network support' systems. Explicit supply network initiatives are always costly, for example initiatives which aim at bringing together all suppliers within a supply network. Therefore, it may be that the extent and frequency of the explicit network initiatives can be reduced over time, possibly only to be resumed again at later points in time.

Rather comprehensive supply network initiatives in the early stages may also be explained by the distinction between fully and partly connected systems (Weick 1976; Loasby 2001). As Loasby (2001, p.400) points out, *"whereas there is necessarily only one way in which a system can be fully connected, there are very many ways in which it may be partly connected"*. When a supply network project is started up, a firm may be interested mainly in 'creating a supply network'. In a supply network of more than a very small number of suppliers, however, the firm may be unsure as to how many and which connections among suppliers are useful and viable. If it is impossible to predict and plan how the system can be partly connected, i.e. impossible to assert how many and which connections are (or can be) useful, it may be fruitful to create a number of interactive arenas (or framing modes, see Holmen, Håkansson and Pedersen 2003) which in joint allow for the potential creation and substantiation of a larger number of connections among suppliers than is expected to be useful. Naturally, not all enabled, potential connections will develop substance. This however, is a positive outcome since it would be much too costly, and possibly detrimental, if the suppliers in a supply network are fully connected (cf. the tier system in supply chains). However, if no connections are created, a firm may need to reconsider its initiatives, and possibly abandon the quest altogether.

In summary, we may view a supply network initiative or project as a means to reform (a subset of) the supply base into a partly connected supply network structure. If supply network initiatives are transient phenomena, how should we then study and assess them? Towards this end, it may be useful to consider theory on path dependence. Mahoney (2000) discerns between two types of path dependence – self-reinforcing and reactive sequences of events. In a self-reinforcing sequence, the same pattern is continuously reproduced. In a reactive sequence, initial events trigger a sequence of tightly linked reactions in which the initial move rather than being reinforced over time, moves the system to a new path. In path dependent processes of both types, the existence of inertia is crucial. *"With self-reinforcing sequences, inertia involves mechanisms that reproduce a particular institutional pattern over time. With reactive sequences, by contrast, inertia involves reaction and counter-reaction mechanisms that give an event chain an "inherent logic" in which one event "naturally" leads to another event"* (Mahoney 2000, p. 511). Hence, if a supply network initiative is seen as a transient phenomenon, it is in effect treated as an initial event which leads to reactive sequences of events which maintain the emerging supply network. Thereby, future research may focus on understanding how initial events (sourcing projects) may be designed so that (the probability rises that) they bring about supply networks (and networking processes) which differ from, but are closely dependent on, the initial events. It is however, also possible that supply network initiatives are marked by self-reinforcing sequences of events. Toyota's network, as described by Dyer and Nobeoka (2000), seems to be an example of a self-reinforcing supply network since the same (costly) network processes are continuously reproduced. Future research which investigates supply networks processually, and possibly inspired by path dependence theory, would be extremely interesting in order to enlarge our knowledge of supply networks and their creation, maintenance, dissolution and management in different

contexts. It may be that in relatively stable settings where there are neither many substitutions of suppliers nor much technological change it is easier to identify supply networks characterized by reactive sequences of events. Conversely, that supply networks of the self-reinforcing type are required in dynamic settings where the need for continuous updating is essential.

Based on our study, and as mentioned above, it is possible to view a supply networking project as a means for transforming part of the supply base into some sort of supply network. It is also possible to view the supply base as one important point of departure for designing a supply network project. For example, inspiration may be acquired from cooperation with some existing suppliers, suppliers may be selected from the supply base etc. However, further research into the relation and interplay between base and network is much needed. For example, if a supply network is a subset of the supply base, how do we define the boundary around the subset? Further, when making a distinction between supply base and supply network, is it the focal firm's perspective (i.e. its representation of a phenomena in 'reality') which matters most, or is it that of a researcher? Put differently, is a supply base a supply base when a focal firm treats it like a supply base even though there may be connections between the suppliers which the focal firm disregards or is unaware of?

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Figure 1: Changes in the main contractor's supply base for technical subcontractors

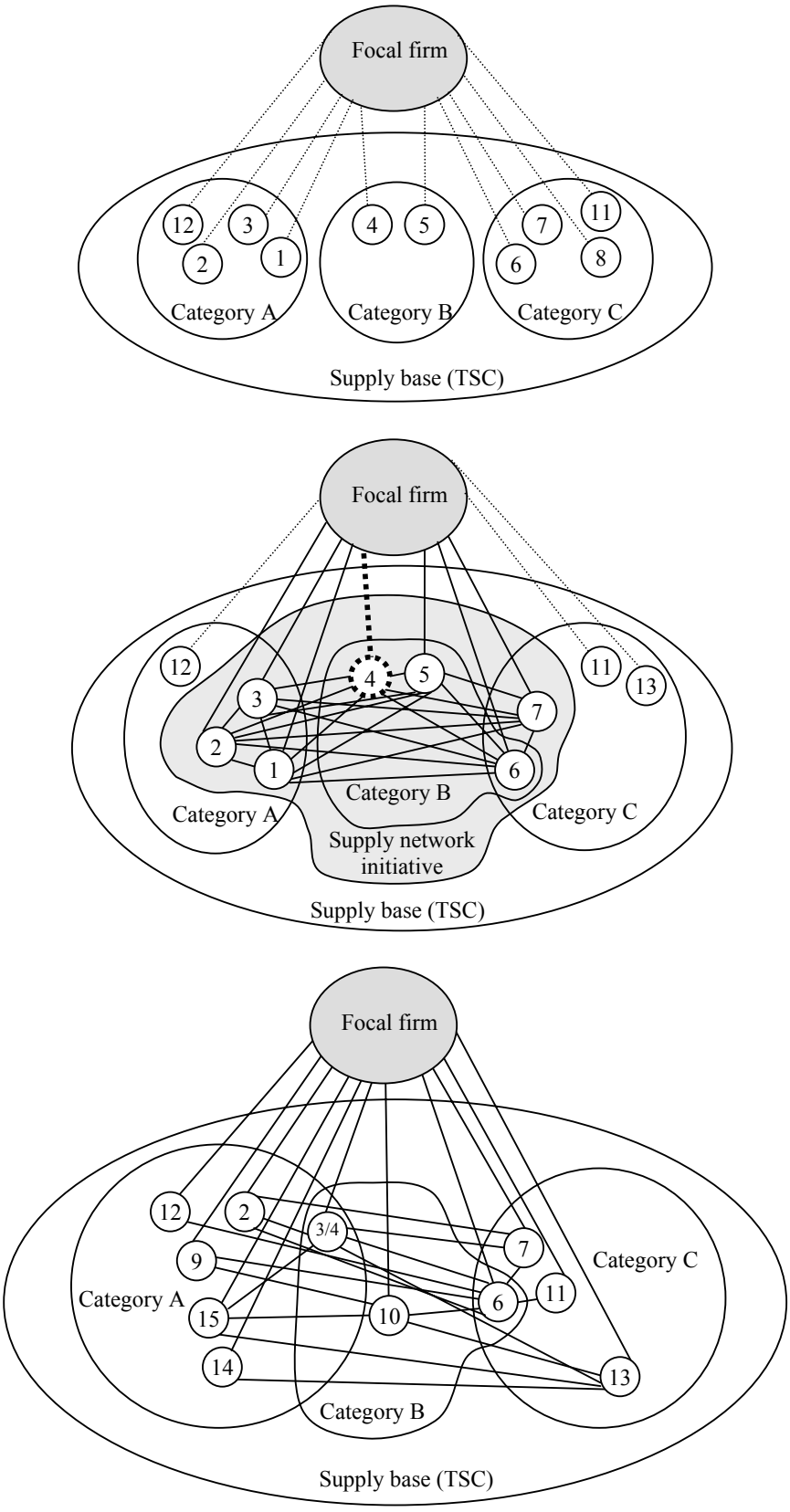

Table 3: Technical subcontractors used by the main contractor in the period of 1997-2003

Subcontractor	Period one: Used in the years before the supply network (SN) project stated in 1997	Period two: Used during the supply network project in 1998-99	Period three: Used in the period 2000-03 (after the supply network project ended)
Subcontractor 1	Yes. Part of SN	Yes	No. The subcontractor has experienced some internal problems resulting in a change of specialisation and strategy towards customers.
Subcontractor 2	Yes. Part of SN	Yes	Yes, but only on smaller projects due to capacity problems.
Subcontractor 3	Yes. Part of SN	Yes	Merged in 2000. Used quite little in this period. The subcontractor's top management would like to co-operate with the main contractor, but is unable to get the rest of the organisation to actually co-operate.
Subcontractor 4	Yes. Part of SN	No	
Subcontractor 5	Yes. Part of SN	Yes	Merged with subcontractor 13 and 14 in 2000, but operates mainly today as three separate units. Subcontractor 5 has been used less than expected, because of some important personal relations were broken as a result of the merger process. Not used after 2002.
Subcontractor 6	Yes. Part of SN	Yes	Yes. The subcontractor is widely used today.
Subcontractor 7	Yes. Part of SN	Yes	Yes. The subcontractor has undergone changes and substitutions of employees. Nevertheless, the co-operation with the main contractor has proceeded and developed.
Subcontractor 8	Yes. Part of SN	Part of the period. The firm had financial problems and left the SN.	No. The subcontractor is out of the professional market.
Subcontractor 9	No	No	Yes. The subcontractor started to be used because the main contractor needed more subcontractors of electrical services. The subcontractor is widely used by the main contractor.
Subcontractor 10	No	No	Yes. Some former employees of subcontractor 5 became owners of this subcontractor. These persons have been the main contractor's key co-operation partners.
Subcontractor 11	Yes, but not part of SN	Yes, partly part of the SN.	Yes. The subcontractor started to be used because the main contractor had too few plumbing subcontractors when subcontractor 8 was no longer used.
Subcontractor 12	Yes, but not part of SN	Yes, but not part of the SN.	Yes. Much used today and an important partner.
Subcontractor 13	No	Yes, but not part of the SN.	Yes. More used after the merger (with subcontractor 5 and 14).
Subcontractor 14	No	No	Yes. Stated to be used after the merger (with subcontractor 5 and 13)
Subcontractor 15	No	No	Yes. Important partner today.