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To my grandfathers,

Kalevi and Pekka

KULMALA, Harri Ilmari
Cost Management in Firm Networks

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Keywords: Cost accounting, Cost management, Customer–supplier relationship, Network, Open–book accounting, Supply chain management

Abstract

This research introduces the present state, development practices, emerging problems, and major challenges in the areas of cost accounting and cost management in networked firms. The research links two separately studied areas, management accounting and networking, in the same context by producing empirical and descriptive evidence on what the state of cost accounting and cost management is in networks and what the guidelines are according to which this state is changing.

The research focuses on Finnish manufacturing industry. The networks analyzed consist of one large main contractor and many small and middle–sized suppliers. The research methods applied are conceptual analysis and case studies carried out with participative observation and action research.

The two major objectives for main contractors in building networks were to increase competitiveness and to reduce costs. In order to meet these objectives, cost information from the network was needed. At the main contractors', purchasing and product design were the internal customers for cost information delivered by suppliers. Reducing costs, increasing cost awareness within organizations, and developing products were the situations in which the internal customers would need cost information. In practice, the main contractors were less satisfied with suppliers' cost information than the suppliers were with their own cost information.

The tracing of direct cost in case networks was conducted poorly. The weak situation in direct costing made the allocation of indirect cost very inaccurate because the allocation was mostly based on direct cost measurement. The reasons for poor costing were limited use of job order numbers and incomplete material consumption follow–up by orders. The most important accounting situations, in which cost information was used and needed at the suppliers' in case networks, were pricing and offer calculation, product mix selection, and production process selection.

In order to improve the present state of cost accounting, some suppliers participated in cost management development projects. During this research, development was based on implementing applications of activity-based costing. The development was incremental, and the ABC systems built were modifications of existing cost accounting systems. The two open–book practices of this research are exceptional compared with earlier literature concerning both the quality of cost information and the scope of openness. The scope of openness in the two cases covered all customer–

specific costs, not only variable or direct costs. The win–win solutions of this research occurred through step–by–step processes. No win–win implementations were made on an ad hoc basis or fast; rather they were based on cost analysis and took over one year to realize. This research emphasizes the behavioral side in the open use of cost information. Inter-organizational cost information utilization depended on the balance of power between firms, on the trust between personnel, on the volume of firms' mutual business, and on the state of supplier's cost accounting.

This research indicates three requirements for efficient and effective cost management in networks: cost accounting of member firms should be organized so that it produces relevant, accurate, and usefully presented information, network firms should share at least part (product or customer–specific) or all of their cost information with their customers / suppliers so that consecutive firms in supply chains could cooperate from the same starting point for cost reductions, and network firms should open their cost information multilaterally at least in situations where the benefit for the whole network is expected to meet the benefits of an individual firm. These requirements can be understood also as steps that a network and member firms should take on the road to establishing network accounting and network–wide cost management.

Besides the requirements, this research indicated four emerging challenges for cost management in manufacturing networks: First, long–term approach to a network calls for knowledge whether customers in the network are profitable or not. Second, before taking production responsibility for new network customers, the profitability impact of possible change in production volume should be known. Third, implementing fair win–win improves the likelihood of positive results in cooperation between firms. Finally, identification of the cost–reduction potential of inter–organizational process changes and cooperative operations within a network is more likely if cost information from network members is available than when it is not.

Three major directions for further research are evident as a result of this research. First, in order to avoid the problems of reliability, generalization, and contextuality, a larger number of networks, from the point of view of what the present state and needs are in cost accounting and cost management, should be analyzed. Second, detailed measurement of the results of the cost management development in networks should be carried out. Third, what challenges emerge after the cost accounting in network firms is well–organized and complete openness concerning cost information is reality?

Tiivistelmä

Tämä tutkimus tarkastelee verkostoituneiden yritysten kustannuslaskennan nykytilaa ja kehittymistä, sekä verkostomaiseen toimintatapaan liittyviä ongelmia ja haasteita kustannusten hallinnan näkökulmasta. Tutkimuksessa yhdistyy kaksi paljolti erillään tutkittua aihealuetta, johdon laskentatoimi ja verkostoitumisilmiö. Tutkimus on toteutettu suomalaisessa valmistavassa metalliteollisuudessa. Tarkastellut verkostot koostuvat päähankkijasta ja useista pienistä ja keskisuurista toimittajista. Tutkimuksessa sovellettiin toiminta-analyyttistä tutkimusotetta.

Päähankkijat asettivat verkostoilleen kaksi merkittävää tavoitetta: kilpailukyvyn parantaminen ja kustannussäästöjen saavuttaminen. Näiden tavoitteiden saavuttamiseksi päähankkijat halusivat verkostoyrityksiltä yksityiskohtaista tietoa näiden kustannuksista. Tätä tietoa tarvittiin erityisesti hankinnan ja tuotesuunnittelun tueksi. Toimittajilta saatava kustannustieto koettiin kuitenkin puutteelliseksi sekä määrän että laadun suhteen.

Välittömien kustannusten seuranta ei ollut riittävän korkeatasoista verkostoyrityksissä. Koska välillisten kustannusten kohdistaminen laskentakohteelle perustuu usein välittömien kustannusten määrään, välittömien kustannusten heikko seuranta saattaa johtaa virheelliseen välillisten kustannusten kohdistamiseen. Näin oli myös tarkastelluissa yritysverkostoissa, joissa merkittävimmät puutteet välillisten kustannusten seurannassa olivat työnumeroiden käytön ja materiaalikulutuksen seurannan laiminlyönti. Toimittajayritykset kokivat, että heidän laskentajärjestelmänsä ei riittävästi tue hinnoittelua ja tarjouslaskentaa, tuotepäätöksiä eikä tuotantomenetelmien valintaa.

Koska kustannuslaskennan nykytila oli verkostoyrityksissä näinkin heikko, eikä vastannut päähankkijoiden verkostolle asettamia vaatimuksia, osa toimittajayrityksistä aloitti systemaattisen kustannusten hallinnan kehittämisen. Kehitystyö perustui toimintolaskentaa mukailevien laskelmien tekemiseen ja yritysten nykyisten laskentajärjestelmien tarkkuuden ja hyödyllisyyden parantamiseen. Kehitystyön tuloksena kaksi toimittajayritystä avasi kustannusrakenteensa päähankkijoille, mikä on aiemman kirjallisuuden valossa harvinaisen edistyksellistä verkostotoimintaa. Tutkimuksen aikana syntyneet win–win –ratkaisut rakentuivat pienin edistysaskelin molempia osapuolia hyödyttäen, mutta kuitenkin selkeästi kustannustietoon perustuen. Tämän tutkimuksen valossa yritystenvälisessä kustannustiedon hyödyntämisessä korostuvat yritysten valtasuhteet, henkilöstön luottamus, keskinäisen kaupankäynnin volyymi ja tarjolla olevan kustannustiedon laatu.

Tutkimuksen perusteella tehokkaalle kustannusten hallinnalle verkostoissa voidaan nimetä kolme keskeistä vaatimusta: verkostoyritysten tulee tuntea omat kustannuksensa täsmällisesti, kustannustietoa tulee hyödyntää avoimesti asiakkaiden ja toimittajien kanssa, ja kustannustietoa tulee oppimisen tehostamiseksi tarjota myös koko verkostolle. Näitä vaatimuksia voidaan pitää myös toisiaan seuraavina askelina, jotka verkostoyritysten tulee kustannuslaskennan alalla ottaa matkalla kohti verkostomaista liiketoimintatapaa.

Edellä esitettyjen vaatimusten ohella tutkimus nostaa esiin neljä tulevaisuuden haastetta valmistavan teollisuuden verkostoille. Ensiksi, verkostoyritysten tulisi tuntea asiakaskohtainen kannattavuus, jotta voidaan arvioida minkä yritysten kanssa verkos-

toituminen on kannattavaa. Toiseksi, ennen verkoston palvelemiseen sitoutumista yritysten tulisi selvittää siitä mahdollisesti aiheutuva tuotantovolyymin muutos ja tämän vaikutus kannattavuuteen. Kolmanneksi, oikeudenmukaiseksi koettujen win–win –ratkaisujen synnyttäminen verkostosuhteissa näyttää parantavan yhteistyön onnistumisen todennäköisyyttä. Neljänneksi, kustannustiedon hyödyntäminen yli yritysrajojen lisää kustannussäästöjen saavuttamisen mahdollisuuksia.

Tutkimuksen seurauksena voidaan esittää ainakin kolme keskeistä jatkotutkimus-aihetta. Tutkimustulosten luotettavuuden ja yleistettävyyden parantamiseksi sekä ympäristösidonnaisuuden vähentämiseksi aineistoa tulisi hankkia lisää nyt tutkituista näkökulmista. Kustannuslaskennan kehittämisen tuloksia tulisi toisaalta arvioida nykyistä tarkemmin koko verkoston näkökulmasta. Lisäksi tulisi paneutua sellaisiin seikkoihin, jotka saattavat olla haasteita siinä tapauksessa, että verkostoyritykset saavat kustannuslaskentansa hyvään kuntoon ja kustannustiedon hyödyntäminen muuttuu systemaattiseksi.

Acknowledgements

It has been suggested that science and scientists are there to seek the truth. Are there absolute definitions and measures for truth, or is truth relative? According to the lesson learned from conducting this research, relativity is what rules in the real industrial world, to a very high degree. However, if our world, the phenomena of this world, and the observations on these phenomena are simplified enough, something absolute might be found. Hence, it seems that an industrial management scientist can find the very truth, relative or absolute, he wants to find.

This thesis is the result of a process that began in 1997. The questions I used to entertain about how to do business were of rather general nature, but they became specific and took on practical form when I worked in industry and observed business. The next step was to find a place in which it would be possible to approach the questions in the light of wider, deeper, and more reliable empirical evidence. The most suitable place for this was Tampere University of Technology where a program for young researchers was launched. Since the beginning of the program, I have not been able to disengage myself from my studies and research. Special thanks go to Professor Hannu Eskola (Digital Media Institute) for leading me to the world of academic research.

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operative help during the years of this research, the research would never have been finished. Hence, thanks to Laboratory Engineer Jukka Annala and Secretary of the Institute Sirpa Järvenpää for help in everyday work, and to Lecturer Danny Donoghue for proofreading my English. The personnel of the Institute of Industrial Management also supported me, for which I am thankful.

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The most important persons in my life, my family, have had to bear the burden of socializing with an inconsistent and confused researcher. I have not been able to provide you with clear schedules or a plan for my life. At the same time, I have troubled you with changing attitudes and changing opinions. Thanks to my parents, Marita and Esko, to my sister Terhi, and to Helvi and Toivikki for going through also the bad moments with me and for giving outsiders' opinions to help me to understand something of my character and interests. Conducting this research has increased my understanding not only of business and science, but also of myself.

It is unclear if science and the scientist can provide us with something called the final truth. Seeking for relative and limited truths seems to be challenging enough for us. I believe the final truth is in the hands of God.

Amuri, Tampere, March 27th, 2003

Harri Kulmala

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II Kulmala, H. I., Paranko, J., Uusi-Rauva, E. (2002) **The Role of Cost Management in Network Relationships**. International Journal of Production Economics. Vol. 79. Iss. 1. pp. 33-43.

III Kulmala, H. I., Seppänen, M. **Exploring Cost Management Practices in Networks.** Research Reports 4/2003. Department of Industrial Engineering and Management. Tampere University of Technology. 34p.

IV Kulmala, H. I., Lahikainen, T., Paranko, J., Happonen, M-P. (accepted, 11.3.2002) **On the Road to Win-Win – A Case Study**. The Journal of Supply Chain Management.

V Kulmala, H. I. **Accounting in Customer–Supplier Relationships – Developing Cost Management in Network Environment**. Proceedings of the 3rd Conference on New Directions in Management Accounting: Innovations in Practice and Research. Vol 2. pp. 699-716. Brussels, Belgium, December 12-14, 2002.

1 INTRODUCTION

1.1 Practical background

1.1.1 Changes in purchasing and supply

Four major changes took place in the purchasing of manufacturing industry firms during the 1990's (Lehtinen, 2001; KTM, 2000; Gumbleton, 1999; Karjalainen et al., 1999; Parker, 1999; Torppala, 1999; Christopher, 1998; Ranta, 1998; Virolainen, 1998; Koskinen et al., 1995; Hamel & Prahalad, 1994; Quinn & Hilmer, 1994; Lehtinen, 1991):

- purchasing become one of the critical strategic issues in managing supply chains,
- outsourcing increased the share of purchases in firms' annual sales,
- division of duties and positioning of firms came to be based on process demands within supply chains, and
- centralization of purchases decreased the number of direct customer–supplier relationships.

In addition, these changes and the emergence of electronic commerce (e-business) have led to an environment in which supply networks appear as a widely discussed issue. This development means that the supply of manufacturing products is more and more organized as illustrated in the top of Figure 1.

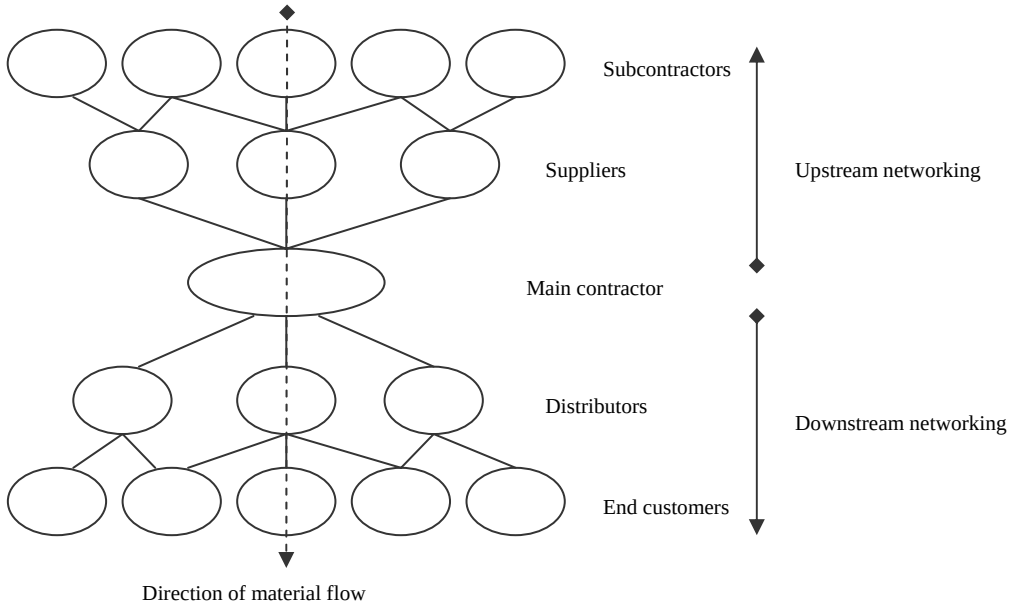

Figure 1. The directions of networking. (Modified from Christopher, 1998, p. 18 and Ranta, 1998, p. 4)

Generally speaking, the four changes introduced deal with upstream networking. The first one, outsourcing, is not a new phenomenon. Firms have, since the beginning of commercial exchange, bought something and interacted somehow with other firms. However, the volume of outsourced activities grew fast especially in the 1990's (Karjalainen, 1999; Trent & Monczka, 1998). Concentrating on the core competencies, doing what the firm expects to be best at, for example being the most

cost efficient, and letting other firms do the rest, where they are best, is unquestionably the driving force behind the outsourcing paradigm (Kakabadse & Kakabadse, 2000; Hamel & Prahalad, 1994). The need to concentrate only on some activities requires specialization of firms as a part of the larger supply chain. Also the academic discussion of inter–organizational relationships dates back to the 1930's (Kakabadse & Kakabadse, 2000; Virolainen, 1998; Ring & van de Ven, 1994; Ouchi, 1979).

Second, there are several activities in a supply chain which are, at least to some extent, consecutive and hierarchical. Therefore, supply chain firms often organize themselves according to the respective structure (Gumbleton, 1999; Lehtinen, 1991). The role of a firm in a supply chain compared with the material flow creates the framework and objectives for the firm: there are, for example, raw material suppliers, capacity providers, work phase subcontractors, part subcontractors, component suppliers, and system suppliers (Lehtinen, 2001; Torppala, 1999). All these (labeled "Subcontractors" and "Suppliers" in Figure 1) are suppliers either to a main contractor or to each other. On the other hand, from the main contractor's point of view these suppliers can be classified into groups according to their strategic importance, volume of purchases, or other variables (Olsen & Ellram, 1997; Campbell, 1985). One of the key variables in classifications has been the style of cooperation with a supplier (Handfield et al., 2000; Kapoor & Gupta, 1997; Koskinen, 1995). The style of cooperation can be everything from trade-oriented (spot transactions) to strategic partnership (long-term commitment).

The third change is the centralization of purchased volume. For example, Parker (1999, p. 16) states that one of the major trends changing logistics business is the consolidation of the industry. The centralization of purchased volume decreases the number of direct suppliers and increases the volumes purchased from single suppliers (Cooper – Slagmulder, 1999). The goal of centralization is to reduce the administrative costs of maintaining many parallel customer–supplier relationships (Nurmilaakso, 2000, pp. 60-61). This trend is reported for many kinds of products (Carbone, 1999; Raider, 1999; Koskinen et al., 1995). Thus, there is a transition in progress from multi–source purchasing to multi–tier supply systems and fewer first–line suppliers.

Academics and practitioners in business economics deal with the issues mentioned under a "networking" label (Lamming et al., 2000; Ebers & Jarillo, 1998; Halinen & Törnroos, 1998; Hyötyläinen & Simons, 1998; Ranta, 1998; Palin, 1998; Stabell & Fjeldstad, 1998; Virolainen, 1998; Hines, 1996, 1994; Koskinen et al., 1995; Andersson et al., 1994; Lamming et al., 1993; Håkansson & Snehota, 1989; Jarillo, 1989, 1988; Thorelli, 1986). Network theories have their origins especially in three different approaches (Vesalainen, 2002, pp. 24-29):

- The social psychologist approach – social exhange theory, social capital approach, and organizational learning (see Castells, 1996; Anderson et al., 1994; Cook et al., 1983; Cook & Emerson, 1978; Granovetter, 1973).
- The strategic management approach – resource–based view, interactive approach, and strategic networks (see Ford et al., 1998; Hamel & Prahalad, 1994, Jarillo, 1993).

- The economic theory approach – transaction cost theory, resource dependency approach, and game theory (Nurmilaakso, 2000; Väntsi, 1999; Virolainen, 1998; Thorelli, 1986; Williamson, 1985, 1983, 1979, 1975).

Networking is understood as a way to compete succesfully in the market, as a way to control end product supply, and as a way to ensure the availability of critical competencies. In this mien, the material flow and value chain from raw material through supply system to end product are the points of interest. Intense discussion about networks in business began in the 1980's and has diversified since its beginning.

1.1.2 Critical success factors within networks

Networks consist of firms and their relationships. Hence, networks are systems of many dyadic customer–supplier relationships (Vesalainen, 2002; Fletcher & Barrett, 2001; Halinen & Törnroos, 1998; Raatikainen & Ahopelto, 1997; Castells, 1996; Anderson et al., 1994). Following inductive reasoning, it is reasonable to expect what is important in dyadic relationships to be important also in networks. For this reason, the critical success factors within networks are first approached from the direction of partnership research.

Mohr & Spekman (1994) studied 13 characteristics of which six were positively connected with the success of partnerships. They can be regarded as critical success factors of partnerships. Seven other characteristics were also tested, but there was no strong evidence of their connection with the success of partnerships. Mohr & Spekman define the characteristics as follows (pp. 137-139):

- "*Commitment* refers to the willingness of trading partners to exert effort on behalf of the relationship. It suggests a future orientation in which partners attempt to build a relationship that can weather unanticipated problems."
- *Trust* – "the belief that a party's word is reliable and that a party will fulfill its obligation in an exchange".
- "*Coordination* relates to boundary definition and reflects the set of tasks each party expects the other to perform."
- *Communication quality* is defined as five characteristics of information: accuracy, timeliness, adequacy, completeness, and credibility.
- "*Participation* refers to the extent to which partners engage jointly in planning and goal setting."
- "Firms in a strategic partnership are motivated to engage in *joint problem solving* since they are, by definition, linked in order to manage an environment that is more uncertain and /or turbulent than each alone can control. When parties engage in joint problem solving, a mutually satisfactory solution may be reached, thereby enhancing partnership success."

Network studies clarify the picture of the criticality of these issues also in networks (Christopher, 1998; Ebers & Jarillo, 1998; Forström et al., 1997). Forström et al. (1997) analyzed networks that consisted of small and medium–sized Finnish firms. Ten critical success factors were found and all the characteristics of Mohr & Spekman were among them. Furthermore, equality of firms, importance of market demands on network's activities, and increased competitiveness were added to the list. In his supply chain analysis, Christopher (1998, p. 234) found three critical success factors for networks: collective strategy development, win-win thinking, and open

communication. In their literature review, Ebers & Jarillo (1998, p. 4) summarize the sources of competitive advantage in networks: Mutual learning leading to faster product development, strategy of co–specialization, better information flow and improved coordination of resource flows, economies of scale through joint sourcing and research, establishing high barriers to entry to a market, and strategic coordination among competitors.

Comparing all the network studies with the study of Mohr & Spekman (1994), the assumption of the similarity of critical success factors in partnerships and in networks is relevant. The difference may appear in open communication. In networks communication has the multilateral component, while in partnerships dyadic communication is enough. From this research point of view, the critical success factors are of special importance because the framework of this research will be built on them and the inter–organizational use of cost information will be reflected against the factors.

1.1.3 Management of networks

Networks are typically placed somewhere in the middle of a market–hierarchy continuum in the typologies of business relationships (Dahlgren et al., 2001; Håkansson & Snehota, 1989; Ouchi, 1979; Richardson, 1972). On the other hand, many different taxonomies and classifications of networks have been presented (Harland et al., 2001; Lamming et al., 2000; Pfohl & Buse, 2000; Raatikainen & Ahopelto, 1997; Jacobs & de Man, 1996; Grandori & Soda, 1995; Snow et al., 1992). Hence, managing a network is somehow a dichotomy because networks consist of individual firms having only transactional ties to the network. In addition, networks also call for some hierarchy in the name of effective and efficient management. It is suggested as well that networks differ from each other significantly.

At least two approaches to systematic management of networks exist: ”runner” and ”quasi–firm” leaderships. The runner school emphasizes the importance of one leading firm or person within a network and has its origin in strategic networking (Handfield et al., 2000; Lambert & Cooper, 2000; Gumbleton, 1999; Cooper & Slagmulder, 1999b; Raatikainen & Ahopelto, 1997; Dyer, 1996; Womack & Jones, 1994; Dyer & Ouchi, 1993). The quasi–firm school consists of authors primarily oriented toward the development of networks and promotes the quasi–firm concept (Hyötyläinen, 2000; Räsänen & Koivisto, 2000; Hyötyläinen & Simons, 1998; Dubois & Håkansson, 1997; Kuivanen & Hyötyläinen, 1997; Lamming, 1993; Jarillo, 1988). The runner school is supply chain management oriented since it holds the network’s leader, the runner, responsible for the management of the network. The quasi–firm school relies on the consortium called quasi–firm that consists of representatives of network firms and makes decisions on behalf of the network firms in circumstances concerning the network.

Management of networks may be possible through linking the ideas of the schools case by case. For example, in the launching phase of a new idea, a strong actor who has the best opportunity to see the advantages of the new idea could act as a runner. In the development phase of the same idea, a more democratic approach in the spirit of quasi–firm would be consistent. How to organize the management depends on the critical success factors. Regarding the success of network members, it has been stated

that the success of supply chains increasingly defines the success of the member firms (Lambert & Cooper, 2000, p. 65). In this mien, a firm should both analyze the leadership and the leader of a network when making a decision concerning participation, and on the other hand try to have influence on the leadership and the leader in order to benefit as much as possible. Hence, both views on the management of networks, runner and quasi–firm, are relevant for a member firm.

In networks, participants may also act like driftwood. The driftwood leadership refers to no systematic leadership at all. In this sense, the network is created unintentionally and consecutive events match participants and circumstances so that the networked way of doing business takes place although no systematic leadership exists. This kind of network management is rather comparable with behavioral patterns in social networks. The driftwood perspective is there in practice, but it is excluded from this research because it is not a systematic approach, while this research is intended to be such.

There is also argumentation against partnerships and networks. The major points in the critique are that partnerships differ from the free market approach and therefore, in many cases, cause reduced competitiveness or more cost than traditional competitive biddings (Cousins, 2001; Kapoor & Gupta, 1997; Miles & Snow, 1992), and it takes too many resources to manage the risks of asymmetry of power in network relationships (Buvik & Reve, 2002, Johansson & Elg, 2002; Nurmilaakso, 2000).

1.1.4 Managing the accumulation of cost

One of the key issues in management is the management of costs. One way to improve the competitive position of a firm, supply chain, or network is efficient and effective cost management. Cost management is a systematic approach in designing and analyzing costs with modern management accounting tools (Mouritsen, 2001; Cooper & Slagmulder, 1999b, 1999a, 1998, 1997; Ellram & Feitzinger, 1999; Kaplan & Atkinson, 1998; Ax & Ask, 1995; Carr & Ng, 1995; Shank & Govindarajan, 1993; Kato, 1993; Berliner & Brimson, 1988).

Ellram & Feitzinger (1999, p. 1) suggest that the purpose of supply chain management is to minimize the total cost of providing solutions to customers while maximizing the revenues of a network. In the spirit of minimizing total cost, supply chain management refers to the management of the accumulation of product costs in the overall manufacturing process. The cost accumulation is illustrated in Figure 2. The origin of this point of view lies in value chain thinking and in how to manage value chain costs within a firm (Shank & Govindarajan, 1993; Uusi-Rauva, 1989; Porter, 1985). The same idea has later been extended to cover the consecutive firms within supply chains (Cooper & Slagmulder, 1998; Uusi-Rauva & Paranko, 1998). Most of the product cost may originate exterior to a firm, and the exterior operations may influence the end product’s cost more than the interior operations.

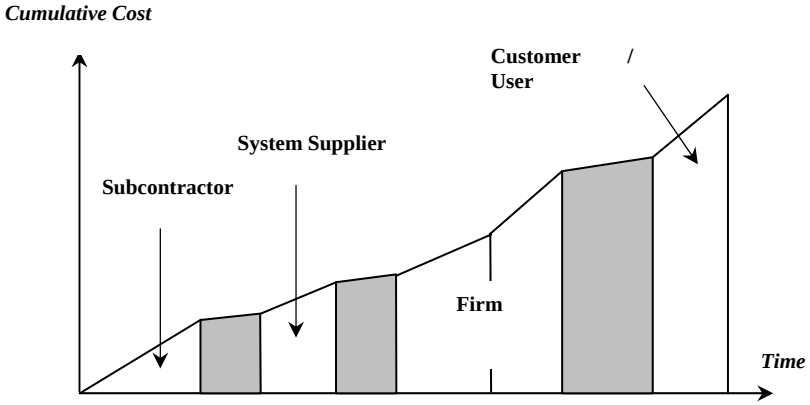

Figure 2. Accumulation of costs in supply chain. (Modified from Uusi-Rauva & Paranko, 1998, p. 51. White - processing, Grey - idle time. Cost increases during idle time due to the interest rate for example.)

Cost management through a supply chain is called inter–organizational cost management (Mouritsen, 2001; Cooper & Slagmulder, 1999b; Cooper & Yoshikawa, 1994). Within a network, inter–organizational cost management is a structured approach to coordinate the activities so that total costs are reduced (Cooper & Slagmulder, 1999b, pp. 145-146).

The relation between cost accounting, cost information, and cost management is as follows: well-organized cost accounting produces accurate, relevant, and useful cost information that helps to manage cost. In order to manage costs, cost should be known. In supply chains, this knowledge calls not only for well–managed cost accounting but also for trust, because part or all of a firm's internal cost information is expected to be shared with other firms. It is not typical to deliver cost information beyond the boundaries of a firm (Cooper & Slagmulder, 1998; Lamming 1993). Considering the minimization of total cost, the performance of a supply chain should be measured. The supply chain should, apparently, be taken into account as a system, because it is not sensible to measure the performance of supply chains by measuring individual firms separately (Cokins, 2001; Holmberg, 2000).

Two issues can be important in managing cost accumulation: taking advantage of the benefits of management accounting innovations and changing the attitudes concerning the disclosure of cost information (Tomkins, 2001; Mouritsen, 2001; Ellram & Feitzinger, 1999; Cullen et al., 1999; Cooper & Slagmulder, 1999b; 1998; Ellram, 1996; Munday 1992b, 1992a). Without cost information transfer and open discussion between firms, inter–organizational cost management may fail also in benefiting from modern management accounting tools as much as possible.

1.2 Theoretical background

1.2.1 Management accounting as a supporter of business

In the field of economic administration, accounting is divided into two groups: financial and management accounting. The major objectives of financial accounting are the registration of costs and the generation of the financial statements (profit and

loss account and balance sheet). The major objective of management accounting is to utilize this information in decision–making (Neilimo & Uusi-Rauva, 1999; Vehmanen & Koskinen, 1997). Two types of objectives are set for management accounting: planning / decision–making and control (Burch, 1994; Drury, 1992).

In decision–making, costs are divided into relevant and irrelevant (Vehmanen & Koskinen, 1997, p. 36). Relevant costs are the costs on which a decision at hand has influence. Irrelevant costs are all the rest. What is relevant or irrelevant cost, has to be analyzed case by case. Problems in this analysis occur especially when connecting different costs to cost–objects. Direct material and labor used to produce a cost–object are typically registered, i.e. traced. In control, cost centers are of special interest because indirect costs are registered by cost centers (Vehmanen & Koskinen, 1997, p. 38). The production of a cost–object, a product for example, calls for cost information from many cost centers, and a cost center may participate in producing many products. This makes it necessary to share the cost center costs between products. Sharing indirect costs between cost–objects is called allocation or assignment.

The calculation of actual costs of a cost–object includes four problems that are called accounting problems (Neilimo & Uusi-Rauva, 1999, pp. 41-43; Belkaoui, 1992, pp. 236-249). The problems encountered are closely connected to the nature of cost accounting and emanate from the fundamental problems of scope, measurement, valuation, and assignment. Furthermore, it is possible to identify two subproblems in assignment, allocation, and accrual problems (Hannula, 1999, pp. 42-43).

The degree to which the utilization–related objective can be reached depends on how the management accounting system is designed (Neilimo & Uusi-Rauva, 1999; Hoffman, 1998; Kaplan & Atkinson, 1998; Kaplan & Cooper, 1998; Vehmanen & Koskinen, 1997; Burch, 1994; Drury, 1992). If the registrational objective is neglected and registration is carried out deficiently, the management accounting system will not support decision–making. Traditional costing methods are job order costing and process costing (Hyvönen & Vuorinen, 2001; Vehmanen & Koskinen, 1997; Lukka & Granlund, 1996). Hybrid systems combining features of these methods exist as well. The critique of the usefulness of management accounting systems based on traditional costing methods began in the 1980's and was directed toward accounting information that does not support decision–making (Kaplan, 1990, 1986, 1984, 1983; Cooper, 1987; Cooper & Kaplan, 1987; Johnson & Kaplan, 1987). As a result of this discussion, more sophisticated and more accurate methods for defining product costs have been developed. In the front line of such methodological development has been activity-based costing i.e. ABC (Neilimo & Uusi-Rauva, 1999; Kaplan & Atkinson, 1998; Karjalainen, 1997; Vehmanen & Koskinen, 1997; Ness & Cucuzza, 1995; Kleinsorge & Tanner, 1991; Turney, 1991; Brimson, 1991).

Roslender (1996, p. 533) sees two directions in the research and development of management accounting: accounting for strategic positioning and critical accounting for management. It is evident that the need to develop new accounting tools derives on the one hand from increased interest in a more accurate and better–serving cost information and on the other hand from more intense market–driven need to manage cost. Systematic cost management is not possible if the accounting system does not support the work (Ax & Ask, 1995; Shank & Govindarajan, 1993; Turney, 1991; Bromwich, 1990). Hence, what is the state of management accounting systems?

Hoffman (1998, p. 39), for example, states that the most important factor restraining the development of business in general is firms' inability to measure product and customer profitability.

1.2.2 The role of management accounting in interaction of firms

As management accounting has a role in supporting business, it is also expected to have a role in the interaction of firms, because firm interaction is an important part of business. The role of management accounting derives from the discussion about the cost saving potential available through the interactive approach (Kajüter, 2002; Mouritsen, 2001; Lazar, 2000; Cullen et al., 1999; Degraeve & Roodhooft, 1999; Seal et al., 1999; Cooper & Slagmulder, 1999b, 1998; Berry et al., 1997; Dyer, 1996; Cooper & Yoshikawa, 1994; Frey & Schlosser, 1993; Munday, 1992a, 1992b). The origin of this approach lies in the target costing (TC) of the Japanese car industry (Carr & Ng, 1995; Tanaka, 1993; Kato, 1993; Monden & Hamada, 1991). The interactive approach refers to the need to control the accumulation of costs, as described in Chapter 1.1.4. Several reports on inter–organizational cost reductions emphasize the need to integrate management accountants and management accounting systems in this mutual work of firms in a supply chain (Cullen et al., 1999; Berry et al., 1997). The driving force behind the need seems to be the role of buyer firms' purchasing in planning and implementing measurement and cost–reduction efforts extending over the complete supply chain (Axelsson et al., 2002; Degraeve & Roodhooft, 1999; Seal et al., 1999; Olsen & Ellram, 1997; Ellram, 1996; Dyer, 1996; Frey & Schlosser, 1993).

Measurement of the outcomes of partnerships and make-or-buy decisions is seen as a primary form of the involvement of management accounting in supply chain management (Seal et al., 1999; Gietzmann, 1996; Berliner & Brimson, 1988). It has been suggested that the measurement of a supply chain's performance should be organized by considering the parts of the chain as a system, not as separate units (Holmberg, 2000, p. 865). As costs are part of the overall performance, the idea is relevant also in the area of measuring costs (Cokins, 2001, p. 25). On the other hand, purchasing literature emphasizes the perspective of management accounting indirectly, mainly via the focus on cost reduction. This may be the reason why management accounting in supplier relationships is concentrated on in the literature. Studies on management accounting in supplier relationships emphasize the use of modern management accounting tools across firm boundaries (Mouritsen, 2001; Lazar, 2000; Cullen et al., 1999; Seal et al., 1999; Cooper & Slagmulder, 1999b, 1998; Cooper & Yoshikawa, 1994). Supply base is also analyzed through similarities and differences in the accounting needs of different kinds of customer-supplier relationships (Handfield et al., 2000; Olsen & Ellram, 1997; Ellram, 1996). ABC, balanced scorecard, TC, open–book accounting (OBA), and value engineering are often mentioned in the context of efficient and effective interfirm management accounting (Kajüter, 2002; Cokins, 2001; Dekker & van Goor, 2000; Cullen et al., 1999; Ellram, 1996; Carr & Ng, 1995).

The nature of the studies concerning management accounting in firm relationships has been mainly dyadic so far. In empirical studies, customer–supplier relationships within supply chains are analyzed (Tomkins, 2001; Mouritsen, 2001; Dekker & van Goor, 2000; Cullen et al., 1999; Buxton, 1997). A problem observed is that the inter–

firm integration of management accounting systems makes it necessary for a firm to decide whose system would be best and how many different systems could be used simultaneously. Furthermore, a discussion has begun on who has a right either to see another's cost in the spirit of OBA or to bring pressure to bear on another's processes in the spirit of TC.

As the major purpose of involving management accounting in firm interaction is to improve the outcome of a business relationship, it should be remembered that the outcome depends also on the existing trust (Svensson, 2002, p. 649). However, some studies claim that trust in a firm relationship is a result of the interactive approach toward management accounting (Cokins, 2001; Seal et al., 1999), while other studies consider inter–organizational management accounting possible only after a certain level of trust has been reached (Tomkins, 2001, pp. 163-165). Hence, without seeking to detract from any particular point of view, management accounting could in certain situations create trust and in certain situations call for it. As mentioned earlier, trust in general is one of the critical success factors of networks.

1.2.3 Inter–organizational cost management

As far as the interaction of a firm with its suppliers and customers is concerned, it can be defined as work done in order to improve a firm's competitive position. This is quite near what strategy is about (Johnson & Scholes, 1998; Hamel & Prahalad, 1994; Porter, 1985, 1980). One way to improve a firm's competitive position is efficient and effective cost management. Hence, cost management is a strategic issue (Shank & Govindarajan, 1993, p. 13). Cost management throughout a whole supply chain is called inter–organizational cost management. Its aim is to push the accumulation curve of supply chain costs in Figure 2 as low as possible. In the environment of this research, manufacturing industry trying to get lean, inter–organizational cost management is defined as follows:

> *"Inter–organizational cost management is a structured approach to coordinate the activities in a supplier network so that total costs in the network are reduced" (Cooper & Slagmulder, 1999b, pp. 145-146).*

According to Cooper & Slagmulder, a firm is using inter–organizational cost management if the next four points occur at the same time (Cooper & Slagmulder, 1999b, p. 3):

1. The firm sets specific cost-reduction objectives for suppliers.
2. The firm helps its customers and/or suppliers find ways to achieve their cost-reduction objectives.
3. The firm takes into account the profitability of its suppliers when negotiating component pricing with them.
4. The firm is continuously making its buyer-supplier interfaces more efficient.

The points reflect the idea of TC. It is demanding for a firm to fulfill all the requirements. Furthermore, the requirements are closely connected to the three critical success factors of networks illustrated by Christopher (1998, p. 234): collective strategy development, win-win thinking, and open communication.

Suitable techniques for inter–organizational cost management are TC, kaizen costing, inter–organizational cost investigations, concurrent cost management, OBA, value

analysis and value engineering, and functionality-price-quality trade–offs (Mouritsen, 2001; Cooper & Slagmulder, 1999b). It is also suggested that the systematic use of these methods should be based on activity-based cost information. As the benefits from modern management accounting tools may fail to eventualize due to negative attitudes toward cost information sharing, they may fail to eventualize also due to the weaknesses in partners' internal accounting (Seal et al., 1999, p. 319).

Concerning the definition of inter–organizational cost management, a question of coordinating only activities may arise. If firms jointly make a construction change or select new material, the effect on activities and, hence, the coordination of activities is rather indirect. Therefore, it should be noted that even without any knowledge about costs, cost reductions are possible.

1.2.4 Cost accounting and cost management in networks

As the studies carried out and practices reported are mainly dyadic by nature, the question of why networks have not been analyzed can be put to academics. One of the reasons may be that the problems in dyadic interaction exist also in networks, but their nature might be multidimensional and multilateral due to more than two participating organizations being involved. However, although the definition of Cooper & Slagmulder (1999b) includes the word "network", their industrial cases reveal that inter–organizational cost management is not empirically analyzed or developed in networks. The word seems to be included in the definition more or less in order to promote the needs of main contractors in reducing costs throughout the supply network. Network accounting has been approached mainly by theoretically introducing some evident problems (Tomkins, 2001; Järvenpää et al., 2001; Nurmilaakso, 2000; Lind, 2000; Hines, 1996). The network approach in cost management is a step forward from the supply chain perspective (Järvenpää et al., 2001; Lind, 2000; Hopwood, 1996). Multilaterality of cost accounting refers primarily to transfer of accounting information between network members (Tomkins, 2001, pp. 182-184). A transparent costing system designed so that costing information is available across the supply network could facilitate sound decisions (Hines, 1996, p. 7).

Two recent empirical studies indicate increasing interest in networks as accounting environments. The studies of Dahlgren et al. (2001) and Frimanson & Lind (2000) are discussed here. The approach of these studies is somewhat different: Frimanson & Lind consider a supplier's production management on the basis of customer–specific cost information, while Dahlgren et al. cover management accounting in wider scope from budgeting to invoicing systems. Frimanson & Lind (2000) analyzed a print shop's cost management practices with its customers, but did not find multilaterality. The most important finding was that the print shop used order–based cost information as an operation management and order–scheduling tool. Cost management in this study was inter–organizational and network–wide from the print shop's perspective. Dahlgren et al. (2001) presented a typology for networks. A network of equal partners that had mutual agreement on using each other's services was named "business network" and it was almost the market situation. Closest to hierarchy was a "functional network" that consisted of a firm marketing the joint end products of nine of its suppliers. In the middle was a "strategic network" that had some joint activities around a product. No common costing and no cost information sharing occurred in the

business network. The functional network's costing system was integrated between firms, and full openness concerning each member's cost was attained. The strategic network used joint product costing for the network's end product and full openness concerning this product's cost was attained.

From this research point of view, a couple of notes on the findings should be taken. First, two–way openness between customers and suppliers has not been reported. This leads to the impression of asymmetry of power in partnerships and networks. Second, the network typology of Dahlgren et al. (business, strategic, and functional) is almost the same as that of Pfohl & Buse (2000: regional, strategic, and operative). The similarities in network descriptions seem obvious. In this research, the empirical data is gathered from networks that fall into strategic category in these typologies. Third, in line with dyadic studies, Frimanson & Lind and Dahlgren et al. found open–book practices between the network firms. Fourth, both of the empirical studies were conducted in Sweden. Fifth, detailed network–wide descriptions of cost accounting and its development is not reported.

1.3 Definitions

1.3.1 Concept definition

The concept definitions in this research are as follows:

Activities are concrete tasks or working phases that are performed in firms. (Ax & Ask, 1995, p. 55)

Cost 1 (a): the amount or equivalent paid or charged for something. 1 (b): the outlay or expenditure (as of effort or sacrifice) made to achieve an object. 2: loss or penalty incurred especially in gaining something. 3 (plural): expenses incurred in litigation; especially those given by the law or the court to the prevailing party against the losing party (Merriam – Webster, 2002)

Cost information refers to measured industrial/commercial input (time, material, resources etc.) of any object (raw material, labor, cost center, unit of a firm, firm, product, customer, etc.) valued in monetary units.

Cost accounting refers to principles, calculation rules, and information systems that are used to produce cost information.

Cost management refers to utilizing cost information in planning, controlling, and coordinating the occurrence of cost. Cost management is an area in which development in accounting for cost–objects and in economic management of a firm meet in the face of new demands and challenges (Ax & Ask, 1995, p. 14).

Inter–organizational refers to activities in which two or more firms take part.

Lean is understood as a model of a multi–tier supply system managed mainly by the main contractor (Gumbleton, 1999; Womack & Jones, 1994).

Network is 1) a system of lines or channels, 2) an interconnected or interrelated chain, group, or system, and 3) a system of firms connected by organized communications (Merriam – Webster, 2002), 4) a fundamental stuff of which new organizations are and will be made (Castells, 1996, p. 168), 5) an organized group of firms specialized in different phases of the production process and thereby completing the work of each other (Hallikas et al., 2001,

p. 10), 6) a set of organizations that have developed recurring ties when serving a particular market (Ebers & Jarillo, 1998, p. 3).

Network enterprise is a specific form of enterprise whose system of means is constituted by the intersection of segments of autonomous systems of goals (Castells, 1996, p. 171).

Price 1 (archaic): value, worth. 2 (a): the quantity of one thing that is exchanged or demanded in barter or sale for another. 2 (b): the amount of money given or set as consideration for the sale of a specified thing. 3: the terms for the sake of which something is done or undertaken: as (a): an amount sufficient to bribe one <*every man had his price*>. (Merriam – Webster, 2002)

Resources are economic elements directed to the performance of activities. (Karjalainen, 1997, p. 5)

Supply chain refers to firms that consecutively take part in delivering an end product consisting of many components to the market by adding something to, changing something in, or removing something from the product delivered by the previous firm.

Supply chain management is the integration of key business processes from end user through original suppliers that provide products, services, and information that add value for customers and other stakeholders (Lambert & Cooper, 2000, p. 66). Christopher (1998, p. 18) mentions that the concept ”supply chain management” could be replaced by concept ”supply network management”. This view is also adopted in this research. The reason for this is that from the point of view of the end product there are many participant firms in each of the upstream supplier tiers.

1.3.2 Research questions and objectives

This research is designed to diminish the gap between the evident need of utilizing cost information in networked firms more efficiently and the scarce reports on the applications of modern cost management practices in networks. How the gap is diminished depends in part on the research questions. The primary research question (PQ) in this research is as follows:

> *What kind of challenges does the networked way of doing business set for cost accounting and cost management in networked firms?*

As the PQ is rather complex to be approached as such, it is divided into five subquestions. The field of research concerning networks and that concerning cost management are widely studied, but although their intersection, in the academic literature, has been noticed as an important research area in theory, it is mostly forgotten in practice. The secondary research questions (Q1 – Q5) of this research are:

1. *How do networks of manufacturing firms account and manage costs?*
2. *What are the needs of network firms’ cost accounting?*
3. *How are cost accounting and cost management developed in business relationships of a network in the sense of cost information accuracy, cost information sharing, and cost–based win–win solutions?*

4. *How do manufacturing networks utilize modern cost accounting and cost management tools such as inter–organizational cost management, target costing, and open–book management?*
5. *How do the differences in customer–supplier relationships explain the actions of network members?*

The secondary questions are posed in order to support the primary question.

The objective of the research is to provide managers and academics with increased understanding of the effect of the networking phenomenon on management accounting, the focus being on cost accounting and cost management. As the research area, i.e. cost accounting, accounting systems, and cost management in networks, is limitedly analyzed in the literature still in the 2000's (Baiman & Rajan, 2002, p. 232) although the need for the analysis was expressed many years ago (Hopwood, 1996, p. 589), this research offers recent information on topical issues.

The theoretical objective of this research is to provide the literature with an analysis of cost accounting and cost management in networks. The aim is to present a framework that illustrates the problems of cost management in networks and links the problems to critical success factors of networks. The empirical objective of this research is to describe the present state, needs, and development of cost accounting and cost management and to present ways to improve the utilization of cost information in firm networks. The illustrations are based on empirical cases and lessons learned from implementations of management accounting innovations. The intention is to provide more detailed and more versatile descriptions than reported before.

This research concerns management accounting in business relationships. The focus of the research is in cost management in firm networks. The areas covered include cost accounting and cost management practices, techniques, needs, and development. Literature on cost management can de divided into primarily theoretically or empirically oriented research. Table 1 illustrates the positioning of this research (empirical network box) in the field of recent cost management literature. The classification in the table represents the author's opinion. However, in order to take its place in the described box, this research consists of five independent studies (see Chapter 1.4.1) that are not all located in the same box.

Focus	Theoretical	Empirical
Firm	Ax & Ask, 1995 Bromwich, 1990 Berliner & Brimson, 1988	Cooper & Slagmulder, 1999a, 1997 Karjalainen, 1997 Kato, 1993 Tanaka, 1993 Shank & Govindarajan, 1993 Monden & Hamada, 1991
Dyadic partner-ship	Handfield et al., 2000 Ellram & Feitzinger, 1999 Cooper & Slagmulder, 1998 Olsen & Ellram, 1997 Ellram, 1996	Axelsson et al., 2002 Mouritsen et al., 2001 Dekker & van Goor, 2000 Lazar, 2000 Cooper & Slagmulder, 1999b Degraeve & Roodhooft, 1999 Buxton, 1997 Gietzmann, 1996 Dyer, 1996 Carr & Ng, 1995 Munday, 1992a, 1992b
Supply chain	Berry et al., 1997	Kajüter, 2002 Cokins, 2001 Cullen et al., 1999 Seal et al., 1999 Cooper & Yoshikawa, 1994
Network	Järvenpää et al., 2001 Tomkins, 2001 Nurmilaakso, 2000 Lind, 2000 Hines, 1996	Dahlgren et al., 2001 Frimanson & Lind, 2000

Table 1. Underlying typology of cost management literature

Most of the empirical research has concentrated on cost management in dyadic partnerships. However, overlapping of the perspectives of dyadic partnership and supply chain is evident to such a degree that it is difficult to see only one perspective without the other. Furthermore, many purchasing and logistics authors analyze cost reductions as such. They are excluded from Table 1 in order to keep the focus of this research on management accounting.

The underlying assumption in the research is as follows:

> *A networked business environment poses challenges for the cost accounting of participating firms and cost management in networks. These challenges should be noted in the development of network members' cost accounting and in the active management of the costs of the network's end products.*

As a result of the research, the research questions are answered and the rationality of the assumption is evaluated. From the perspective of the research questions, the research is descriptive and explorative.

1.4 Research design

1.4.1 Research structure

This research is based on data gathered in five studies that are reported in separate articles. The research is designed to be an aggregate of these studies, which are closely linked with each other in terms of context, data, units of analysis, business environment, and time. However, the studies are independently designed to address different specific research questions. The objectives of the five studies are independent and the research approaches and methods used are selected to support these objectives. Hence, the research methods are not the same in all studies. As appendices of the research, the studies form a major part of the contribution of this research.

The five studies are as follows:

I Open–book Accounting in Networks

This study creates a framework for analyzing cost information and its use in inter–organizational relationship and network contexts. The basis for the study is in characteristics that have been noticed as important for successful partnerships, in two information types to be shared in partnerships, and in six empirical descriptions of practices in OBA. The study is conceptual in nature. Furthermore, some of the problems of open cost information are illustrated. This study provides the research with the theoretical framework and underlies the empirical studies.

II The Role of Cost Management in Network Relationships

The study presents the first case study on the present state and needs of cost management in a network. The background to the network phenomenon and its presence in manufacturing industry is described as well. A method for the empirical analysis of networks as an accounting environment is presented. The issues related to the solution of the problems of cost accounting and the efforts to achieve cost reductions are discussed, and the requirements for the development of cost accounting in networks are explained.

III Exploring Cost Management Practices in Networks

This study presents the second case study on the present state and needs of cost management in another network and a longitudinal follow–up of the development of cost management in the network described in the article II. Furthermore, the case networks are compared in the contexts of the emergence and features of networks, which are theoretically introduced as well. The state of the art in cost management in case networks is criticized, but empirical evidence shows also development and improvements.

IV On the Road to Win–Win – A Case Study

In this study, the first steps toward win–win in one of the development cases reported in the article III are described. An exceptional OBA practice in a customer–supplier relationship is reported. The starting point for this practice was in the present state analysis described in the article II. The construction of the win–win situation was begun by implementing ABC at the supplier's and giving the same cost data to a customer that was available for the supplier. The study deepens the understanding of the nature of the customer–supplier relationship behind the development. Firms' weak knowledge of actual product profitability is proved in the study once again.

V Accounting in Customer–Supplier Relationships – Developing Cost Management in Network Environment

The reports on the development of cost accounting and cost management are mostly limited to individual firms. In this study, three cases of inter–organizational development practices in cost management are analyzed from the perspective of customer–supplier relationships. The cases belong to the network of the article II and include the case of the article IV. However, a detailed analysis in the contexts of purchasing management and supplier portfolios is conducted. The unit of analysis is a customer–supplier relationship and three out of the five longitudinal cost management development cases of the article III are covered. The study introduces how the customer–supplier relationship can influence the inter–organizational use of cost information and suggests that in networks these relationships and their nature should not be ignored when striving for improvements in cost management.

The article I provides the research with an illustrative framework of cost information in networks. The four other articles report on empirical state, needs, and efforts to develop cost management in manufacturing networks. Table 2 illustrates the research, how it is composed of the articles, and which of the secondary research questions are answered in the articles. The scientific contribution of this research consists in

- providing empirical evidence on cost management and its development in firm networks (articles II – V),
- explaining the motives and consequences of the cost accounting –related events (articles III – V),
- setting the results into the framework of how cost information is structured and used in networks (articles I, III, and V), and
- expressing challenges that networking sets for cost management (articles I – V).

Unit of analysis		Nature of study / Number of units of analysis
Customer–supplier relationship	**Network**	
V Accounting in Customer–Supplier Relationships – Developing Cost Management in Network Environment (Q4 and Q5)	III Exploring Cost Management Practice in Networks (Q1 – Q4)	**Empirical / >1**
IV On the Road to Win-Win – A Case Study (Q3 and Q4)	II The Role of Cost Management in Network Relationships (Q1 and Q2)	**Empirical / 1**
	I Open–book Accounting in Networks (Q1 and Q4)	**Conceptual**

Table 2. The composition of the articles in the research.

The research is structured according to two variables. First, the unit of analysis is network in the articles I – III, and customer–supplier relationship in the articles IV and V. Unit of analysis is an important variable, because cost management is analyzed in network context first and is later approached in detail with the observations on customer–supplier relationships. The major unit of analysis in this research is a network. However, in order to understand networks, customer–supplier relationships within a network are of major importance as well, and they are the unit of analysis in two articles. Second, the nature of the research and the number of units of analysis vary between articles. The theoretical framework is built up in article I, which is conceptual in nature. In the empirical articles, the number of units of analysis is one in the beginning and more than one as the research proceeds. This approach provides an opportunity to refine the research after completing one study and moving toward the next one in the sense of identifying what should be analyzed next. Table 3 presents three or four key contents of each of the articles.

Unit of analysis	
Customer–supplier relationship	**Network**
V Doctrines of 1) customer-supplier relationships in portfolio frameworks and 2) inter–organizational cost management. Analysis of the development of cost management and the use of cost information in three customer–supplier relationships in a network. Synthesis of the focus in the use of cost information in different customer–supplier relationships. Conclusion of the need to consider not only the measures or variables used in relationship portfolio frameworks but also of the need to carry out deeper analysis concerning a relationship's nature in order to set realistic objectives and to gain acceptable results concerning the inter–organizational use of cost information.	**III** Comparison of the present states and needs of two networks in the case of network as a cost management environment. Explanation of the similarities and differences in terms of the nature and characteristics of networks. Description of a network's development in cost management. Discussion on the behavior of networks in front of the development of cost accounting and on the attitudes toward openness of cost information.
IV Introduction of a method to improve cost information and to develop cost management in a customer–supplier relationship. Carrying out of win-win negotiations between the parties. Description of the changes in a supplier's cost accounting and in the use of cost information in a customer–supplier relationship.	**II** Introduction of the basic issues of networking: centralization, the impact of partnerships on extending accounting to cover supply chain, the impact of increased volume on supplier's profitability, customer–specific profitability, win-win principle. Description of the rather weak knowledge of cost structure in a case network and of the needs related to its development. Description of three challenges for efficient cost management in networks.
	I Approach of six perspectives concerning OBA in networks. Literature review on open–book practices. Analysis of possibilities and problems of OBA in a framework built up from earlier theories. Illustration of the structure of cost information within networks.

Table 3. The key contents of articles.

The empirical observations in the studies are a result of an intensive and iterative research process. Hence, there is some overlapping of data in some of the articles. However, the perspectives on the data vary. Furthermore, the data could be reported in other forms as well, but the composition of this research is based on the progress of time. This derives from the primary interest in the state, needs, and development of networks' cost management.

1.4.2 Research approach

1.4.2.1 Qualitative research

The selection of the research approach is one of the most important decisions in conducting any research because the way in which data is gathered and of what kind the results can be depend in part on this selection (Aaker & Day, 1986, p. 49). In this mien, two main alternatives, quantitative and qualitative, are analyzed. While quantitative research analyzes things in numerical mode in the context of scientific rules accepted by academics (populations, samples, correlations, causalities,

reliabilities), qualitative research brings out issues that have a substantial meaning in a described context. According to Stainback & Stainback (1988, p. 8) the difference between these approaches is present in the objectives: The objective for qualitative research is to understand phenomena, while in quantitative research the objective is to make statements that have predictive power. The boundaries between these approaches are vague. As Alasuutari (1999, p. 32) mentions about research and studies conducted in general, a purely quantitative or qualitative approach is hard to find. However, research is typically positioned as being either quantitative or qualitative.

This research is qualitative. The reasoning behind this selection should take into account at least three perspectives:

- What is the assumption of reality?
- What is the nature of the research subject / man?
- What is the relationship between the research subject, the informant, and the researcher?

First, the assumptions of reality are analyzed in ontology. Ontology is a part of philosophy concentrating on the structures and basic elements of reality. In this context, ontological assumptions of reality are analyzed because the researcher's position with regard to them describes the underlying assumptions behind the research. Morgan & Smircich (1980, pp. 494-495) introduce ontological assumptions with the help of a subjectivist–objectivist continuum (see the left side of Table 4).

> *"Symbolic modes of being in the world, such as through the use of language, may result in the development of shared, but multiple realities, the status of which is fleeting, confined only to those moments in which they are actively constructed and sustained." (Morgan & Smircich, 1980, p. 494, about "reality as a social construction")*

> *"The social world is a pattern of symbolic relationships and meanings sustained through a process of human action and interaction." (Morgan & Smircich, 1980, p. 494, about "reality as a symbolic discourse")*

The research subjects in this research are regarded as creating social and symbolic structures, i.e. both firms and networks consisting of firms are interpreted as such. Furthermore, the subjectivist approach is more typical than the objectivist approach in studies conducted so far. Adapting the ideas of Alasuutari (1999), the case is not that simple, but some firms in some contexts may exist as concrete structures. This would be the case, for example, if a network's end product and its features represented the network as a measure for performance. This approach would be quite far–fetched, however. The actors studied are mostly structures created by humans and contracts between humans.

Ontological assumptions about reality	Assumptions about the nature of man
Subjective approaches	
Reality as a projection of human imagination	Man as pure spirit, consciousness, being
Reality as a social construction	Man as a social constructor; the symbolic creator
Reality as a realm of symbolic discourse	Man as an actor; the symbolic user
Reality as a contextual field of information	Man as an information processor
Reality as a concrete process	Man as an adaptor
Reality as a concrete structure	Man as a responder
Objective approaches	

Table 4. Ontological assumptions about reality (left) and the assumptions about the nature of the actor (right) in the continuum of subjective and objective approaches. (Adapted from Morgan & Smircich, 1980, pp. 492-495)

Second, the assumptions about the nature of man are another issue which Morgan & Smircich (1980, pp. 494-495) place on the subjectivist–objectivist continuum (see the right side of Table 4). In this research, the assumptions about the nature of man refer to the assumptions about the nature of research subjects because firms and networks are formed of men. To simplify, the subjective actor is a spirit and consciousness and the objective actor is a mechanical responder.

> *”They are not simply actors interpreting their situations in meaningful ways, for there are no situations other than those which individuals bring into being through their own creative activity.” (Morgan & Smircich, 1980, p. 494, about ”man as a social constructor”)*

> *”Human beings are social actors interpreting their milieu and orienting their actions in ways that are meaningful to them. In this process they utilize language, labels, routines for impression management, and other modes of culturally specific action.” (Morgan & Smircich, 1980, p. 494, about ”man as an actor”)*

> *”Human beings are engaged in a continual process of interaction and exchange with their context – receiving, interpreting, and acting on the information received, and in so doing creating a new pattern of information that effects changes in the field as a whole.” (Morgan & Smircich, 1980, p. 494, about ”man as an information processor”)*

The actors in this research do not represent the extreme ends; rather they mostly create a reality of their own, are social actors, and process information. The assumption about the nature of the actors is therefore more subjective. On the other hand, the manufacturing networks’ need to adapt to the market prices reflects, at least in the context of the end product, objective adaptation to the stimulus created by the environment. The actors as a whole are, however, quite far from the objective approach, because they actively create a reality of their own, even in an unforeseeable way, as will be later described in this research. According to Morgan & Smircich (1980, p. 492), hermeneutics as a research paradigm and research approaches following from this paradigm are in harmony with the subjective approach.

Third, the relationship between the research subject and the researcher may steer the research and through this steering the nature of the results as well. There is criticism of the quantitative approach, because although it is methodologically regulated, the framing of questions may be superficial. This may lead to accurate results that have good predictive power and that are generalizable, but that are not relevant at all. Hence, some quantitative studies may be self–evident or nonsense:

> *"Statistical significance cannot tell us anything about the substantial significance of the tested statements" (Lukka & Kasanen, 1995, p.80).*

One of the reasons for the lack of substantial significance may be that when reliability is increased the number of observations has to be increased. This leads to the researcher's having fewer opportunities to control every single observation. Consequently, the explanations for behavioral patterns and actions are identified mainly to the extent that the researcher has been able to think forehand, in a questionnaire for example.

The qualitative approach is different insofar as the researcher has a relationship to every single observation, i.e. interviewed informant. In qualitative studies, the researcher can also go back to issues that were not clear the first time or in a certain context. The researcher can ask the informant to focus some of his/her messages or acts for example in the spirit of why, how, and what questions. The researcher can also call into question some or all the actions of the informants in order to encourage the informants to explain and motivate their activities. Identifying the nature of the informants and the motives behind their activities may be easier when the researcher has continuous or recurrent access to the context of the informant. The most extreme form of participation is action research in which the researcher influences the informant more or less, and in this way the research results as well (Coughlan & Coghlan, 2002). Researcher–influenced results are a problem in terms of how much they relate to the research subject and how much to the researcher. However, action research as an extreme is justified by the access to confidential data: Organizations reveal more information to a researcher who is working in order to develop the organization than to a researcher who is only making observations.

Evered & Reis Louis (1991, pp. 12-13) analyze the relationship between the research subject and the researcher. Figure 3 illustrates six possible roles of the researcher in relation to the phenomenon studied. The scale is inside–outside, describing the position of the researcher from the research subject's point of view. In this research, the role of the researcher is mainly that of "participative observer" (articles II and III) and in certain parts that of "member of an organization" (article IV), or "invisible observer" (article V). The observations have been made in interviews, in interaction, and in follow–ups of discussions and actions. Hence, the role of the researcher in this research is located clearly more "inside" than "outside". However, in all the individual studies, the researcher has not worked directly for any of the participant firms, and the firms and their personnel have known this.

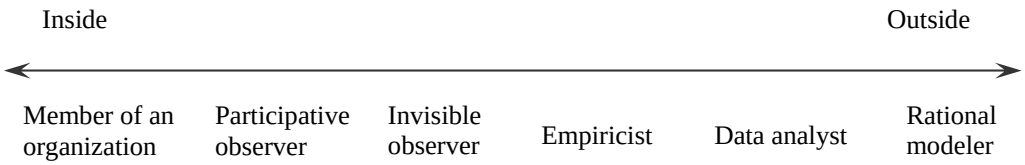

Figure 3. The role of the researcher in relation to the phenomenon studied. (Modified from Evered & Reis Louis, 1991, p. 12)

The following analysis of research methods, data, reliability, and generalizability is based on the fact that this research is conducted in an environment that emphasizes case studies and case methods. The outline of the case study methodology is mainly adopted from Voss et al. (2002), Alasuutari (1999), Yin (1994), Miles & Huberman, (1994), Olkkonen (1993), Gummesson (1991), Leonard-Barton (1990), and McPhee (1990). The special issues related to case studies in the field of management accounting research are mainly approached by following the argumentation of Coughlan & Coghlan (2002), Salmi & Järvenpää (2000), Kaplan (1998), and Lukka & Kasanen (1995).

1.4.2.2 Research methods and data

The choice of research method is closely linked to the nature of the research questions and to the earlier research on a specific field. The following questions are to be analyzed in the context of what is the fit between research approach, tradition, methods, and data:

- What is the research paradigm behind the method selection?
- How has the field been approached earlier?
- How much do academics know about the issue?
- What kinds of research methods is it possible to use?
- How will the data be collected?

It is difficult to have neutral observations without any involvement in the research subjects of this research, networks, and the use of cost information within networks. The observations on these issues are closely linked to the observer and to the social context behind the social and symbolic structures influencing the observations. Hence, it is very difficult, and maybe impossible, to rely only on external measurement. The underlying research paradigm is therefore antipositivist hermeneutics. According to Olkkonen (1993, pp. 72-73), it is a major characteristic of hermeneutics to try to build theory through deeper and more detailed understanding of phenomena. This is why many management problems are approached through this paradigm.

So far, cost management in network environment has been limitedly approached, research suggestions have been conceptual in nature, and the empirical studies have been conducted as case studies (Mouritsen et al., 2001; Järvenpää et al., 2001; Dahlgren et al., 2001; Lind, 2000; Nurmilaakso, 2000; Frimanson & Lind, 2000; Cooper & Slagmulder, 1999b, 1998; Hopwood, 1996; Hines, 1996; studies conducted as part of this research not included). Hence, the field of research is quite new. The

field of research is applied as well; it is like a synthesis of two fields of research, located namely in the crossroads of organizational networking and cost management.

All the studies mentioned are qualitative in nature. Single and multiple case studies have been used. The empirical evidence is so scarce that no information classifications for quantitative studies in this field have been made. Enlarging the analysis to cover also inter–organizationality of cost management in the spirit of dyadic customer–supplier relationships, most of the studies are qualitative as well (see Chapters 1.2.2 and 1.2.3), either case studies or action research. Descriptiveness is typical of the earlier studies and some normative guideline setting exists. To summarize, it cannot be claimed that cost management in network environment is an effusively studied issue.

The selection of research approach and paradigm leads to outlining of some research methods. In the field of management accounting research, studies are conceptual analyses, nomothetical, action–oriented, decision–oriented, or constructive (Kasanen et al., 1993; Olkkonen, 1993). This research is action–oriented, which means that the research is empirical and both descriptive and normative. The role of the researcher in the understanding of the research environment, i.e. the context, is essential.

There is also a typology for exploratory and explanatory research (Alasuutari, 1999; Olkkonen, 1993). Explanatory research is conducted in order to search for predictive factors for phenomena and coefficients of determination. Exploratory research is intended more or less to show phenomena and their relations with might–be causalities. This research is explorative in nature. It develops the existing theory of cost management in network environment. In the development of theory it is not necessary to find statistical evidence on single issues; rather, the aim is to understand and to conceptualize a phenomenon (Yin, 1994). Case studies are typical of the theory development phase (Salmi & Järvenpää, 2000). In case studies, the number of cases can be limited in such a way that an extra case does not increase evidence or our knowledge. Cases that are expected to differ from each other should be examined in order to find out as much as possible about the phenomenon studied (Yin, 1994; Gummesson, 1991). In multi-site case studies, it is important to have some similarities and some differences between cases (Yin, 1994; Leonard-Barton, 1990).

There is no unquestionable agreement in management accounting on what is or what should be the relationship between research approach, paradigm, the nature of the research, and the methods. Due to this lack of regulation, many issues have been approached by case studies. However, the case study is at its best in answering the questions ”why” or ”how” (Voss et al., 2002; Alasuutari, 1999; Miles & Huberman, 1994; Yin, 1994). The case study can be used in studies of different natures; in constructive or action–oriented studies for example. On the other hand, in a case study a versatile variety of methods can be used so that they can also suit other kinds of studies (Yin, 1994; Gummesson, 1991). As Lukka & Kasanen (1995, p. 86) state:

> *”Statistical analysis and case observations can also be combined in a single study to produce powerful rhetoric.”*

The methods applied are conceptual analysis and a literature review (article I), conceptual analysis and a single case study with interviews (article II), multiple case

studies with participatory observations and interviews (articles III and V), and a single case study with action research (article IV). Each of the studies is designed according to the principle of appropriateness. The method selections are independent and derive from the particular research problems in the studies. However, the aggregate research method in this research is the case study method, which is in line with the level of knowledge in the field of research so far. Table 5 summarizes the research methods used. In the right column the period of analysis is given. In article I, no empirical analysis was conducted but the framework for this research was built. Building the conceptual framework is a normal means of having a prior view of the general constructs or categories intended to be studied (Voss et al., 2002). On the other hand, the conceptual framework represents a construct into which the results can be placed and in which they have contextual significance.

Unit of analysis		**Period of analysis**
Customer–supplier relationship	**Network**	
V Descriptive multiple case study. Data gathering: • structured interviews, • follow-up of actions in three customer–supplier relationships • official information	III Explorative multiple case study. Description and comparison of two networks. Longitudinal follow-up of one network. Data gathering: • structured interviews, • follow-up of actions in one network • official information	**More than two years**
IV Action research. Data is gathered during the development of a supplier's cost accounting and a customer–supplier relationship.	II Conceptual analysis and descriptive single case study. Data gathering by structured interviews	**Less than two years**
	I Conceptual analysis. Introducing six problems of OBA in networks and building of the framework for the research.	**Of no importance**

Table 5. Research approaches and methods.

The period of analysis varies between the articles. Empirical analysis in the article II describes a certain situation. In the article IV, the analyzed changes in the behavior of firms cover less than two years. In the article III, a similar situation as in the article II is described in one network, and a longitudinal follow–up of more than two years is conducted in the network of the article II. Finally, in the article V, the same period follow–up is deepened toward analyzing customer–supplier relationships.

The empirical data is gathered from two firm networks. The key data of this research has been obtained through structured, semi–structured, and free interviews, and participatory observations. The responses in the interviews were written down on the structured or semi–structured questionnaires during the interviews. Due to the confidential nature of some of the issues discussed, the interviews were not recorded on tape. Non–recording was expected to encourage the respondents to answer as free and open as possible. The number of firms concerned is 15. The first network was analyzed during 1998–2001, and the second during 2000–2001. Summarizing the spirit of the empirical part of the research, the research was conducted almost in a similar way as Mouritsen et al. (2001, pp. 223-224) have done in the two dyadic cases of OBA and TC implementation:

”We followed the companies during and after the process of establishing inter–organizational management controls, and we analyzed the effects of open books and target costing/functional analysis.”

The pace of changes in management accounting practices is typically slow (Malmi et al., 2001; Hyvönen & Vuorinen, 2001; Karjalainen, 1997). Also the development of cost management in networks was expected to be a slow process. This slow pace has an influence also on the empirical data of this research. For example, the second network did not make any development efforts during the period of analysis and therefore changes were not present in practices. However, many changes both in cost accounting and in cost management occurred in the first network and they are reported in the articles III – V. Table 6 illustrates the empirical data of this research.

Unit of analysis	
Customer–supplier relationship	**Network**
V Three inter–organizational development projects of cost accounting and cost management (1 + 3 firms). Description and classification of customer-supplier relationships.	III Present state and need analyses of cost management in two networks (1+5 and 1+7 firms). Longitudinal development of a network (1+ 8 firms).
IV An inter–organizational development project of cost accounting and cost management between a customer and a supplier. Win-win negotiations carried out in the relationship.	II Present state and need analyses of cost management in a network (1+7 firms).
	I No empirical data

Table 6. Empirical data used in the articles.

Comparing the objectives of the research and the data, a statement of Miles & Huberman (1994, p. 1) justifies the qualitative approach:

”With qualitative data one can preserve chronological flow, see precisely which events led to which consequences, and derive fruitful explanations.”

To increase the reliability of observations and to assess informants’ statements, researchers should approach the research subject from many directions. This is called triangulation. The triangulation of the data, which is of special importance in case studies (Salmi & Järvenpää, 2000), was done separately in each of the studies by cross–checking the answers given in the interviews with each other and with official data (annual reports, etc.) when possible.

1.4.2.3 Reliability and generalizability of the results

The research approach, the scientific paradigm behind the research, the methods used and the data gathered are not perfect, which means that the reliability and the generalizability of the results of the research must be subjeted to assessment.

First, the results of this research can be, due to the research design, increased understanding of the studied phenomenon or of the research subjects, or hypotheses.

Because the quantitative approach and statistical methods are not used in this research, no numbers that describe the reliability of the research can be given. Hermeneutics is a contextually relevant paradigm in holistic and dynamic environments, so that the context of the research is the only dimension in which reliability can be assessed. The reliability problems in longitudinal and multi–site research were tackled by following the argumentation of McPhee (1990) and Leonard-Barton (1990).

Due to the methods used (interviews, follow-up, participatory observations, and contextual understanding), the results depend strongly on interviewees' experiences and opinions, and on the researcher. It is possible that interviewees do not reveal their deep feelings and negative opinions about other parties to the interviewer for fear of harming the business if the counterpart hears the feelings.

> *"One of the most important characteristics of a successful case study is that it can convince the reader of the validity of the case description and analysis, i.e. it makes a credible impression" (Lukka & Kasanen, 1995, p. 75).*

One of the features illustrating the reliability of this research is the referee system used by the journals. Some of the articles proceeded through the review processes of individual journals, which represents credible impression in the eyes of a professional reader. Analyzing short parts of the research (the five studies) separately also increases the reliability of the total research.

As action research is used in the article IV, an important point concerning the reliability of the results is the discussion whether action research is science or consulting.

> *"Action research engages the researcher in an explicit program to develop new solutions that alter existing practice and then test the feasibility and properties of the innovation" (Kaplan 1998, p. 89).*

Thus, testing is included, which should tend to improve reliability. Even if action research can be conducted during consulting, there are clear rules for how to document, analyze and form conclusions in action research (Coughlan & Coghlan, 2002). Furthermore, Kaplan (1998, p. 114) separates research from consulting by the requirement of gathering and analyzing detailed data and publishing the results of studies

> *"so that others can independently develop and validate the ideas."*

Hence, also well–conducted action research can be held as reliable as cases in which the researcher is only an observer.

Second, generalization is always a problem in case studies, if generalization is approached from the positivistic perspective: generalizing results from a sample to a population is not possible. The low number of cases is a clear limitation for the generalizability of the results in this research. On the other hand, according to Alasuutari (1999, p. 234-237) it is not necessary for all science to produce

generalizable results. The underlying hermeneutic paradigm is that qualitative research is aimed at different purposes than generalization. However, there are advocates for case study generalization as well. For example, Lukka & Kasanen (1995) state:

> *"[T]he potential for generalizing from (high quality) case studies is greater than commonly considered". (p. 71)*

This idea is based on contextual generalization rhetoric.

> *"[W]ithin the practically achievable standards of accounting research, high quality case studies may produce credibly generalizable results. In descriptive case studies, contextual generalization rhetoric provides a way to move from isolated observations to results of a more general status." (p. 85)*

The generalization of the results of this research is possible in business environments whose circumstances are the same as those described in the research and do not differ strongly in any major sense. However, the predictive power of the results in the sense of traditional quantitative studies cannot be estimated because the nature of the research is to highlight the key issues around the topic in order to increase knowledge of them and to direct further research.

> *"[T]he generalization is not automatic. A theory must be tested through replications of the findings in a second or even in a third neighborhood, where the theory has specified that the same results should occur" (Yin, 1994, p. 40).*

This research addresses more than one unit of analysis. This reduces the possibilities of jumping to a conclusion after a single observation.

1.5 Thesis overview

This thesis is structured as described in Figure 4. The main chapters, the highlights of their contents, and the connection of the articles and the text are expressed in the figure.

The networking phenomenon is analyzed in Chapter 2 and cost management in Chapter 3. These chapters are the theoretical basis of this research. In Chapter 4, the research environment is described and the conceptual framework for the research is built. The model of accounting in networks based on the article I is introduced in this chapter.

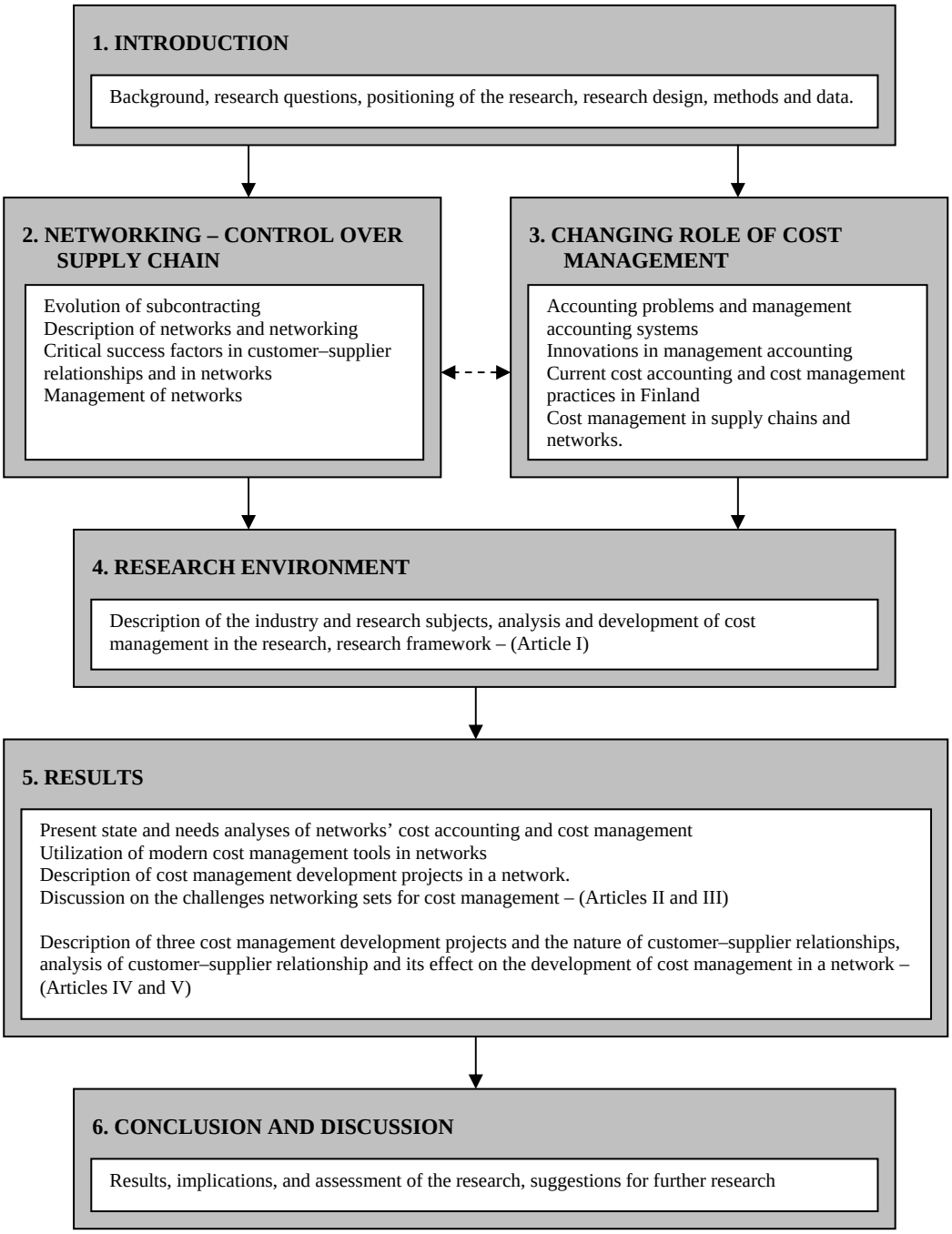

Figure 4. Overview of the thesis.

Chapter 5 includes the empirical results of the research. The results are briefly highlighted, because most of the results are reported in the articles II – V. In addition, some of the research results that were not in the focus of the five studies (appendices), are introduced in this chapter. Finally, Chapter 6 summarizes the results both from theoretical and empirical perspectives and includes the assessment of the research. In this chapter the research questions are answered. Suggestions for further research are made as well.

2 NETWORKING – CONTROL OVER SUPPLY CHAIN

2.1 Networked business

2.1.1 Evolution of subcontracting

Purchasing is not a new function in firms. It is an important function for any economical actor operating in the market in order to buy and to get others to sell goods or services. Scientific research on consumer buying behavior began in the 1960's and was soon expanded to include also industrial purchasing (Baily, 1963; Sheth, 1973; Sheth & Sharma, 1997). The role of organizational relationships in a firm's competitive strategy has been of special interest in business literature since the 1980's (Porter, 1980; Håkansson, 1982). Traditionally, buying part of the work related to a contract is called subcontracting. As networking is primarily a purchasing–led phenomenon in the manufacturing industry, Ford et al. (1998, pp. 122-147) state that the purchasing strategy of a firm can be analyzed through three issues: outsourcing, supply base management, and creation of partnerships.

In recent years, purchasing research has concentrated mainly on two issues: how to categorize suppliers into different supplier classes from the viewpoint of their competence and operations (Lehtinen, 2001; Torppala, 1999; Trent & Monczka, 1998; Virolainen, 1998; Ellram, 1996; Koskinen et al., 1995; Lehtinen, 1991; Kraljic, 1983; Fiocca, 1982), and how to create and manage a portfolio of the supplier relationships (KTM, 2000; Bensaou, 1999; Sakki, 1999; Matikainen, 1998; Kapoor & Gupta, 1997; Olsen & Ellram, 1997; Krapfel et al., 1991; Campbell, 1985). Furthermore, the literature has also discussed the possibilities of a buyer to develop a supplier (Handfield et al., 2000; Krause et al., 2000; Räsänen & Koivisto, 2000; McIvor et al., 1998; Dyer & Ouchi, 1993). The outsourcing paradigm has been the driving force behind the increasing interest toward supplier relationships (Kakabadse & Kakabadse, 2000; Karjalainen, 1999; Quinn & Hilmer, 1994; Hamel & Prahalad, 1994). The result has been the increased proportion of purchases in the annual sales of firms (Lehtinen, 2001; Hyvönen & Vuorinen, 2001; Trent & Moczka, 1998; Lehtinen, 1991).

There are several activities in a supply chain which are consecutive and hierarchical. Firms in supply chains organize themselves with respective structure (Gumbleton, 1999; Lehtinen, 1991). There are, for example, raw material suppliers, capacity providers, work phase subcontractors, part subcontractors, component suppliers, and system suppliers (Torppala, 1999; Lehtinen, 1991). All these are different tier suppliers either to a main contractor or to each other. On the other hand, from the main contractor's point of view all suppliers can be divided into portfolio groups according to their strategic importance, volume of purchases, or other variables (Olsen & Ellram, 1997; Campbell, 1985). One of the key variables in this division has been the style of cooperation with a supplier (Handfield et al., 2000; Kapoor & Gupta, 1997; Krapfel et al., 1991; Koskinen, 1995). The style of cooperation can be everything from trade-oriented (spot transactions) to strategic partnership (long-term commitment).

The more the success of a buyer depends on a supplier, the higher the supplier is located in the supplier system of the buyer. System suppliers are responsible for their own suppliers and sell subassemblies to buyers, while raw material suppliers provide buyers mainly with standard goods. Intense joint development is typically organized with system suppliers, while the transactional approach emerges typically with bulk material suppliers. In the evolution of subcontracting, it is not automatic which position in a supply chain a firm inherits. The Finnish Ministry of Trade and Industry (KTM, 2000) studied the structure of supply chains and the reasons why certain firms end up as system suppliers while others continue as subcontractors in a networking environment. The study comprised 33 small and medium–sized (SME) Finnish firms in the metal and electronics industries. The system suppliers were defined as first–tier suppliers (See Figure 1, ”suppliers”). They were more developed and were responsible for larger volume than the subcontractors. A total of 80% of the system suppliers’ net sales were over 1.7 M€, while 56% of the subcontractors’ net sales were under 1.7 M€. Willingness to form a commitment with customers, good financial situation, ability to take risks, and development capabilities were named as the most important reasons for a firm becoming a system supplier.

The old wisdom of not putting all one’s eggs in the same basket, the idea that is known as the portfolio theory dating back to financial investment analysis in the 1950’s (Markowitz, 1952), is emerging in purchasing due to the trend of growth of purchased volume. A portfolio in purchasing is a collection of supplier groups that can be distinguished from each other by certain purchase–related variables (Turnbull, 1990). Recommendations for how to act with different supplier groups are part of the portfolios, because one of the most important reasons for the use of portfolio tools is to increase the efficiency and effectiveness of purchasing (Matikainen, 1998; Wind & Mahajan, 1981; Henderson, 1970).

As a result of the evolution in subcontracting, purchasing has become a diversified function within a firm. It calls for different approaches in the management of different purchases and customer–supplier relationships.

2.1.2 Changes in supply base structure

The major trend in recent years has been the centralization of industries. The creation of big corporations has been worldwide and the actors created are global both in their operations and as regards their customers (Parker, 1999; Soros, 1998; Castells, 1996; Fukuyama, 1995; Hamel & Prahalad, 1994). Car manufacture, medicine and food industries, telecommunication, and machine building have become concentrated in bigger corporations. Even such a fragmented industry as paper manufacturing has seen mergers and acquisitions like those of Stora & Enso and UPM–Kymmene & Haindl in Europe. Furthermore, Parker (1999, p. 16) states that one of the major trends changing the logistics business is the consolidation of the industry.

The centralization of purchased volume can be studied through a number of suppliers and the volume purchased from them (Cooper – Slagmulder, 1999, pp. 84 - 89). For example, Sandvik Tamrock had more than 600 direct suppliers in 1996 and today they have only 160 (Anttila et al., 2002, p. 4). Xerox reduced the number of its direct suppliers from 4000 to 500 in the late 1980’s and early 1990’s (Dyer & Ouchi, 1993, p. 62). Finnish electronics manufacturers reduced their number of direct suppliers by

more than 22 per cent from 1990 to 1994. The number of partner suppliers has risen at the same time from 8 per cent to 14 per cent of the whole supplier base. (Koskinen et al., 1995, pp. 31-35) IBM uses 50 suppliers for 85% of its production requirements and Sun Microsystems uses 40 suppliers for 90% of its production material needs (Carbone, 1999, p. 31). Diet Coke derives 80% of its sales from 13% of its customers. Taster's Choice reports that 87% of its sales come from 4% of its customers (Raider, 1999, p. 17). Thus, there is a huge transition from traditional subcontracting to system suppliers and fewer first–tier suppliers in progress.

In manufacturing industry, the structure of a main contractor's supply base has changed from simple subcontracting relationships to an organized multi-tier supply network (Lehtinen, 2001; KTM, 2000; Hines, 1994). However, two issues make the situation more complex, somehow recalling the problems of matrix organizations. First, a supplier takes part in many main contractors' supply networks. This means that suppliers manage their risks by building up a customer portfolio, and due to involvement in many partnerships they operate with the systems and methods of many main contractors. Therefore, a main contractor cannot expect suppliers to change their operations and integrate them with those of a main contractor. Second, the analysis of networking should include also other perspectives than physical flows of material. The participation of service organizations, like universities, research units, and supporting organizations, makes the picture of network relationships more complex than the tiered supply base. This may be far from the clearly organized pyramid model. As the relationships within a network change over time and may depend on specific tasks, matrix organization may rule. Furthermore, for many industries and purposes the pyramid model is not suitable.

How is the role of purchasing changing? According to a survey by Trent & Monczka (1998), the role of purchasing is becoming more important in reaching the goals related to cost, quality, delivery times, and technology of a firm. The survey was designed for 100 top U.S. executive managers, which means that the results strongly reflect North American attitudes. The target group of the questionnaire takes part in the study annually and the response rate was 53% in 1990, 61% in 1993, and 58% in 1997. The estimate for the importance of suppliers in the overall performance of a firm was 3.10 in 1990 and 3.83 in 1997 (scale 1-5). Outsourcing product and process technology was mentioned as becoming important for 43% of the respondents in 1990 and for 55% in 1997. A transactional approach toward purchases and suppliers was used by 78% in 1990 and by 66% in 1997. The proportion of partnerships was 24% of all contracts in 1990, but 36% in 1997. The dollar value of partnership purchases grew from 34% to 50% of all purchases during the seven–year period. It was estimated that the proportion of partnership contracts would rise to more than 50% by 2000; their dollar value being around two thirds of that of all purchases. The three most typical performance measures for purchasing were cost reductions (91% of the respondents), delivery capabilities (89%), and quality of suppliers (86%). The biggest changes from 1993 to 1997 were in total cost of ownership (from 26% to 55%) and in administrative cost of purchasing (from 69% to 52%). As one of the big changes to come, Hoover et al. (2001) mention electronic management of supply chains. In this mien, the focus is changing from managing the supply to managing the demand.

The changes, as seen both in practice and in top management attitudes, give purchasing a more important role in business. Purchasing with the cost–reductive

target setting has been one of the major functions responsible for the emergence of networks.

2.1.3 Networks as actors in the market

Networking is a form of social behavior (Ford et al., 1998; Castells, 1996; Kamppinen, 1994). People often contact each other on the basis of each other's competencies. The contacts are often restricted to certain people that belong to one's network. The social behavior turns into networking when people who know each other via different ways cross-use each other's services. Networking in business is reminiscent of social behavior, because firms are not alone in the market (Håkansson & Snehota, 1989). Earlier experiences, trust, and the market mechanism control the contacts. Furthermore, Håkansson & Johansson (1992) state that the members of a network should be tied to each other by three features: technology, mutual interaction, and commitment.

The role of networks has changed the competitive paradigm. Firms take part in end product supply networks that compete against alternative end product networks. More than this, the success of a firm is highly influenced by the network it is part of (Harland et al., 2001; Lambert & Cooper, 2000). Hence, at least part of the competition between individual firms has been moved to the network level. In the market, the transition from inter–firm competition toward inter–network competition is going on.

However, an end product is always considered as a product of the seller. This is independent of the seller's contribution to manufacturing. This means that the seller has all the risk of failure in the eyes of end customers, but all the network members can have access to the benefits of well–managed network business. Whatever the reason is for networking, this should be remembered.

2.1.4 Typology of networks

A network may arise from firms doing occasional or established business. The network parties may provide a service, manufacturing, or both of these. In the following, networks are understood as established structures that are considered always when network members do business in the area that can be understood as the competence area of the network. This limitation means that the members should clearly experience themselves as somehow dependent on the other members and as responsible for the overall success of the network. Due to the focus of this research, upstream networking, the downstream perspective is outlined in the following.

There are two generic processes for creating networks: divergent and convergent (Raatikainen & Ahopelto, 1997, pp. 78-80).

- A divergent process emerges in outsourcing. The aim here is to create access to competencies that the outsourcing firm lacks or to buy more efficient operations.
- A convergent process is usually initiated by a firm creating a multi-tier supply network. The initiator of a convergent network tries to control the activities of separate and independent firms.

In the divergent process the number of direct supply relationships increases, while in the convergent process it decreases. Some divergency usually precedes the convergent process. The process may determine who dominates the network: The convergent network is expected to be main–contractor dominated (Gumbleton, 1999; Stuart et al., 1998; Hines, 1994). It seems that the divergent network process is common at least in high–growth industries and the convergent process emerges strongly when the growth of an industry slows down or stops (Kulmala et al., 2002; Parker, 1999; Poirier, 1999; Koskinen, 1995; Hines, 1994). However, the processes may exist simultaneously if some new activities are outsourced at the same time as some purchases are centralized with certain suppliers. Therefore, it is too early to categorize industries via the networking processes. In this research, the development described in Chapters 2.1.1 and 2.1.2 represents mainly convergent networking.

Network typologies and taxonomies are many (Harland et al., 2001; Dahlgren et al., 2001; Pfohl & Buse, 2000; Lamming et al., 2000; Jacobs & de Man, 1996; Grandori & Soda, 1995; Snow et al., 1992). The variables used in the taxonomies include the influence of the focal firm on a network, end product features, the scope of a network's activities, the purpose of networks, and the degree of the integration of activities between network members. The most important message of these studies is that managing a network calls for analysis of what is the underlying logic behind the birth and existence of a particular network. It is widely suggested that different kinds of networks expect a different managerial approach. In the following, two main approaches to network typologies are illustrated.

First, Lamming et al. (2000) presented a product–based taxonomy of networks. The taxonomy is based on the innovativeness, functionality, and complexity of end products. The origin of this approach is in the study of Fisher (1997), in which the demands that different kinds of products set on a supply chain were considered. Lamming et al. (2000, p. 682) mention that cost reductions are a competitive priority for networks supplying functional products, while innovative products call for speed and flexibility. Continuing from the work of Lamming et al. (2000), Harland et al. (2001, p. 23) state that two key variables in networks are the degree of supply network dynamics and the degree of focal firm supply network influence. Supply network dynamics was measured in terms of process variety and volume, the frequency of new product launches, the number of suppliers of similar products, and ease of switching. Although the taxonomies of Lamming et al. and Harland et al. derive from empirical studies, both of them underline the need for further research in the area.

Second, Jacobs & de Man (1996) illustrated six network types for different purposes. The origin of their typology lies in industrial clusters and Porter's (1990) cluster theory. The major point of the study is that the environment, the purpose of the network, and industry logic determine how the network activities should be organized. Continuing from the research on industrial cluster taxonomy, Pfohl & Buse divide networks into four classes: virtual, regional, operative, and strategic (2000, pp. 391-394). Virtual and regional networks include actors from several industries. The difference between these is the use of information technology (IT) solutions and competencies: a virtual network consists of firms that have different competencies and where contacts are mainly organized by IT, whereas regional networks rely on social interaction in a limited geographical area. An operative network is defined by "relatively standardized transactions", emphasizing efficiency in operations. Trust is

not needed because contracts consider only a limited area of network members' operations. In a strategic network, "hierarchical structure is led by a strategic center" and "distribution of power is asymmetrical". A typology almost similar to that of Pfohl & Buse is the typology of Dahlgren et al. (2001). The latter divides networks into three classes: business, functional, and strategic. The definitions and descriptions of these classes is almost the same as that of Pfohl & Buse for regional, operative, and strategic, respectively.

Comparing the typologies with the empirical context of this research (see Figure 1), "strategic network" is the context in which networks are analyzed. Furthermore, the products of manufacturing industry fall mainly into the functional category.

2.1.5 Characteristics of networked business

Network members may try to manage capacity and resources flexibly by utilizing them across the boundaries of firms (Nurmilaakso, 2000; Ollus et al., 1998b; Hines, 1994). It may be possible to avoid shortages and overloads in capacity by sharing orders between network members in such a way that overlapping competencies and capacities are concerned network–wide. Also optimization in the use of capacity may be possible if the communication is flexible in a network. This may help in the optimization of the cost structure of each order as well. Resources and personnel can be used as a resource pool which network members exploit according to their needs. This calls for multi–skilled personnel in order to avoid the educative needs during organizational changes, and for agreed rules for assigning the cost of the resource pool to the users. From the personnel point of view, this arrangement may lead to more meaningful work due to the broad training, job enrichment, job enlargement, and job rotation that it facilitates (Nickels et al., 1990, pp. 473-474). Furthermore, better understanding of the operations within a network may emerge.

The networked way of doing business relies on removing the barriers to information sharing. This means, first, that information should be shared more and in more useful form between network members than has been traditionally the case between customers and suppliers. Second, information sharing in networks should happen at all organizational levels. Efficient and flexible working might demand the operative personnel of network firms to communicate directly with each other without gatekeepers. This is described as multilateral communication, that should be a result of systematic network development (Kuitunen et al., 1999). Kakabadse & Kakabadse (2000, p. 717) estimate that Japanese–style partnerships, keiretsus, will become common in the West, which means increased transparency of all information in supply chains.

Outsourcing is one of the best–known characteristics of networking (McIvor, 2000; Useem & Harder, 2000; Lambert & Cooper, 2000; Kakabadse & Kakabadse, 2000; Quinn, 2000, 1999; Maltz & Ellram, 1999; Bensaou, 1999; Ford et al., 1998; Fisher, 1997; Quinn & Hilmer, 1994; Jarillo, 1989). Outsourcing also relates to the innovativeness of networks:

> *"Every outsourcing opportunity offers possibilities to improve innovation" (Quinn, 2000, p. 20).*

By connecting competence areas, firms may find integrative solutions or applications that could not have been found without cooperation. According to the cluster theory, knowledge of a specific issue accumulates in a geographical area in which the conditions for such knowledge are preferable and the engagement in the issue is active (Pfohl & Buse, 2000; Ruuskanen, 2000; Palin, 1998; Jacobs & de Man, 1996; Castells, 1996; Koskinen, 1995; Porter, 1990). Innovativeness is more likely when many people working on the same issue continuously interact with each other. The efficiency of logistics becomes important in the manufacturing of end products that are physical instead of knowledge–intensive: the more efficient the physical material activities are and the shorter the throughput times are the less there is need to transport.

A collective network strategy built up by network members is on the one hand a way to commit the members to the network's operations and on the other hand a way to write down guidelines that best support the individual objectives of the members (Hyötyläinen, 2000; Hyötyläinen & Simons, 1998; Palin, 1998). According to Anttila et al. (2002), creating a collective strategy is a natural way to begin network development. In a strategy process, member selection can be made so that the most commitment–willing and the most important firms are chosen. After the strategy process, it is possible to proceed in operative levels (Christopher, 1998, pp. 234-235):

> *"Traditionally, members of a supply chain have never considered themselves to be part of a marketing network and so have not shared with each other their strategic thinking. For network competition to be truly effective requires a significantly higher level of joint strategy development. This means that network members must collectively agree strategic goals for the network and the means of attaining them."*

In reality, few networks that consist of SMEs seem to have collective strategies. In the study of networks in the Turku and Pori regions in Finland, the hypothesis of the non–existence of a collective network strategy was accepted (Palin, 1998, p. 202). However, the data was gathered in 1995 and in larger–firm networks the situation might be different.

Joint development, even without collective strategy, is a typical network characteristic (Ollus et al. 1998a & 1998b). Joint development may happen in product or process development. Early involvement of suppliers in development efforts would increase the probability of identifying cost–saving solutions in terms of the whole supply chain. From the immaterial rights point of view, a network may offer a regulated environment in which individual firms openly discuss their findings without jealousy and fear of being badly exploited.

Summarizing this chapter, there are five major characteristics typical of the networked way of doing business:

1. Managing capacity and resource work–load jointly and flexibly with network partners
2. Removing communication hierarchies and increasing transparency of information between network members
3. Outsourcing of activities

4. Areally focused operations
5. Joint development of strategy, products, and processes.

2.2 Critical success factors of networks

2.2.1 Customer–supplier relationships as building blocks of networks

A customer–supplier relationship is a dyadic tie, i.e. an economic, social, juridical, or other tie, between a buyer and a seller. What makes this tie transaction–oriented or partnership–oriented can be analyzed through the critical success factors within partnerships. Mohr & Spekman (1994) studied 13 partnership characteristics of which six were positively connected with success: commitment, trust, coordination, communication quality, participation, and joint problem solving. Seven other characteristics were also tested, but there was no strong evidence of their connection with the success of partnerships. Virolainen (1998) studied critical success factors in Nokia's strategic business units. Shared values, two–way information sharing, trust, early communications with supplier, top management support, distinctive value added by suppliers, mutual commitment, and mutual understanding were named as critical success factors. In this focused case study, Virolainen ends up with observations parallel to those made by Mohr & Spekman from more extensive data. Triangulated from Monczka et al. (1998), the success of partnerships is based on trust, mutual integration in strategy formation and operations, information sharing, and joint problem solving.

Virolainen (1998, p. 205) has considered the motives for participating in partnerships and Vesalainen (2002, p. 15) the same in networks. Access to new technology, securing the availability of strategic components, reducing lead times, improving quality, sharing risks, and reducing total cost of acquisition were mentioned as the most important motives for creating partnerships (Virolainen, 1998). Willingness to share risks, access to new markets, the need to adopt new technologies, reducing time to market, and access to complementary competencies were mentioned as the most important motives for participating in the networked way of doing business (Vesalainen, 2002). There is partial similarity in these motives.

Customer–supplier relationships can be divided into subgroups by utilizing purchasing portfolios (Handfield et al., 2000; Bensaou, 1999; Matikainen, 1998; Kapoor & Gupta, 1997; Olsen & Ellram, 1997; Krapfel et al., 1991; Campbell, 1985; Kraljic, 1983; Fiocca, 1982). The initial motive for this is to identify supplier or relationship groups that call for a different managerial approach. As a result of supplier classification, the supplier base may offer a natural opportunity for the network approach. Networks consist of firms and their relationships. Hence, networks are systems of many dyadic customer–supplier relationships (Vesalainen, 2002; Fletcher & Barrett, 2001; Halinen & Törnroos, 1998; Raatikainen & Ahopelto, 1997; Castells, 1996; Anderson et al., 1994). Following inductive reasoning, it is reasonable to expect that to what is important in dyadic relationships is important also in networks. On the other hand, it is necessary to consider also the underlying network when analyzing a specific relationship:

”To understand business relationships, greater attention must be directed to the business network context within which dyadic business relationships take place.” (Anderson et al., 1994, p. 12)

2.2.2 >From dyadic relationships to multilaterality

Some studies clarify the picture of the criticality of partnership success factors also in networks (Christopher, 1998; Ebers & Jarillo, 1998; Forström et al., 1997). Forström et al. (1997) analyzed networks that consisted of Finnish SMEs. Ten critical success factors were found and all the six factors of Mohr & Spekman (1994) were among them. Furthermore, equality of firms, importance of market demand on network’s activities, and increased competitiveness were added to the list. In their literature review, Ebers & Jarillo (1998) summarize the sources of competitive advantage in networks as follows: mutual learning leading to faster product development, strategy of co–specialization, better information flow, and improved coordination of resource flows, economies of scale through joint sourcing and research, establishing high barriers to entry into a market, and strategic coordination among competitors.

Comparing these network studies with the studies of Mohr & Spekman (1994) and Virolainen (1998), the assumption of the similarity of critical success factors in partnerships and in networks is relevant. However, networks may emphasize certain features in business. Christopher (1998, p. 234) summarizes the main challenges as follows:

”Of the many issues and challenges facing organizations as they make the transition to this new competitive environment, the following are perhaps most significant: collective strategy development, win–win thinking, and open communication”.

The last of Christopher’s (1998) three major challenges, open communication, is analyzed in the following. The difference between dyadic partnerships and multilateral networks may appear in open communication. In networks communication has the multilateral component while in partnerships dyadic communication is enough. The more communicators there are, the more challenge there is in managing the communication. Mouritsen et al. (2001, p. 236) describe an outsourcing situation in which the need for a new way of communication was evident:

”After outsourcing, both [case] companies experienced a ’knowledge-gap’ that was thought to require a new management control to put them back in touch with the development or production processes they found important.”

The knowledge gap should be considered also in networks. Whatever the reason for networking, the network may fail if information sharing does not work. The studies of inter–organizational operations emphasize the role of information sharing (Apostolou, 1999; Virolainen, 1998; Monczka et al., 1998; Christopher, 1998; Ebers & Jarillo, 1998; Forström et al., 1997; Mowery, 1996). It depends on the management of a network, i.e. on how the information sharing is organized in terms of information scope, scale, and systems.

It has been suggested that the success of network members depends on the success of the focal firm in a network (Lambert & Cooper, 2000). Spekman et al. (2002, pp. 45) set win–win orientation as a precondition for the success of supply chains. Hence, there is a need to consider the second challenge of Christopher (1998, pp. 234-235), the win-win issue:

> *”There is now a growing realization that cooperation between network partners usually leads to improved performance generally. The issue then becomes one of determining how the results of that improved performance can be shared amongst the various players. ”Win-win” need not mean 50/50, but at a minimum all partners should benefit and be better off as a result of cooperation.”*

The major reason for failures in implementing win–win is obviously injustice, i.e. parties' inability to decide who gets which part of the cake (Söllner, 1997, p. 234). The noble idea of sharing the benefits gained through cooperation may fail also due to failures of measurement and evaluation. It is not unambiguously clear how ”benefit” should be defined, how it could be measured, and whether it could be measured the same way every time. The weak integration of management accounting systems does not help in solving this problem. As a basis for measuring win–win, cost information is irrelevant if it is inaccurate and unreliable. At the worst, the network members lose time and money in arguing how to implement win–win and what it means for different parties. Long–term commitment may help because, as time goes by, the stochastical variance of uneven share of benefits does not accumulate to one party only.

The first point of Christopher (1998), collective strategy development, was introduced in Chapter 2.1.5 and is further considered in Chapter 2.3.

2.2.3 Motives and incentives for networking

2.2.3.1 Growth

Growth has always been one of the most interesting topics in business economics. Growth is suggested to be one of the necessities on the road to success:

> *“Growth is another given in business because every company needs growth to perpetuate itself” (Robert, 1997, p. 81).*

Generally speaking, growth is defined mostly as quantitative increase of measurable objects, i.e. annual sales, profit, personnel, etc. (Salonen, 1995). On the other hand, growth can be defined also through qualitative organizational factors like development, learning, and improved decision–making process (Laukkanen, 2000; Penrose, 1995). Combining the quantitative and qualitative perspectives on growth, a firm may grow although the annual sales, for example, decrease.

Even if Robert's (1997) opinion of growth has dominated Anglo–American management culture and emerges also globally, there are opposite opinions as well. In Scandinavia there are studies according to which there is no need for a firm to grow (Viitala & Jylhä, 2001, p. 19). There is a scale difference behind the opposite

opinions: part of the small business owners do not see motives for growth because the main reason for owning and managing a business is to employ oneself. However, development in the spirit of qualitative growth is important also for them because neglecting customer needs and competitors' development means death in the market (Viitala & Jylhä, 2001, p. 19).

According to Johannisson (1992), network relationships are necessary but not on adequate condition for success. For a long time there has been evidence regarding networking as a method to grow:

> *"[F]astest growing firms … make more use of external resources than their competitors. Those firms that are at the forefront of using external resources grow, on average, much faster – more than 10% each year – than their competitors over a 10-year period. This finding constitutes more evidence in favor of the efficiency of networking arrangements" (Jarillo, 1989, p. 133).*

A survey on Finnish manufacturing industry revealed a positive correlation between networking and the growth rate of firms (Tsupari et al., 2001). A similar finding in the Finnish software industry was made by Kulmala et al. (2002).

2.2.3.2 Profitability

Along with growth, Robert (1997, p. 80) defines profitability as a fundamental necessity:

> *"Every business must be profitable to survive – that is a given of business life, otherwise the company dies".*

Profitability is a key operational precondition of a firm in the long run (Kaplan & Atkinson, 1998; Uusi-Rauva, 1996). If a firm is continuously unprofitable, it will meet the end. Profitability is defined either as revenue minus costs (profit, absolute profitability) or revenue minus cost per capital invested (relative profitability) for a certain period (Neilimo & Uusi-Rauva, 1999, pp. 20-21). The most used measures for profitability are profit per revenue (how much of the business volume is the profit?) and profit per total capital invested or per equity (what is the return on investment or on tied–up capital?) (Neilimo & Uusi-Rauva, 1999, pp. 265-273). Profitability can be influenced by changing revenues, costs, or capital invested. In this research, the focus is on influencing costs.

Whipple & Gentry (2000) report on alliances between material suppliers, service providers, and manufacturing firms. Cost savings were an important factor in the development that led to the formation of alliances. One of the most important outcomes of alliances between material suppliers and manufacturing firms was the reduced number of suppliers, which led to a convergent network structure, tiered material flow, and reduced cost.

There is one major trend that influences the increase and sustaining of profitability in manufacturing industry. Many industries are experiencing the same trend that the automobile industry went through earlier: decreasing price rate (Cooper – Slagmulder,

1997). This can be seen when production volume development and price levels are compared. The production volume of the Finnish metals, engineering, and electronics industries[1] has risen by 55 per cent from 1997 to 2000 and the gross value[2] has risen by 50 per cent in the same time period (MET, 1999 & 2002, pp. 11 - 43). In other words, production volume measured by physical quantity has risen more than production volume measured by financial quantity in the same period. This means that the change in unit prices has been negative. Change in profitability consists of changes in productivity and price recovery (Hannula, 1999, p. 26; van Loggerenberg & Cucchiaro, 1981, p. 90). On the other hand, product and resource prices are the components of price recovery. In order to increase profitability, the positive productivity change should be greater than the negative price recovery. This is a challenge for manufacturing industry and makes it necessary to reduce the unit cost of products.

2.2.3.3 Other motives

In addition to growth and profitability perspectives, the analysis of firms' motives for joining or taking part in networks should be extended to cover also other motives. For this reason, transaction cost theory and three studies on motives are introduced here.

The selection of the method of governance for different customer–supplier relationships calls for risk management. At one extreme, a firm produces everything itself. At another extreme, almost everything is bought from the market. Networks and partnerships are typically located between these extremes (Dahlgren et al., 2001; Pfohl & Buse, 2000; Nurmilaakso, 2000; Väntsi, 1999). Transaction cost theory (see e.g. Williamson, 1985, 1981, 1979) explains to a large extent at least some of the partnership and network arrangements. The theory takes the imperfect market as a given fact: Transaction cost theory supposes that there is friction in using the market mechanism (Väntsi, 1999, pp. 23-27). A customer can analyze the cost of this friction by calculating the costs of searching for, contracting, monitoring, and enforcing a supplier (Virolainen, 1998, p. 80). Furthermore, transaction cost theory suggests that the governance of different customer–supplier relationships should be organized according to the transaction cost related with these relationships (Buvik & Reve, 2002; Williamson, 1985, 1981, 1979). In other words, some relationships are more costly to manage than others. Hence, there is a need to minimize costs by using different managerial approaches with different business partners.

The explanatory role of transaction cost theory regarding partnerships and networks emerges mainly from two major issues: the limited number of suppliers available for a customer and asset specificity (Buvik & Reve, 2002; Virolainen, 1998). First, for geographical, economical, political, technological, or any other reason, a customer needs certain kinds of suppliers. In the imperfect market, only a few suitable suppliers may be operating. Therefore, it is necessary for the customer to operate with a long–run partnership approach with the suppliers available instead of with a hit–and–run transaction approach that would be the market mechanism. Second, a large number of possible suppliers may be useless if the nature of mutual business calls for high search and contract costs. In this case it is necessary to stick with the selected supplier due to

[1] Includes firms of classes 27-35 in Finnish industry classification.
[2] Gross value includes turnover, change in stock, manufacturing for own use, and purchasing not related to company's business.

the high costs of changing to another supplier. This phenomenon refers to asset specificity, which means investment in assets, which are specific to the requirements of a particular exchange relationship (Väntsi, 1999, p26). When the asset specificity in a relationship increases, a firm has to pay attention to the time perspective and the type of contracts in order to minimize the harm of another party's potential opportunism and uncertainty. According to Williamson (1983), a firm can form "hostage" contracts that minimize the failure costs of contracting. However, time may change the contracts:

> *"[C]ontractual safeguarding arrangements are significantly relaxed, the longer the duration of the relationship." (Buvik & Reve, 2002, p. 278.)*

Finally, transaction cost theory may also explain some of the protectionist acts of firms. Networking could, in the spirit of the competitive strategy of Porter (1980), help in creating entry barriers in an industry (Johansson & Elg, 2002). Hence, networking could keep new firms out of a business. This might be a motive for existing firms to create networks.

Forström et al. (1997) analyzed network members' experiences of the operations related to critical success factors in two networks and compared the experiences with the expectations of the members. Five critical success factors that were operationalized best are illustrated in Table 7 (left column). The study was conducted within networks consisting of furniture industry SMEs in Finland.

Forström et al. (1997, p. 51-52)	Ebers & Jarillo (1998, p. 5)	Kulmala et al. (2002, p. 39)
Knowledge sharing	Technology development	Lack of marketing resources
Well–built trust and social relationships	Increasing market power	Increasing sales
Well–organized interaction	Market development	Technology development
Increasing competitiveness	Reducing uncertainty	Operations development
Orientation toward market	Cost savings	Assuring customer relationships

Table 7. Experienced reasons and motives for participating in networks.

In their literature review, Ebers & Jarillo (1998) list five important reasons why firms create networks (Table 7, center column). "Saving cost" and "market development" may refer to the same objectives as "increasing competitiveness" and "orientation toward market" in the study of Forström et al. However, the research settings in these studies were somehow different.

The research setting of Kulmala et al. (2002) concerned also Finnish firms in the software industry. In the survey, firms' motives for joining a network were analyzed. Table 7 (right column) illustrates the five most important reasons as experienced by respondents in descending order of importance. The results, at least from the technology and market development perspectives, indicate the same as the literature review of Ebers & Jarillo. Five firms mentioned that the lack of marketing resources was almost the only motive for joining a network. Furthermore, many respondents referred to access to other firms' technology through networks, which indicated similarity of results with those of Ebers & Jarillo. A surprise, compared with Whipple

& Gentry (2000), was that very few firms considered increasing competitiveness and reducing costs as motives for networking. The study was conducted in the software industry, which makes it impossible to generalize the results to cover the manufacturing industry. However, it is reasonable to believe that these motives are somehow relevant in any industry.

Organizational learning may accelerate within a network environment in which information is shared openly (Beeby & Booth, 2000; Stuart ym., 1998; Forström et al., 1997). If networking boosts learning, it could be a motive for networking.

2.3 How to manage networks?

2.3.1 Runner, quasi–firm, combination, or driftwood?

Networks are typically placed somewhere in the middle of a market–hierarchy continuum in the typology of business relationships (Dahlgren et al., 2001; Håkansson & Snehota, 1989; Ouchi, 1979; Richardson, 1972). On the other hand, many different taxonomies and classifications of networks have been presented (Harland et al., 2001; Lamming et al., 2000; Pfohl & Buse, 2000; Raatikainen & Ahopelto, 1997; Grandori & Soda, 1995; Snow et al., 1992). It is suggested that networks differ from each other significantly, indicating different needs for the management of them. Hence, managing a network is somehow a dichotomy because networks consist of individual firms having only transactional ties to the network and at the same time networks call for some hierarchy in the name of effective and efficient management.

The runner school emphasizes the importance of one leading firm or person within a network (Handfield et al., 2000; Lambert & Cooper, 2000; Gumbleton, 1999; Cooper & Slagmulder, 1999b; Raatikainen & Ahopelto, 1997; Dyer, 1996; Womack & Jones, 1994; Dyer & Ouchi, 1993). The runner school has its origin in strategic networking. Since one of the critical variables in the network taxonomy of Harland et al. (2001) was the influence of a focal firm on the network, the runner school expects one firm to lead the network organization. The leadership takes place in goal setting, development, control, and evaluation. Moreover, the runner is a central actor in creating the strategy of the network, which means that the strategy may be a strategy of the runner to which other members adapt themselves.

Asymmetry of power in the network is an underlying and accepted fact for the runner school. The runner is typically a bigger firm than the followers and is nearer to the end customer. The proportion of a supplier's sales to the runner is not what matters in interpreting a network, runner–managed or otherwise. The question for suppliers is whether to participate or not in activities expected by the runner. The role of the followers is to provide the runner with new ideas, participate in defined activities, and do their part as well as possible. For example, the TC approach underlines the role of the runner, because the runner is there in cost analysis with all the suppliers, but the suppliers are there only when their own production is considered. The runner school is therefore hierarchical in nature. The managerial approach of the runner school is not very suitable for networks in which there is no focal firm or in which the focal firm is not the same one in every situation.

The quasi–firm school consists of authors primarily oriented toward the development of networks (Hyötyläinen, 2000; Räsänen & Koivisto, 2000; Hyötyläinen & Simons, 1998; Dubois & Håkansson, 1997; Kuivanen & Hyötyläinen, 1997; Lamming, 1993; Jarillo, 1988). The management of a network is made the responsibility of a management team that coordinates those activities in which all or some members are expected to take part. The management team consists of participants from network firms. Some of the activities, like creating network strategy, call for participation from all the firms, while some activities, like negotiation of a collective raw material contract, call for participation from those most involved or most aware of the issue. Depending on the issue, the members of the management team may vary.

The most important point regarding the quasi–firm school is the development of the network activities. The development work is organized in development teams that focus on different topics and use also external help, for example researchers and consultants. Furthermore, the development teams act at all the levels of organizations: they are formed at operational level as well as at managerial level, across firm boundaries.

How to organize the management depends on the critical success factors. Because win–win thinking was one of these, the management of a network should create and maintain it. Win–win of a runner network builds up from efficiency and effectiveness of runner–led activities, creating cost savings, for example, to be shared between the network members. Win–win in the quasi–firm network builds up from democracy in the design and decision–making. As Kim & Mauborgne (1997) suggest, the results of fair processes are easier to accept for people than results of unfair processes. Hence, commitment of the network members to the activities jointly agreed on could be better in a quasi–firm network than in a runner network.

The runner and the quasi–firm schools are not opponents. In contrast, the approaches complete each other and in many cases can be used in the same network. For example, in the launching phase of a new idea, a strong actor who has the best opportunity to see the advantages of the new idea could act as a runner. In the development phase of the same idea, a more democratic approach in the spirit of the quasi–firm would be appropriate. The purpose of the network or of a specific network activity is what matters when selecting the approach.

In networks, participants may also act like driftwood. Driftwood leadership refers to no systematic leadership at all. In this sense, the network is created unintentionally and consecutive events match participants and circumstances so that the networked way of doing business takes place although no systematic leadership exists. This kind of network management is rather comparable with behavioral patterns in social networks. The driftwood perspective is there in practice, but it is excluded from this research because it is not a systematic approach, while this research is aimed to be such. However, we have to accept the truth that many events take place occasionally, although development and improvement are systematically approached.

2.3.2 Critique of networking

As mentioned before, managing supply chains and supply networks is very much management of the accumulation of product cost calculated through a process in which many firms take part. Whether networks call for a special managerial approach is not clear, because a wide gap exists between network theories and managerial needs in practice (Hyötyläinen & Simons, 1998, pp. 80-81). Therefore, it is not clear that managing networks differs from management of any other inter–organizational business. The problem with the management of a network is that the organizational positioning of a network in the market is not clear. A network is not a unit that could be led as independently as a firm, but on the other hand a network needs some coordination. The economical commitments between network members are contractual by nature, but the strategic commitments rely mainly on attitudes and trust. This dichotomy may lead to a confused picture of management and leadership of a network.

The relation between partnership type business relations and networks is vague. Can networks exist without partnerships, and are partnerships formed without networks? Partnership thinking refers mainly to how deeply two firms are committed with each other. On the other hand, networks may consist of non-partnership business relations, because networking may refer only to how many firms operate with each other. In this research, it is assumed that both phenomena are independent but in strategic networks some partnership relationships exist.

A mild opposition to partnership and network thinking exists. One of the major points in the critique is that partnership differs from the free market approach and therefore, in many cases, causes reduced competitiveness or more cost than traditional competitive biddings (Cousins, 2001; Kapoor & Gupta, 1997; Miles & Snow, 1992). Kapoor & Gupta (1997) studied indirect purchases and summarized that in many cases partnerships cost more than competitive biddings. The logic behind the cost approach relies on economics–based thinking according to which competition always leads to the most cost–efficient result. What makes partnerships bad is that in one way or another they create an atmosphere of secure business, which leads to limited efforts to innovate, develop, and increase productivity. Furthermore, Cousins (2001, pp. 72-74) suggests that partnership thinking is misunderstood in the West. The origins of it may not lie in Japanese culture but in the quality theories of Deming, according to which operating with a lower number of suppliers leads to improved communication and a decreased number of failures. Hence, the original partnership should not be generalized to all relationships but only to quality issues. Miles & Snow (1992, p. 53) stated in the early 1990's that most of the problems in networks derive from a weak understanding of the suitability of the networked way of doing business in different situations. Managers who implement networked organizations not as pioneers but as followers may fail when extending networks to areas where networks are against the industry logic or when modifying the network so that it no longer provides all the advantages expected. These two reasons may lead to removing competitiveness out of the business.

There are also opinions according to which open communication in networks may lead to stealing or exploiting a member's ideas (Kulmala et al., 2002, p. 42) or to the need to commit oneself to a strategy created by others (Räsänen & Koivisto, 2000).

Hence, another reason against networking comes from the perspective of opportunistic behavior: a firm that is a member of a network may act opportunistically, take all the benefits first, and then leave agreed responsibilities uncompleted (Baiman & Rajan, 2002; Cousins, 2001; Hallikas et al., 2001; Tsupari, 2001; Carter, 2000; Kovalainen, 2000; Ruuskanen, 2000; Nurmilaakso, 2000; Matikainen, 1998; Håkansson & Snehota, 1989).

> *"It must be remembered that all firms are snakes; they are maximizers and satisfiers concerned with their own survival and self–interest." (Cousins, 2001, p. 81)*

For example, among Finnish shipyards it is common that during a boom extensive outsourcing gives high prices to subcontractors but during a recession the outsourcing stops (Matikainen, 1998). This kind of behavior makes it hard for subcontractors to do business with the long–term perspective that is necessary to meet the demands of partnerships. The behavior may also depend on the Bullwhip effect (Metters, 1997). By this is meant the fact that small variances (in demand, inventories, lead times, availability, employment rate, etc.) at the customer end of supply chains turn out to be big variances at the supplier end. To avoid this effect, customers should communicate the demand forecasts as soon as possible to all the supply chain members. If the communication fails, the supplier end does not have time to adapt to the market situation, which makes the variances even bigger.

The third major concern is that it takes many resources to manage the risks of the asymmetry of power in network relationships (Buvik & Reve, 2002, Johansson & Elg, 2002; Hallikas et al., 2001; Nurmilaakso, 2000). The need to apply economical and juridical tools like in any ordinary business relationship may destroy the benefits that would be gained through flexible operations. Buvik & Reve (2002, p. 278) mention that relaxation of the governance structures is possible when a relationship becomes older, but not in the beginning. Hence, networking is not a fast tool for solving the problem of cost efficiency. Johannisson & Elg (2002, p. 401) illustrate two ways in which networking creates entry barriers. Offers made to vertical partners may be more exclusive than those made to others, and cooperation with competitors may stabilize a market. In this sense, when the market begins to recall a monopoly, innovativeness may decrease. Nurmilaakso (2000, pp. 64-65) illustrates that it is not clear that a low number of alternative suppliers is efficient. Although the information is incomplete, more than one source for each of the purchased goods is needed.

2.4 Summary

The creation of networks is a result of the evolution of subcontracting through concentration on core competencies and reducing the number of customer–supplier relationships. The paradigm of competition is sliding toward competition between networks instead of competition only between individual firms. This has created a need to classify and analyze networks from the managerial perspective in order to find the most efficient procedures for the management of different types of networks.

What is needed in networks can be estimated through customer–supplier relationships that are the building blocks of networks. The critical success factors include

commitment, trust, participation, joint problem solving, coordination, information sharing, and shared values. Furthermore, the way in which win–win is implemented may have severe impact on the success of partnerships and networks. The motives for joining a network are typical motives for doing any business, but they reflect willingness to increase the speed of business development: the attainment of technological and marketing–related possibilities faster and more cost efficiently than by creating these by oneself describes the role of networks. Information sharing and open communication are requirements for multilateral network management and development which, in turn, is often called the quasi–firm approach to networks. However, characteristics of quasi–firm and runner–managed approaches may be present in all networks. Whatever the managerial approach to a network is, without multilaterality the benefits of efficiency are not fully utilized.

From the perspective of cost management and its development, customer–supplier relationships in a network should be deeply analyzed in order to identify to which degree the approaches to cost management and development efforts can be designed similarly in the dyadic relationships of a network. Furthermore, as networking changes the way in which business is done in general, it certainly poses challenges for cost management as well. The most obvious of these is that while many decisions in a manufacturing network are closely linked with costs, cost accounting in network firms should meet high standards of relevancy, accuracy, and usefulness.

3 CHANGING ROLE OF COST MANAGEMENT

In this chapter the fundamentals, practices, and modern approaches of cost management are presented. In this research, cost management refers to determined utilization of cost information in order to improve the cost–efficiency and competitiveness of a firm. Cost management is an area in which development in accounting for cost–objects and development in economic management of a firm meet in the face of new demands and challenges (Ax & Ask, 1995, p. 14). Furthermore, the environment of this research emphasizes efforts to reduce cost. The underlying purpose of cost management justifies the following cost management analysis, which has been carried out from the perspective of the present state and ongoing development.

3.1 Problems with cost information

3.1.1 Accounting problems

Cost accounting is part of performance measurement and one of its goals is to measure a unit's performance in the area of costs.

> *"The role of accounting information within a business is to facilitate the development and implementation of business strategies" (Shank & Govindarajan, 1993, p. 93).*

Cost information should, as part of accounting information, support the development and implementation of strategy. Before any special cost accounting or cost management methods are analyzed, a brief look at the problems of accounting is necessary. The problems encountered are closely connected with the nature of cost accounting and emanate from the four fundamental problems of scope, valuation, assignment, and measurement (Neilimo & Uusi-Rauva, 1999, pp. 41-43; Belkaoui, 1992, pp. 236-249). In the following analysis, these problems are approached.

1. The problem of scope entails ascertaining which variables should be taken into consideration when defining actual costs. Solving this problem calls for decisions regarding which costs relate to a specific cost–object and which not. Hence, the first issue in costing is to decide which costs are included in the calculation.
2. The problem of valuation entails searching for an appropriate way to evaluate resources used. For example the following options are useful: original cost, market value, replacement value, and opportunity cost. Thus, the second decision is to decide a value for the costs selected in the problem of scope solution.
3. The division of total cost into parts implies a problem of assignment. Costs should be assigned to cost–objects (product, customer, time period, etc.). Any choice among cost assignment methods is a choice among different ways to divide the whole into parts. Using the cause and effect criterion, managers identify the variable that causes cost–objects to incur costs. Most often the principle of causality is used in cost accounting. Direct charge and causal tracing should be used wherever possible. Allocation is the last resort. Allocation is the indirect assignment of cost. Allocation is a "dirty word" in cost systems - something to be avoided if possible. It implies arbitrariness of measurement and a limit to the

meaning of the resulting information. Furthermore, it is possible to identify two subproblems in assignment, i.e. allocation and accrual problems (Hannula, 1999, pp. 42-43). In this view, the allocation problem refers to the distribution of costs between cost– objects and the accrual problem refers to the distribution of costs to different periods.

4. The measurement problem entails a search for suitable variables to be measured using an appropriate method. The essence of the problem is that what cost accounting needs are monetary units, but the objects of scrutiny consist of physical units. Hence, the last problem is operative, i.e. how to measure what it was decided to measure.

The method of solving these problems may vary between times and cost–objects, and the solutions depend on the accounting situation. For example, opportunity cost is a very attractive alternative if a competitive investment situation is the starting point but, on the other hand, it is very difficult to calculate. The solution of these problems does not depend on the accounting method selected. For example, the problem of scope can be solved similarly with job order costing and ABC. In the empirical part of this research, accounting problems are discussed in the context of how network firms relate to them in their accounting practice and development.

3.1.2 Management accounting systems

Another major concern in cost accounting is connected with management accounting systems. The main message of the Institute of Management Accountants' (IMA) 81st Annual Conference in summer 2000 was that management accounting should turn out to be useful or disappear. This is the same message that has been on the table at least since Johnson & Kaplan published their book *"Relevance Lost: The Rise and Fall of Management Accounting"* in 1987. Three major issues concerning management accounting failures were tackled in the book (p. 3):

1. Today's management accounting information, driven by the procedures and cycle of the organization's financial reporting system, is too late, too aggregated, and too distorted.
2. This leads to the information being irrelevant for managers' planning and control decisions.
3. The management accounting system also fails to provide accurate product costs.

Product cost is not necessarily taken into account in the financial perspective. Neither is it necessarily possible to explain the product cost by aggregated cost center follow-up. The major point in the critique of traditional cost accounting systems is directed toward the problems in overhead allocation and in how to use measurement:

> *"Traditional systems, using burden rates on direct costs, often provide flawed cost information which makes it harder for management to keep track of the indirect costs." (Börjesson, 1994, p. 79)*

> *"The reasons for weak cost accounting are the use of costs as indirect measures of quality and time, long time period between cost actualization and reporting, and cost information not reported by activities" (Turney, 1991, p. 28).*

If management accounting information can be described by the first and second points of Johnson & Kaplan, the third point could be caused by these two points. Accurate product cost is, however, one of the most important management tools in decision-making. It offers possibilities to analyze products as such, to compare different products with each other, and to define the initial explanations for a company's profitability. These possibilities can be lost by failures in product costing. As regards improvements, the conference in 2000 illustrated that only minor changes in accounting systems have taken place during more than ten years.

3.2 Management accounting innovations

Management accounting innovations are developed either as a result of academic research, consultancy, every–day practice in business, or a combination of all of these. They are developed to tackle the issues that are considered problems. To summarize, they are developed in order to improve the ability of management to monitor, control, and direct business. What are management accounting innovations? In this context, management accounting innovations are adopted from Bjørnenak & Olson (1999) and Mouritsen et al. (2001) and they are:

- Activity-based costing (ABC)
- Activity management (AM) and activity-based management (ABM)
- Local information systems (LS)
- Balanced scorecard (BSC)
- Life cycle costing (LCC)
- Target costing (TC)
- Strategic management accounting (SMA)
- Cost of quality (CQ)
- Economic value added (EVA)
- Open–book accounting (OBA)

Bjørnenak & Olson (1999, p. 328) have presented a generic framework (See Figure 5) to help in understanding the innovations and to highlight both the differences and developments in recent innovations. However, they do not include the last three innovations in their analysis. In the framework, the innovations are divided into two dimensions: scope and system dimensions. The scope dimension considers the cost–objects, causal variability factors, and the time frame for a calculation. The system dimension covers the number and lifetime of accounting systems and user aspects on them. The framework helps in the analysis of what really is an innovation and how big the changes are from these perspectives.

> *"Traditionally, management accounting has focused primarily on the scope dimension, that is: what shall be accounted for, and for what period of time. The conventional scope dimension includes sub-dimensions such as cost items, cost–objects and allocation bases." (p. 327)*

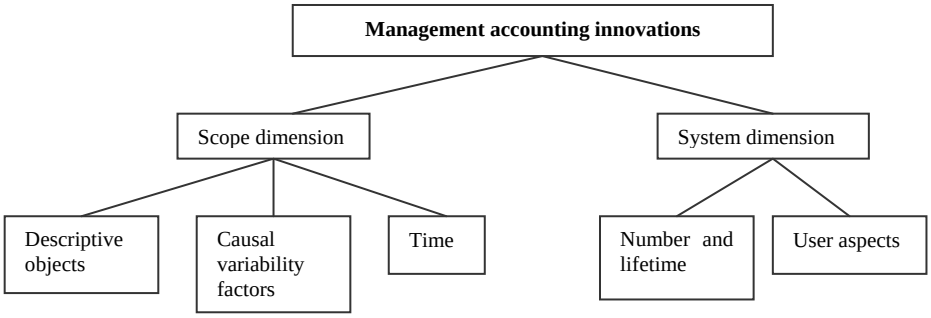

Figure 5. A generic framework for unbundling management accounting innovations. (Modified from Bjørnenak & Olson, 1999, p. 328)

System dimension is something new and could be interpreted as part of the answer to the usefulness discussion that has surrounded accounting systems. Bjørnenak & Olson (1999) analyzed changes of the focus of management accounting innovations. Their conclusion is that differences with the traditional management accounting systems exist and they will become clearer in the future.

> *"The review … shows that management accounting is becoming more diversified in the scope and system dimensions" (p. 335). "We have shown that the new models differ from the old, not that the new are necessarily better than the old models" (p. 336).*

In the following, ABC, TC, and OBA are analyzed in detail. LCC is illustrated in the context of TC. The selection is based on the fact that these three innovations have been of special importance in the network firms of this research due both to the networked way of doing business and to the cost pressure, as will be later explained.

3.2.1 Activity-based costing

As a consequence of the criticism of traditional cost accounting, a new method named ABC was developed in the late 1980's (Kaplan, 1990; Uusi-Rauva, 1989; Berliner & Brimson, 1988; Cooper, 1987; Cooper & Kaplan, 1987). The innovation in the method lies in analyzing the cost accumulation of a product through activities. Whether the innovation really was made in the 1980's is not clear. About the historical basis of accounting for activities, Bjørnenak & Olson (1999, p. 330) state:

> *"Activity as a cost–object has a long tradition in the Anglo-Saxon literature and the German literature."*

Also Ax & Ask (1995, pp. 81-83) state that accounting by activities is nothing new. It is commonly agreed that in multi–product manufacturing ABC is the fairest system in assigning costs to cost–objects (Kaplan & Atkinson, 1998; Cooper & Kaplan, 1998; Börjesson, 1994; Shank & Govindarajan, 1993; Turney, 1991; Brimson, 1991). As Roslender states (1996, p. 536):

> *"Initially, ABC was presented as a means of establishing product costs more accurately."*

In this research, ABC is adopted as a modern cost accounting approach but also the weaknesses are illustrated. ABC fits the scope of this research because it emphasizes the value chain perspective from the cost–object point of view.

> *"The value chain highlights strategically relevant activities in order to understand the behavior of costs and to identify sources of competitive advantages." (Börjesson, 1994, p. 79)*

In the 1990's the adoption of ABC has been going on and many implementations have been made (Hyvönen & Vuorinen, 2001; Gunasekaran et al., 1999; Clarke et al., 1999; Järvenpää, 1998; Karjalainen, 1997; Malmi, 1996; Cokins, 1996; Laitinen, 1995; Lumijärvi et al., 1995; Cooper et al., 1992). Furthermore, there is a wide trend toward understanding ABC not only as a cost accounting tool but also as a strategic tool for identifying competitive advantage of a firm and positioning a firm among the competitors:

> *"By systematically analyzing costs, revenues, and assets in each activity, the firm can achieve differentiation-with-cost advantage - something which Japanese manufacturers have been able to achieve." (Shank & Govindarajan, 1993, p. 61)*

It is argued that ABC could be an effective tool in avoiding the third accounting failure point, i.e. the failure of management accounting systems to provide accurate product costs. However, before it is possible to use ABC or any other accounting method efficiently, it should be made sure that the registrative function of cost accounting is managed well.

> *"[R]ecording task should be considered the major purpose of the management accounting system, and that cost data should be attributed, or recorded with references to departments and objectives." (Bjørnenak & Olson, 1999, p. 329)*

This means that job order numbers, work time registration, and cost center definitions are made and operationally used in enough detail. The causality issue behind the idea of using ABC makes the recording absolutely necessary:

> *"A modern term for one type of causal variability factor is cost driver." (Bjørnenak & Olson, 1999, p. 331)*

The statement also notes the stochastic nature of production. Activity and cost drivers are mean values of stochastic phenomena. The frequency of process changes and updating defines the reliability of the mean values.

There are also opinions according to which ABC does not produce relevant information for decision–making in certain environments and situations, and ABC may even lead managers to biased decisions that do not cover other issues than cost (Ax & Ask, 1995, pp. 89-92). This means that an ABC implementation should be made only after there is a civilized guess about its possibilities to help in the problems considered:

> *"[T]he superiority of ABC over volume–based costing in assigning current actual overhead to products does not imply that ABC is a strategic panacea or that formal cost accounting systems should be switched over en masse from volume–based rules to activity-based allocation rules." (Shank & Govindarajan, 1993, p. 180)*

There is no common agreement on whether a product or something else, for example a customer, a service, or a way of operating, should be the actual cost–object. It can be said that the selection of the cost–object depends on the business, on the accounting situation, and on the decision to be made, not on the accounting method used. However, the cost–object selection may influence also the selection of accounting method. Summarizing the discussion, knowing the cost of cost–objects (product, customer, service, or something else) is important whether this information is directly used in decision-making or not. The cost–object is priced at the time of sales anyway, so the cost should also be known.

Considering the four problems of cost accounting, i.e. problems of scope, measurement, valuation, and assigning, ABC does not directly solve these problems. These problems need to be solved case by case independently of the costing method. A firm may decide about certain principles according to which all the questions related to these problems are answered. However, these principles can be used with or without ABC.

Criticism of ABC has emerged ever since the concept was widely introduced. The criticism has evolved from theoretical views of problems in the implementations. Taking a look at the three most important problems in ABC (Shank & Govindarajan, 1993, pp. 181-183) reveals that the first point relates to updating:

1. A static versus dynamic view of costs
2. Adherence to an obsolete distinction between product and period costs
3. Costing products through today's activity chain assumes today's strategy

As a whole, the problems reflect concern on the possible stagnation of management information systems and managerial thinking.

Ax & Ask (1995, pp. 83-92) state eight concerns about ABC. First, the amount of overheads has not increased as much as ABC promoters say. The amount of overheads out of the total manufacturing cost is about 25-35% and has not changed dramatically since the early 1990's. Direct material and labor cost form the major part, 65-75%. Second, the general statement about ABC producing "actual" product cost is misleading because it is not clear if it is possible to define "actual" in the context of costs. Third, simple accounting routines are needed in practice, but ABC is not simple for firms. Fourth, Japanese firms that are in the forefront of using modern cost management techniques do not use ABC. Fifth, cost drivers are hard to define and calculate. Sixth, cost drivers do not necessarily discriminate products because the same cost drivers are used for many products. Seventh, a proportion of cost is insensitive to changes in cost driver volumes. Eighth, taking the cost of unused capacity into account, ABC costs are not necessarily relevant in all decision–making situations.

Hence, the critique of Ax & Ask can be interpreted mainly as a concern about the existing gap between theory and practice. This gap was later proved to exist at least in Irish firms (Clarke et al., 1999). An important reason for the very low adoption rate of ABC in Irish firms was explained by the fact that firms in a small economy are not provided with the same opportunities to meet academics and to enjoy education in the use of the modern accounting techniques as do firms in big economies such as the U.S. for example (p. 464). It can be argued that ABC is a sophisticated accounting method to such a degree that the possibilities to use it depend on the environment around a firm.

3.2.2 Target costing and product life cycle

Two problems in cost–based pricing are that markets do not necessarily accept prices set only based on cost (high prices), and costs are not known for them to be used as a basis for prices (inaccurate prices). TC is a market–oriented method for designing and reducing the cost of a product and its subassemblies (Cooper & Slagmulder, 1999a, 1997; Ansari & Bell, 1997; Kato & Boer, 1995; Tanaka 1993; Kato, 1993; Monden & Hamada, 1991). Many pricing situations are such that a market price for a product is somehow evident, and the acceptable cost of a product can be estimated as a difference of the market price and the profit expectations. Figure 6 illustrates the TC process with details of how to start from an allowable cost definition and how to break up the product cost into the component level.

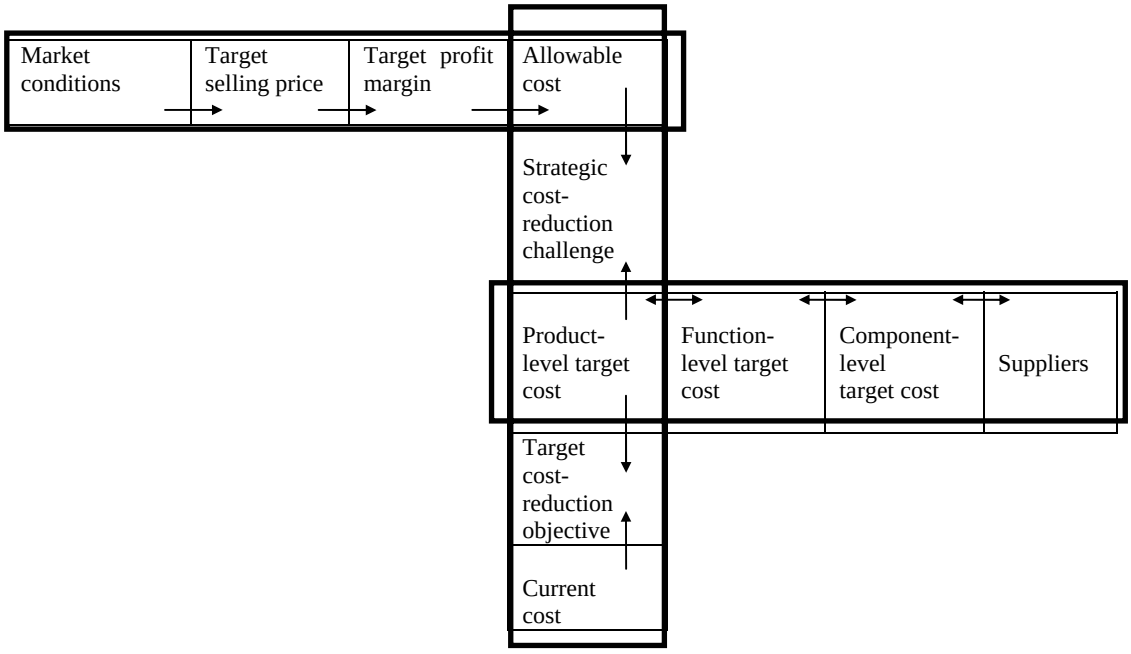

Figure 6. Target costing process. (Modified from Cooper & Slagmulder, 1997, p. 150)

TC is considered practical especially in mature industries in which operative efficiency and cost management provide a firm with competitive advantage. The market prices should be known and the costs of a product should be accounted at least with moderate accuracy in order to exploit the TC technique.

Cooper & Slagmulder (1999b, p. 235) have analyzed the fit of the TC approach in different accounting situations by stating 29 requirements regarding the business environment. Almost all of them are present in the automobile industry and most of them also in machine building. In contrast, following the example of the fast growth and rapid technology change of the industry in which Nokia operates, TC is applied only limitedly and the process does not strictly follow the theory (Järvenpää, 1998). However, TC as an approach toward cost management as a whole is experienced as very important for various industries.

The underlying spirit of TC lies in the overall control of the accumulation of product cost by following the functional structure of a product. Mouritsen et al. (2001, p. 228) summarize the issue by explaining the results of a case study:

> *"Target cost management was … one mechanism to re–install control, … mainly through its functional analysis component."*

Design of the costs over the life cycle of a product is an idea that is tangential to TC. Separation of LCC and TC is not clear in the literature, but mostly TC has been considered as a tool to be used in LCC (Bjørnenak & Olson, 1999; Kaplan & Atkinson, 1998).

> *"Target costing is a type of life cycle costing, which challenges the calendar–time perspective of costs. Instead of calendar time, the costing and budgeting processes follow the life–time of the products." (Bjørnenak & Olson, 1999, p. 332)*

Cost reduction is a contextual approach for LCC in mature industries. In high–growth industries, the focus might be somewhere else. Kaplan & Atkinson (1998) divide LCC into TC and kaizen costing, as illustrated in Figure 7. TC is directed to the pre–production phase and kaizen costing to the production phase in the life cycle of a product. The underlying belief behind kaizen costing is that the life cycle of a production process is longer than that of products. As one of the influencers of the products' total cost, the cost of using a production system should be actively reduced during its use (Kaplan & Cooper, 1998, pp. 58 –61).

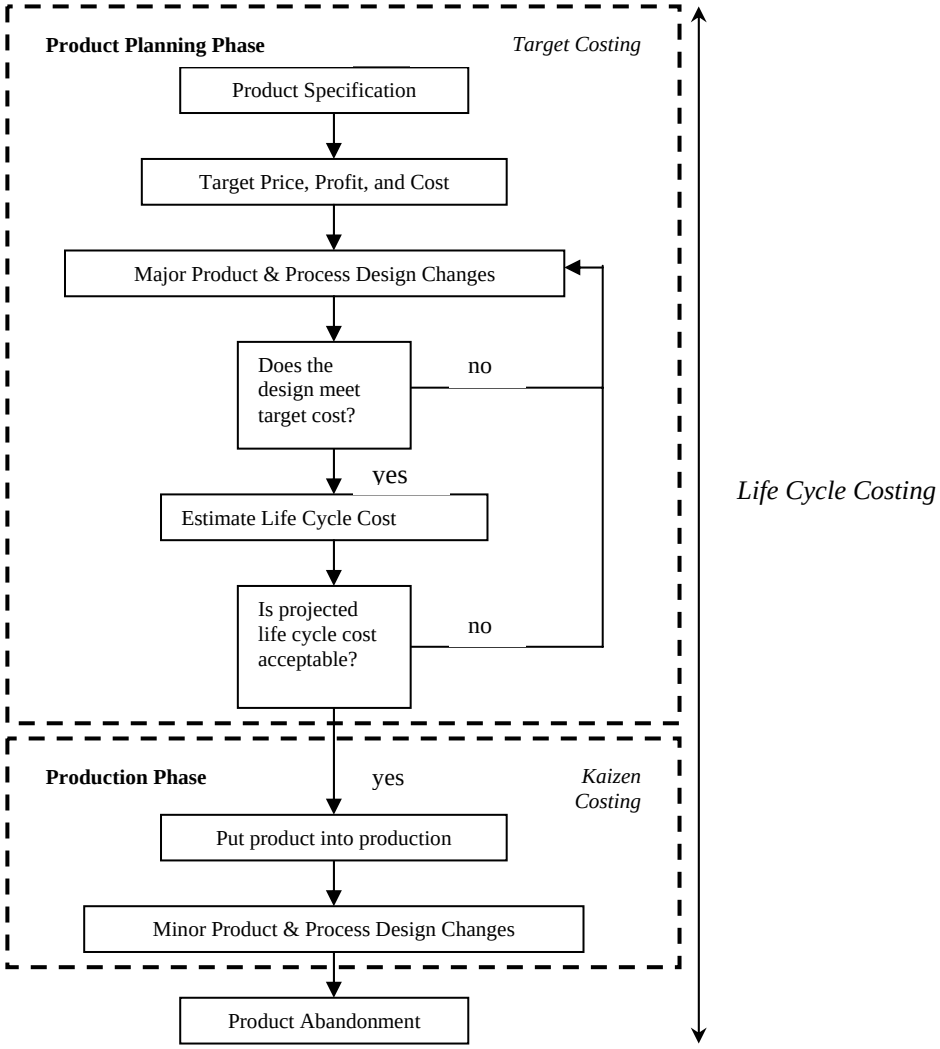

Figure 7. Cost reduction tools. (Modified from Kaplan & Atkinson, 1998, p. 223)

The life cycle of a product begins when the need for it emerges and ends when the product is thrown away, moved to another user, or is otherwise removed from the original use (Suomen sähköteknillinen standardoimisyhdistys ry, 1979, p. 9). This definition reflects the perspective of the user. Another possible perspective is that of the producer. These perspectives should be separated because they emphasize different issues (Ansari & Bell, 1997, p. 15):

- The producer is interested in all the costs of providing the market with a product during its life cycle.
- The user is interested in the total cost of owning the product during the period of its use.

Hence, Figure 7 represents a producer's perspective. The costs for the user of a product accumulate from various elements such as buying price, running cost, repair and maintenance, and scrapping for example.

Kaplan & Atkinson (1998, p. 236) set three objectives for LCC:

1. To develop a sense of the total costs associated with a product in order to identify whether the revenues during active sales will cover the costs of all the phases.
2. To identify a product's environmental cost consequences and to spur actions to reduce or eliminate those costs.
3. To identify the costs during the phases of product and process design in order to control and manage costs in those phases.

The first objective emphasizes profitability awareness at the product level by using the cost accounting approach. Around 80% of a product's total cost is committed in the design phase (Kaplan & Atkinson, 1998; Uusi-Rauva & Paranko, 1998; Blanchard, 1986, 1978). The third objective strongly relates to the idea of managing the accumulation of cost through emphasis on identifying all the cost elements already in the design phase.

3.2.3 Open-book accounting

Prices hide – from the customer's perspective – the costs of the operations conducted at the supplier's. Hence, the costs of the supplier's operations and the costs of the way in which the customer–supplier relationship is managed are not visible to the eyes of the customer. This makes it impossible for the customer to analyze the rationality of the operations of a supplier. Managing the cost of an end product is limited to the internal operations of a firm due to the prevailing invisibility in the supply chain. The result is that a main contractor of a multi–tier network knows only a fragment of the elements in an end product's total cost. Hence, managing accumulation in the cost of a network's end product becomes difficult. To have a rational influence on the cost of an end product, the cost elements of a product's cost structure should be known.

A suggested method for addressing the problem of hidden costs in supply chains is open–book accounting (Axelsson et al., 2002; Mouritsen, 2001; Cokins, 2001; Cooper – Slagmulder, 1999, 1998; Hines, 1996; Ellram, 1995; Frey & Schlosser, 1993). In OBA, a firm reveals its cost structure to another firm in order to show commitment to the other firm's future, to strengthen a firm's position as a supplier/customer among competitive firms, to learn about the other firm's operations, and to conduct joint cost–reduction efforts.

> *"Cost transparency means the sharing of costing information between customer and supplier including data which would traditionally be kept secret by each party, for use in negotiations. The purpose of this is to make it possible for customer and supplier to work together to reduce costs." (Lamming, 1993, p. 214)*

OBA has been studied so far mainly from the perspectives of a firm's internal practices and dyadic partnerships (Schonberger, 2002; Axelsson et al., 2002; Mouritsen et al., 2001; Seal et al., 1999). An approach toward analyzing networks as accounting environments is emerging (Tomkins, 2001; Dahlgren et al., 2001; Lind, 2000). The potential of openness is illustrated as follows:

> *"Open–book accounting is often legitimated from potential positive consequences of increased transparency in cost calculations between*

different parties in inter–organizational supply chains." (Mouritsen et al., 2001, p. 225)

"Openness or transparency enabled via information exchange is seen as a vital element in creating a competitive inter–organizational production system." (Lambert et al., 1998, p. 498)

The nature of OBA is not clear. There are claims in the literature that it is a strategy, profitability visualizer, or process development tool:

"Open–book accounting is a strategy that leads towards co-operation between firms situated in a supply chain." (Mouritsen et al., 2001, p. 225)

"Open–book accounting is another manifestation of this move towards transparence by which cost data is shared upstream and downstream and hence each partner's profit is visible to the others." (Christopher, 1998, p. 235)

"Open–book accounting made it possible to benchmark suppliers and to redesign suppliers' production and distribution processes. Open–book accounting's information about the production process gave the logistics management an unprecedented opportunity to discuss competitive advantage in terms of faster delivery time and competitive prices." (Mouritsen et al., 2001, p. 233-234, about the role of open–book accounting in a case study)

Openness covers so wide a range of issues, for example profitability of firms in a supply chain and measuring the process, that analyzing OBA only as a cost reduction tool would underestimate its managerial role. There is also a weakness in OBA. If the cost information shared with partners is misleading, i.e. inaccurate, irrelevant, or obsolete, there may be no benefit from openness. This is a challenge for the accounting of participating firms. Besides the demands on the accounting system, OBA calls also for trust:

"[E]stablishing trust is a key issue when it comes to utilizing this technique." (Axelsson et al., 2002, p. 56)

"Information, which previously was kept secret, is now made available. Consequently … new adjustments and interventions can be made to start cost savings projects. Information sharing allows for the construction of a whole new space for cost management as more elements can be inserted into one planning mechanism. This most likely requires a highly developed sense of trust between the parties involved, and it presupposes a system by which information is actively shared." (Mouritsen et al., 2001, p. 225)

There are risks in applying OBA. For example, if a firm belongs to many networks, what is the relationship of these networks in the market? Membership of a network may limit the possibilities of a firm to operate in other networks. Although this

research concentrates on networks as single entities, it should be remembered that a firm might meet a complex network situation in the market. Comparing OBA with other management accounting innovations, it has more to do with attitudes toward doing business and beliefs than with pure accounting.

3.3 Current practice in Finland

In the 1990's, cost accounting in Finnish firms was studied in many surveys (Hyvönen & Vuorinen, 2001; Malmi, 1999; Malmi, 1996; Lukka & Granlund, 1996; Laitinen, 1995; Rautajoki, 1995) and case studies (Järvenpää, 1998; Karjalainen, 1997), but the focus was on large and medium–sized firms. The data in the surveys was about 150-450 firms and the response rate was about 25-50%. The studies considered manufacturing industries, but the data was only limitedly organized by different industries. Hence, in the following analysis, machine building and paper industries, for example, are included in the same figures. Generalizing the results to describe machine–building as a whole should not be done, because the cost structures and product mixes in paper industry differ from machine building. However, machine–building firms were the largest group of respondents in all the surveys.

3.3.1 Cost accounting

Adoption of ABC has been slow but clearly the trend. In 1992, no respondents had implemented it, but 6% were planning to do so (Lukka & Granlund, 1996). In 1993 the percentage of ABC users was 11 (Laitinen, 1995), in 1995 it was 14 (Malmi, 1996), and in 1999 it was 18 (Hyvönen & Vuorinen, 2001). Table 8 gives a summary of cost accounting studies indicating adoption rates of accounting tools in Finland during 1992-1999. Rautajoki (1995) stated that in 1994 24% of respondents used ABC, but the figure was an exception compared with the trend. Malmi (1996) explained the result of Rautajoki as a measurement error due to the respondent profile: respondents of Rautajoki's study were production managers, while in other studies they were accounting managers. According to Malmi, production personnel may have misunderstood ABC as an inventory control method.

Percentage of firms using a particular accounting method and mean values of material and direct labor cost as percentage of total cost.	ABC in Use	ABC implem.	Target costing	Life cycle costing	Job order costing	Process costing	Material cost–%	Direct labor–%
Lukka & Granlund (1996; 1992)	0	6	2		30	32	45	19
Laitinen (1995; 1993)	11	13	6					
Malmi (1996; 1995)	14	8						
Järvenpää (1998; 1997)			7	2				
Hyvönen & Vuorinen (2001; 1999)	18		6	4	34	35	53	15

Table 8. Summary of cost accounting studies indicating adoption of accounting tools and cost structure in Finland during 1992-1999. (Publishing year; year of data)

In line with increased ABC adoption, job order costing and process costing have increased their attractiveness. In the study of Lukka & Granlund (1996), 38% of respondents used neither process nor job–order costing, but in the study of Hyvönen & Vuorinen, this rate is only 2%. This may mean increased accuracy in the assignment of indirect and overhead costs. Karjalainen (1997) mentions that the pace of change in accounting systems has been slow. However, he states (p. 158) that surveys produce low adoption rates because they do not analyze small changes but rather changes in the overall approach to cost accounting.

There were four major reasons for firms to adopt ABC (Malmi, 1996, pp. 249-250):

1. Existing system not useful for management 55%
2. A wish to try a new tool 42%
3. Existing system not reliable 41%
4. Process organization requires new accounting 28%

Comparing the results with the argumentation of Johnson & Kaplan (1987), three out of the four major reasons can be derived from the criticism of traditional accounting systems. The second reason, a wish to try a new tool, may have something to do with the experimental nature of man. There were also two minor reasons: parent's/headquarter's advice (16%) and information system renewal (12%). These reasons relate to overall development of firms. In development there can be some synergy if the accounting system is included in the change in all units.

The users and purposes for the use of activity-based cost information are of special importance because the accounting information should be in the form that best serves its users. Furthermore, the design of cost accounting systems is highly dependent on the purposes for which the information should be used. Malmi (1996, pp. 253-254) identified the nine most important situations in which ABC information was needed:

1. Profitability analysis 93%
2. Pricing 82%
3. Measuring activity efficiency, time, or quality 71%
4. Calculating operating profit 62%
5. Developing production and processes 62%
6. Product mix decisions 48%
7. Make-or-buy analysis 39%
8. Product planning 38%
9. Scheduling and optimizing production 36%

The respondents were allowed to select as many purposes as they considered necessary. The purposes were also classified according to who would be interested in which situation. The three most important purposes for different cost information users are illustrated in Table 9. Although the respondents were thinking only of ABC information, the purposes linked to particular users might be relevant for any kind of cost information. It can be suggested that functions differ much more from each other than the purposes in the use of cost information.

User / Importance	**Production**	**Accounting**	**Marketing**
1.	Measure activities	Profitability analysis	Pricing
2.	Develop production/ process	Financial accounting	Profitability analysis
3.	Profitability analysis	Measure activities	Product mix decisions

Table 9. Users and respective uses of ABC information. (Modified from Malmi, 1996, p. 257)

The benefits gained by using ABC related to changes. The respondents compared the situation before and after ABC information. Nine changes were connected to the use of ABC (pp. 256-257):

1. Increased cost awareness 79%
2. Changes in pricing 45%
3. Increased profitability 40%
4. Shortened throughput times/higher quality 27%
5. Re-engineering of activities 27%
6. Changes in product mix 24%
7. Changed purchasing habits 15%
8. Customer–related changes 13%
9. Changed product features 10%

Cost awareness is not easy to measure, but it describes how the organization and its employees experience their knowledge of costs. The biggest change had taken place here. From the competition point of view, it is very important that increased cost awareness also changes pricing or product mix. As Kaplan & Atkinson (1998, pp. 150-156) illustrate the results of accurate costing versus traditional costing, the variances in the cost of cost–objects are typically bigger than expected. If more accurate knowledge of costs does not change product mix, pricing should be changed at least. Via changes in pricing also increase in profitability can be gained. However, 10% of respondents mentioned that no benefits were gained or the benefits were not known. This may be due at least to the newness, weakness, non–use, or misuse of the ABC system.

The study of Karjalainen (1997) illustrates that there might be a weakness in the ABC surveys as well. If the features of the accounting system are not triangulated but the judgement of the use or non–use of ABC is made based on answers of questionnaires, the data may be biased. By nine empirical cases Karjalainen shows that the adoption of ABC has been slow in Finland, but some of the features of ABC are present in many implemented systems. Furthermore, possible reasons for the slow adoption rate were indicated. First, the benefits gained by an activity–based accounting system are hard to measure, which may lead to the impression that changing the accounting system is useless. Second, two of the nine implementations studied were failures. Failures might not encourage other firms to implement new systems.

According to the cost accounting theory, allocating or assigning overhead cost to cost–objects is the most inaccurate phase in costing. This observation was once again made in the empirical study of Hyvönen & Vuorinen (2001). The most important problems in product costing were (p. O12, relative importance on 1-5 scale):

1. Allocation of administration overheads to products 3.3
2. Data collection 3.2
3. Allocation of sales and marketing overheads to customers 3.2
4. Allocation of sales and marketing overheads to products 3.1
5. Allocation of production overheads to products 2.7

Four out of the five most important problems related to overhead costs.

3.3.2 Cost management

In 1992 the percentages of material cost and direct labor were 45 and 19, respectively, of the total cost of respondents (Lukka & Granlund, 1996). In 1999 the respective percentages were 53 and 15 (Hyvönen & Vuorinen, 2001). During the same period, extensive outsourcing has occurred, partnerships have been created, and development of system suppliers has emerged (KTM, 2000; Karjalainen et al., 1999; Koskinen, 1995). Part of the direct labor cost is changed to material costs by outsourcing. This explains to a high degree the changes in cost structures of large and medium–sized firms.

Four out of the five studies considered here have examined the use of TC. Even if there seems to be widening interest in this cost–reduction oriented approach, the current popularity of the method seems to be low. The adoption rate in Finland, less than 10%, did not change significantly during 1993-1999 (Järvenpää, 1998, pp. 172-176). In Japan the percentage of those using or planning to use TC is 76% and in Scotland 41%. The percentage of TC users in Japan was 100 in the automobile industry, 88 in the electronics industry, 83 in machine building, 53 in the metal industry, and 33 in other manufacturing industries (Kato & Boer, 1995). Hence, the Japanese automobile industry is a pioneer and Finland is not in the forefront of using TC.

Cost reduction efforts are often conducted by following TC roughly as described by an accounting manager and a designer:

> *”[W]e have some general target costs for the newly developed products, but they are not actual, specific target costs as specified in the technique.” (Mouritsen et al., 2001, p. 229)*

> *”This is the way how costs have always been designed.” (A representative of Main Contractor A in this research)*

Generosity may lead to a reduced number of analyzed product features, which is near to design–to–cost approach. The systematic breaking down of cost structure to the component level and the idea of actively reducing cost by setting targets is not widely understood, although some of the work has been done in the spirit of the comments above.

LCC is more unusual than TC. A total of 11% of English and 2% of Finnish firms used or planned to use LCC (Järvenpää, 1998). Uncertainty that related to analysis of the future may decrease the percentage. Furthermore, there are no tools for eliminating the uncertainty.

3.3.3 Culture and firm size

Comparing Finland with other cultures in the context of cost accounting practices, big differences do not exist. Malmi (1999, p. 654) states that the Finnish business context does not significantly differ from that of other Western countries. Furthermore, as Hyvönen & Vuorinen (2001, p. O20) state:

> *"[D]uring the 1990s, the developmental trend in Finnish manufacturing units took a similar path than that traced by studies focussing on corresponding units in other Nordic countries, and, at least in case of ABC, in U[nited] K[ingdom]. Some dissimilarities between the results can be distinguished, but the overall evolvement of cost accounting and management practices seems to follow a similar pattern within each country."*

The descriptions above were from large and medium–sized firms in the Finnish context. However, the lack of data from small firms is evident. Many studies indicate that the larger the firm the better and more modern cost accounting is (Hyvönen & Vuorinen, 2001; Innes et al., 2000; Ax & Ask, 1995; Malmi, 1996; Drury & Tayles, 1994). Hence, it is reasonable to suggest that SMEs have not reached the level of larger firms in applying accurate cost accounting and modern management accounting tools.

3.4 Strategic cost management in supply chains

3.4.1 Developing cost accounting and cost management

The development of accounting systems within a firm is possible by following on the one hand the needs of a firm and on the other hand the possibilities available. The needs are relational, depending for example on the industry logic, accounting situations, and current accounting practices. The possibilities arise from methods and techniques. What kind an accounting system should be and in which direction accounting methods should be developed depends on the particular purpose for which cost information is going to be used. Shank & Govindarajan (1993, p. 7) describe the issue as follows:

> *"Accounting is not an end in itself, but only a means to help achieve business success. Accounting techniques or systems must be judged in light of their impact on business success. Specific accounting techniques or systems must be considered in terms of the role they are intended to play."*

Furthermore, the selection of the development guidelines for an accounting system has a significant effect on the usability of its results. As different accounting situations emphasize different kinds of information, there are controversies regarding the matching of one particular accounting system to any purpose:

> *"In evaluating the overall accounting system for a business, mutual consistency among the various elements is critical. The key question is*

> *whether the overall fit with strategy is appropriate. For example, a target cost system with tight, engineered cost allowances may be an excellent tool for assessing manufacturing performance in a business following a strategy of being the low–cost producer. However, developing such an accounting tool might be dysfunctional in a business pursuing a strategy of differentiation via product innovations." (Shank & Govindarajan, 1993, pp. 7-8)*

Extensive reading of ABC literature shows that a versatile understanding of the purposes of ABC systems exists. ABC can be used for solving an assignment problem in product costing as well as for serving as a strategic tool in product mix selection. The design of the system can be either strategic or operational–oriented.

> *"A strategic–oriented system may have different characteristics from a coordinating or operational–oriented system. It is the design characteristics that form the system, not the label of the model." (Bjørnenak & Olson, 1999, p. 336)*

Hence, labeling something as an ABC system, for example, does not mean that all the advantages described for it could be attained. On the other hand, changing an accounting system in the ABC direction may happen piece by piece even if a theoretically perfect system is not implemented (Karjalainen, 1997). Problems in the implementation of ABC lie in solving the accounting problems and in carrying out the ABC project. As mentioned before, solving the accounting problems depends on the case or on a firm's policy. Problems and milestones of an ABC project include certain general project characteristics independent of the fact that the project is an accounting system project. However, there are certain characteristics that are special for implementing ABC. The major reasons for not implementing ABC are the high costs of creating an accurate system, the huge number of details that have to be managed in the beginning of a project compared with traditional costing, and inability to measure the benefits gained through the ABC system (Karjalainen, 1997; Ness & Cucuzza, 1995; Kleinsorge & Tanner, 1991). The desire to avoid these problems may be a reason for many firms not to begin the implementation of ABC.

Improvements in data gathering or in management accounting reports do not call for a specific accounting system. Increasing the accuracy of a current system and improving the usability of cost reports are good incremental goals for the development of cost accounting. Managing cost becomes easier if the information on which the work is based, cost information, is well produced. This is the reason why cost management development could benefit from development in cost accounting. Development in cost management is more versatile and may call for changes in production as well as in the product. How the biggest chances to save cost can be discovered depends at least partly on the suitability of the cost accounting system.

Concerning the process in which a product flows, as Cooper & Slagmulder (1998) mention, the next step after firm–wide cost management is to go beyond the boundaries of a single firm to see what happens in other firms of the supply chain. An example of what should be agreed in a relationship is the statement of Womack & Jones (1994, p. 102) about accounting in lean enterprises:

"[T]here must be clear agreements on target costing, acceptable levels of process performance, the rate of continuous improvement (and cost reductions), consistent accounting systems to analyze costs, and formulas for splitting pain and gain."

What really has been implemented in the use of modern techniques in inter–firm accounting is very little:

"Although some evidence of the implementation of these ideas exists, little research explicitly addresses the question of how different design characteristics are integrated in the implementation of these ideas." (Bjørnenak & Olson, 1999, p. 336)

Summarizing the development of cost accounting and cost management, it has problems both at the firm level concerning the implementations and the pace of changes, and at the inter–firm level concerning the cost management of supply chains.

3.4.2 Inter–organizational cost management

Regarding the interaction of a firm with its suppliers and customers, it can be defined as work done in order to improve a firm's competitive position. This is quite near what strategy is about (see e.g. Johnson & Scholes, 1998; Hamel & Prahalad, 1994; Porter, 1980, 1985). One way to improve a firm's competitive position is efficient and effective cost management. Cost management is a systematic approach in designing and managing costs. The relation between cost accounting, cost information, and cost management is as follows: well-organized cost accounting produces accurate and relevant cost information that helps to manage cost. On the other hand, cost management is a strategic issue within a firm:

"Cost analysis traditionally is viewed as the process of assessing the financial impact of alternative managerial decisions. How is strategic cost management different? It is cost analysis in a broader context, where the strategic elements become more conscious, explicit, and formal. Here, cost data is used to develop superior strategies en route to gaining sustainable competitive advantage. A sophisticated understanding of a firm's cost structure can go a long way in the search for sustainable competitive advantage." (Shank & Govindarajan, 1993, p. 6).

Ellram & Feitzinger (1999, p. 1) suggest that the role of supply chains in product cost management is crucial:

"The purpose of supply chain management is to minimize the total cost of providing a solution to the customer while maximizing customer service and thus revenues."

In considering the minimization of total cost that refers here to the total cost accumulation in supply chains (see Figure 2) the performance of a supply chain should be measured. The supply chain should be taken into account as a system, because it is not sensible to measure the performance of supply chains by measuring

only single firms (Holmberg, 2000, p. 865). Supply chain management is to a high degree management of the accumulation of product costs in the manufacturing process. Most of the product cost may originate exterior to a firm, and exterior operations may influence the end product's cost more than interior operations.

In order to manage costs, cost should be known. Since knowing cost within a firm is difficult (see Chapter 3.1), it may be doubly as hard to know the cost of other firms. This calls not only for well–managed cost accounting, but also for trust. It is not typical to deliver cost information beyond the boundaries of a firm (Kajüter, 2002; Cooper & Slagmulder, 1998; Lamming 1993). Cost management through a whole supply chain is called inter–organizational cost management. Its aim is to push the accumulation curve of supply chain costs in Figure 2 as low as possible:

> *"Inter–organizational cost management is a structured approach to coordinate the activities in a supplier network so that total costs in the network are reduced" (Cooper & Slagmulder, 1999b, pp. 145-146).*

It should be noted that the environment in this context is manufacturing industry trying to get lean. A firm is using inter–organizational cost management if the next four points occur at the same time (Cooper & Slagmulder, 1999b, p.3):

1. The firm sets specific cost-reduction objectives for suppliers.
2. The firm helps its customers and/or suppliers find ways to achieve their cost-reduction objectives.
3. The firm takes into account the profitability of its suppliers when negotiating component pricing with them.
4. The firm is continuously making its buyer-supplier interfaces more efficient.

Suitable techniques for inter–organizational cost management are TC, kaizen costing, inter–organizational cost investigations, concurrent cost management, value analysis and value engineering, and functionality-price-quality trade–offs (Cooper & Slagmulder, 1999b, p. 150). It is also suggested that the systematic use of these methods should be based on activity-based cost information. Mouritsen et al. (2001, p. 221) add OBA to the list of techniques:

> *"[I]nter–organizational management controls such as open–book accounting and target cost management/functional analysis create new possibilities for management intervention."*

The role of management accounting innovations in increasing inter–organizational operations seems to be important, as Mouritsen et al. (2001, p. 228) illustrate in a case study:

> *"The logistics manager introduced target cost management, and it came to play an important role in the efforts to establish inter–organizational management control."*

The four points of Cooper & Slagmulder do not directly consider the issues of cost information transfer and trust between partners. The points are, however, a sound basis for assessing inter–organizational cost management. The points are also an

advanced way to analyze customers' readiness to utilize cost information if it is provided by suppliers.

Regardless of firms' capabilities and methods to produce accurate cost information, the primary challenge may still lie in attitudes: How to get firms to discuss activities and cost accumulation? Without cost information transfer and open discussion between firms, inter–organizational cost management does not exist. Networking may offer a good opportunity to manage cost information transfer because of the overall need to build systems for transferring information. Cost information could be connected to these systems as part of communication.

3.4.3 Network accounting

The studies carried out and practices reported on cost management in firm relationships are mainly dyadic in nature so far. One of the reasons for the lack of analysis of networks as an accounting environment might be that networks as such have only recently been made an object of intense research. The problems of dyadic interaction exist also in networks, but their nature is multidimensional and multilateral due to the increased number of participating organizations. As the industrial cases of Cooper & Slagmulder (1999b) reveal, inter–organizational cost management is not empirically analyzed or developed in networks although the definition includes the word "network". Network accounting has been approached theoretically, mainly by introducing problems in network accounting (Tomkins, 2001; Järvenpää et al., 2001; Lind, 2000; Hines, 1996).

The network approach in cost management is a step forward from the supply chain perspective (Järvenpää et al., 2001; Lind, 2000; Hopwood, 1996). As Järvenpää et al. (2001, p. 123) describe, the number of actors and influencers make the network accounting situation look almost like a mess. Cost management in networks is described mainly via five themes (p. 122): strategic cost management, improvements in information systems both in member firms and as an integrative effort, cost accounting for projects due to changing network partners, creation of a network–wide and jointly accepted performance measurement system, and creation of inter–organizational team–work practices. Comparing these themes to those introduced in network or management accounting literature, there is almost nothing new. Furthermore, the demand for standardization in performance measurement is beyond the mandate of any network member, which means that a consensus should be reached before beginning this work. Järvenpää et al. (2001) summarize network accounting be as the use of ABC, TC, and OBA in the spirit of strategic cost management.

Hines (1996, pp. 6-7) suggests that a transparent costing system designed so that costing information is available across the supply network could facilitate sound decisions. Also, according to Lind (2000), cost information should support all the decision–making in networks. He suggests that cost information could have a major role in opening discussions on strategic choices of cooperating firms (p. 77). In practice, domination by one party has prevented many networks from utilizing modern cost management tools.

Concerning these studies, multilaterality of cost accounting and cost management refers primarily to the transfer of suppliers' cost information between network members and customers' use of it. This point of view is supported also by Tomkins (2001), who mentions that networks do not call for new accounting methods but only new practices for sharing cost information with partners. Tomkins suggests that shared cost information could improve trust between network members and help in managing operations.

The empirical studies of Dahlgren et al. (2001) and Frimanson & Lind (2000) present four networks in which cost information is used inter–organizationally. The approaches in these studies are somewhat different: Frimanson & Lind consider a supplier's production management on the basis of customer–specific cost information, while Dahlgren et al. cover management accounting in three networks in wider scope from budgeting to invoicing systems.

Frimanson & Lind (2000) analyzed a print shop's cost management practices with its customers, but did not find multilaterality in the cost management practices. The print shop managed its customers as a network, but the customers did not define themselves as such. The most important finding was that the print shop used order–based cost information as an operation management and order–scheduling tool. Order–based cost information was calculated by summing up the direct cost of an order and the overheads assigned to an order. The cost structure of orders was given to customers. The initiator for the openness of cost information was the print shop, which wished to get the production plan better organized by explaining the cost effects of different alternatives to the customers. Cost management in the study of Frimanson & Lind was inter–organizational and network–wide in nature from the print shop's perspective, but referred to downstream networking because openness was directed toward many customers.

Dahlgren et al. (2001) presented a typology for networks. Three case networks were placed in line, the ends being market and hierarchy. A network of equal partners that had mutual agreement on using each other's services was named "business network" and it was almost the market situation. Closest to hierarchy was a "functional network" that consisted of a firm marketing the joint end products and nine suppliers. In the middle was a "strategic network" that had some joint activities around a product. No common costing and no cost information sharing occurred in the business network. The functional network's costing system was integrated between firms and full openness concerning each member's cost was attained. The strategic network used joint product costing for the network's end product and full openness concerning this product's cost was attained. Dahlgren et al. summarize that networks might not need new management accounting concepts and models. The case networks operated with traditional management accounting systems and these systems supported the management of network's activities. However, there were no cost–based analyses of the benefits gained through networking.

The empirical studies provided no description of the developmental aspect of networks' accounting systems. Furthermore, comparing with the cost management studies concerning dyadic partnerships and supply chains (Axelsson et al., 2002; Kajüter, 2002; Cokins, 2001; Mouritsen, 2001; Dekker & van Goor, 2000; Lazar, 2000; Cooper & Slagmulder, 1999b; Cullen et al., 1999; Seal et al., 1999; Degraeve &

Roodhooft, 1999; Berry et al., 1997; Buxton, 1997; Gietzmann, 1996; Dyer, 1996; Carr & Ng, 1995; Cooper & Yoshikawa, 1994 Munday, 1992a, 1992b), the network studies raise a question of whether the only real challenge in network accounting is multilateral information sharing. At least the need for more detailed and empirical analysis on the issue is evident.

3.5 Summary

In order to conduct effective and efficient cost management, cost accounting should be well–functioning. The major problems in cost accounting are as follows:

- accounting problems are hard to solve and they cannot be solved by selecting a specific accounting method,
- the registrative function of cost accounting is neglected to a high degree,
- management accounting systems do not produce useful information for those who could use cost information to reduce cost, and
- adoption of modern management accounting innovations is slow and they are utilised only partly.

In the framework of unbundling management accounting innovations (Bjørnenak & Olson, 1999), the perspective of the cost information user, the internal customer, is not taken into account to the degree that would be needed. An example of this is that with some exceptions (see e.g. Axelsson et al., 2002; Uusi-Rauva & Paranko, 1998; Ellram, 1996) no comprehensive studies on the actual users of cost information in firms exist.

Proceeding from the problems at the firm level to the problems in inter–organizational cost accounting, one sees that attitudes play a central role here also. Opening cost information to another party is something that is considered to include risks, and only few detailed empirical cases have been reported. For this reason there is only limited understanding of the inter–organizational use of modern accounting methods.

Considering the cost–efficiency of networks, improvements might be gained without knowledge of costs. However, this research focusses on the systematic use of cost information and, hence, the ad hoc approach is ruled out. It is reasonable to presume that inter–organizational cost management is at least part of network cost management in the environment considered in this research. Even if the definition of inter–organizational cost management includes the words “supplier network” (Cooper & Slagmulder, 1999b, pp. 145-146), the multilaterality of networks is still awaiting a detailed and empirical analysis. Furthermore, analyses of present state and needs concerning cost management are required in order to identify appropriate cost accounting development efforts in networks which are, in turn, almost forgotten in accounting literature. Whatever the development efforts might be, the analyses would reveal problems and possibilities of networks as accounting environments.

4 RESEARCH ENVIRONMENT

4.1 Industry description

This research concerns Finnish machine building. In Finnish statistics, machine building is categorized into metals, engineering and electronics industries / mechanical engineering / machinery (MET 1999-2002). Small and middle–sized firms (less than 100 employees) are the most common firm groups in Finland. A total of 97.5% of Finnish firms in 1995 fell within these categories (Uusi-Rauva et al., 1999, p. 16).

In this research, the firms are divided in three classes according to firm size: small firms (annual sales less than 4 M€), middle–sized firms (annual sales over 4 M€ but less than 80M€), and large firms (annual sales more than 80 M€). The typical pattern for firms analyzed in this research is that small firms are job shops with few machines, and are led by the owners who also work in the firms. The number of employees is typically 30 or under. Middle–sized firms are work–shops or small factories with few white–collar personnel and more than 30 employees. Large firms typically include many departments and functions and they employ a high percentage of staff with a university degree. The number of employees in large firms often exceeds 500. However, there are no clear and explicit limits regarding the different measures of firm size, so that the firms in this research are divided in the three classes mainly contextually.

The customers of small and middle–sized mechanical engineering firms are typically large main contractors or middle–sized system suppliers. The average number of major customers is three to six, and there may be several minor customers. Most of the subcontractors do not have in–house designed products but manufacture according to the customer's drawings. Contract manufacturing and original equipment providing, which means manufacturing using the customer's brand, is becoming common. This trend closely relates to the partnership development described in Chapters 2.1.1 and 2.1.2.

In addition to manufacturing firms, this research includes a group of service firms. Service firms are component suppliers like component wholesalers specialized in distribution or they provide customers with engineering and design services. Some service firms give technical support for components that they also deliver to the customer's facility. Typical deliveries from service firms are hydraulic and electric components, filters, seals, motors, and other standardized components. The role of service firms in understanding the end use of components is growing. The number of different components in service firms is decreasing due to the standardization trend. Outsourcing by middle–sized and large firms means that administration and delivery of components is frequently transferred to the responsibility of service firms. This means that a customer does not touch a component in any way before its use and service firms take care of the availability at the customer's. Vendor–managed inventories are the trend and growing interest is emerging in web–based management of order–delivery processes.

The gross value of the Finnish mechanical engineering industry[3] rose from 10.3 Mrd € in 1990 to 18.3 Mrd € in 2000 (+ 78%). Finland's gross domestic product rose 25% (from 105 Mrd € to 131 Mrd €) in the same period. (MET, 2002, pp. 7 – 9) Hence, the growth in mechanical engineering has exceeded the average growth in Finland. Labor productivity in metal, engineering, and electronics industries increased by 87% from 1990 to 1999 and the unit labor cost has decreased by 28% during the same period (MET, 2000, pp. 13 – 36). Hence, the increase in labor price was significant, but it has not whittled away the increase in productivity. On the other hand, the recession of the early 1990's may have driven the firms with weakest productivity to bankruptcy, causing the productivity figures to show huge improvement. There may be many ways to improve productivity. One of these ways in manufacturing industry is to invest in research and development in order to develop productivity–improving solutions. Investment in Research and development in mechanical engineering was 2% of the gross value of production in 1999. However, in electronics industry it was 9% (MET, 2000, p. 5).

Consolidation of the metal, engineering, and electronics industries was a major underlying trend in Finland during the 1990's (Tilastokeskus, 2002). From 1993 to 1999 the number of firms in the metal, engineering, and electronics industries increased by 14%. Over the same time the production volume increased by 86%. In other words, the average production volume per firm increased. This means that firms in the industry grew on average. However, the number of large firms (500 - 1000 employees) increased by 70% during the same period when the number of small firms (5 - 9 employees) increased by only 10%. In 1999 the average annual sales per firm was 52% higher in large firms than in 1993, while in small firms it was only 38% higher. This means that in 1999 large firms were responsible for a greater percentage of the total business than in 1993.

At least two issues should be remembered when analyzing the statistics. First, when a firm grows, it is registered in a different class in statistics. This may mean that the growth of firms can be seen in the figures concerning the largest firm group, while new firms are established in the smallest group. Second, from 1993 to 2001 the Finnish national economy experienced a period of continual growth measured by gross domestic product. This economic trend may have had an influence on the behavior of the research subjects. These phenomena should be taken into account also when placing the research results into the context of earlier theories.

4.2 Research subjects

4.2.1 Firms and networks

Empirical data was gathered from two networks, named A and B here, including 15 firms. Firms in the networks were divided into four groups: main contractors were the focal firms that had the position of main contractors as described in Figure 1. Middle–sized manufacturers were firms that had annual sales over 4 M€, small manufacturers were firms that had annual sales less than 4 M€, and service firms were firms that

[3] Includes firms of classes 28, 29, 34, and 35 in the Finnish industry classification.

provided engineering, design, and logistics services in the supply of technical components. Other groups than main contractors represent the supplier and subcontractor levels in Figure 1. Furthermore, both main contractors had defined their networks so that these suppliers are included. The main contractors had a lot more suppliers, naturally, but the main contractors did not consider all of them members of the network. The main contractors selected the network members. Suppliers' importance, earlier development efforts, and willingness to be a member were taken into account in the selection.

Network A consisted of Main Contractor A and eight of its suppliers, of which one (SC3) joined the network during the research. The description of network A and its supply relations are illustrated in Figure 8. The longitudinal time period of the network A follow–up was three years (1998-2001). The annual sales of Main Contractor A are ca. 150 M€ and the personnel is ca. 600. The main contractor is a global end product provider for mining and construction industries. The percentage of suppliers' sales to the main contractor ranges from 5% to 55%. All the firms except MSM 2 were located in the Tampere region.

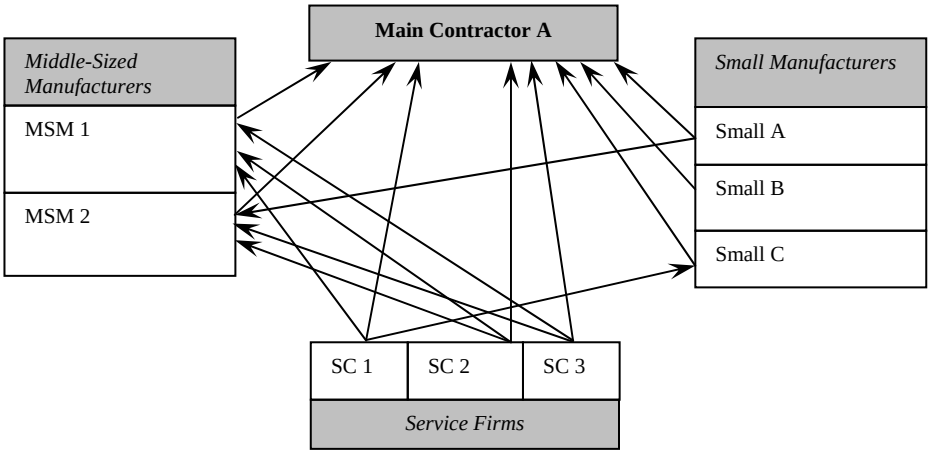

Figure 8. Network A and its supply relations.

Network B consisted of a Finnish–based international equipment provider (main contractor) and five of its suppliers (see Figure 9). The longitudinal time period of the network B follow–up was one year (2000-2001). The annual sales of Main Contractor B are ca. 16 M€ and the personnel is ca. 130. The main contractor is a product factory of an international consolidated manufacturer. The products are subassemblies for the pulp and paper industry. One of the suppliers is a service firm providing components and technical support (SC1). Four firms are manufacturers, two of them middle–sized and two small. The percentage of suppliers' sales to the main contractor ranges from 10% to 70%. The five suppliers were selected to the network for three reasons: they deliver critical components, they are located near the main contractor (except Small B), and they were the most willing ones to take part in supplier development conducted by the main contractor. All the firms except Small B were located in the Tampere region.

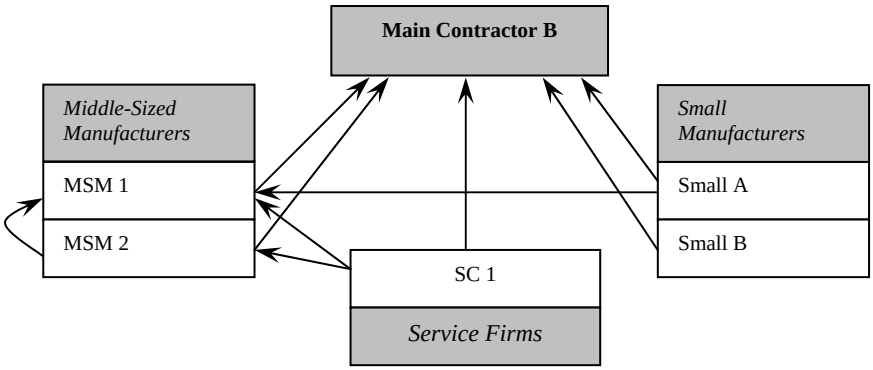

Figure 9. Network B and its supply relations.

Network B is smaller than network A measured by sales volume, size of member firms, number of transactions, and number of supply relations. A detailed comparison of the other characteristics of networks is presented in the article III. SC1 in network B is a subsidiary to the same company as SC1 is in network A. However, in the contexts of this research and the different main contractors, the subsidiaries were independent of each other.

4.2.2 Organization of networks

Networks were organized according to the principles of the quasi–firm school from the very start (Anttila et al., 2002; Koivisto & Mikkola, 2002; Ruohola, 2001; Räsänen & Koivisto, 2000). Managerial teams consisting of representatives of all the member firms selected areas for development and discussed the future of the networks. Both networks got together twice a year to have a ”network day”. During this six to eight hours long multilateral gathering, main contractors’ strategies and challenges for the next two years and development projects of the networks for the next six months were discussed. The discussion was conducted according to an agenda that was created by all the members with strong emphasis on the needs of the main contractors. However, all the members had a real possibility to influence what the network was going to do during the next six months and in which development efforts they were going to participate as a firm. Outside the “network days”, development work was done according to what was decided during the ”network day”. Personnel of the member firms of both networks took part in education that was organized around topics identified as critical during ”network days”. Furthermore, minor development efforts were conducted in various contexts so that the cooperation between different network firms took place at least once per month.

However, there were a couple of persons at the main contractors’ that used much more power than the representatives of suppliers. In network A the purchasing manager of Main Contractor A acted like a highly–motivated runner of a network. In network A, this led to a situation in which work was efficient and focussed, but after which small manufacturers became passive. They did not take part in any cost management development projects. Lack of resources was an obvious reason for the passiveness as was the fear of the main contractor’s influence. On the other hand, middle–sized manufacturers took the advantage to develop toward a system supplier and they began to develop a supplier network of their own. Service firms reacted

positively to cost management development. By 2001 all the service firms and middle–sized manufacturers had changed their cost accounting either by a one–time calculation or by a new system. In network B, the factory management team consisting of four or five managers of Main Contractor B acted like a slow–pace runner. Although a managing director of a middle–sized manufacturer wanted to move toward transparency in cost issues, no development was gained. Main Contractor B preferred other areas, logistics and team work development for example, instead of cost accounting and cost management.

Hence, although work around the network issues was organized in quasi–firm style, the selection of the issues and the direction in which they should be developed was mainly done by the main contractors' runner style. It is reasonable to believe that the effect of the main contractors on the development of the networks is significant. However, all the members of both networks have had their word, or at least they have been heard, in decision–making concerning the networks.

4.2.3 Analysis and development of cost management

The empirical data of this research was gathered during the follow–ups of the networks. The follow–ups were started after the networks were established in a defined form and the initiation toward development was taken by the network members. The first step that was similarly conducted in both networks was cost management present state and needs analyses. The description, method, and content of these analyses is illustrated in Chapters 5.1 and 5.2 and in the articles II and III. The present state analysis of cost management was the basis for both analyzing and developing the network's capabilities in cost accounting and cost management. The purpose of present state analysis in network environment is to describe the present state of suppliers' cost accounting practices and capabilities and to describe a customer's needs concerning the suppliers' cost information. Present state and needs analyses produce basic knowledge on the current cost management practices, on which kind of practices the network is striving for, and on what should be done to meet the needs found. Present state analysis of cost management is a starting point for the development of cost management in individual firms as well as in the network as a whole. Both the analysis and development of cost management were carried out in the sense of Figure 10, which illustrates the four-phase (1. – 4.) development process of the network's cost management. The process was utilized especially in coordinating the development work in network A (Kulmala & Paranko, 2002, p. 105).

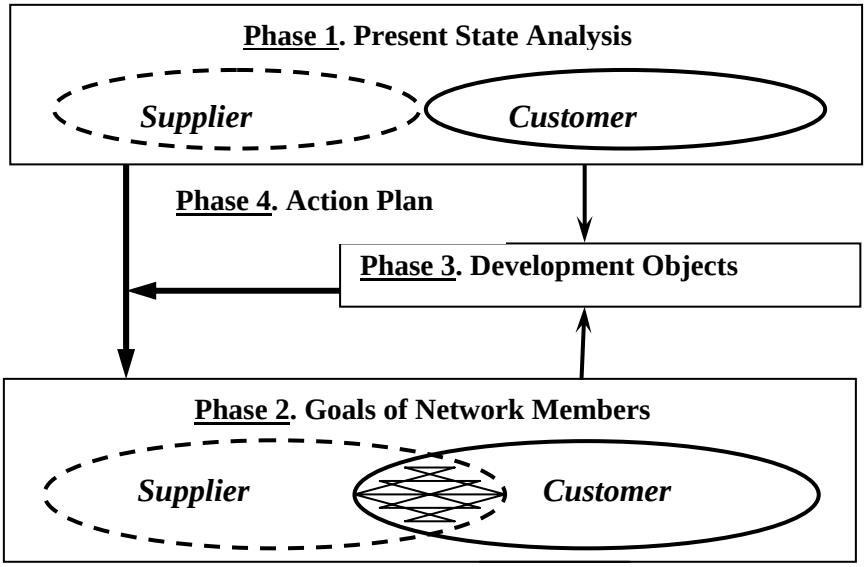

Figure 10. Development process of cost management in network relationships.

In network A five cost management development projects were carried out. One of them was conducted in such a way that it could be included in this research only partially. The project began in 1996 and it had no clear connection with the creation of network A. Hence, four cost management development projects were included in this research as a whole (reported in the articles III – V) and one project only from the results point of view (reported in the article III). Figure 11 illustrates the major milestones in cost management development.

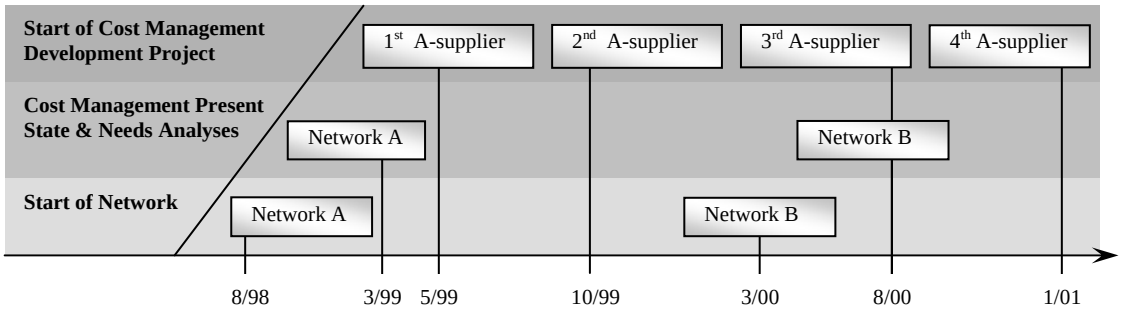

Figure 11. Milestones in the firms' cost management development.

After the present state and needs analyses the firms became involved in cost management development for their own interests. All the participants in network A had a chance to start development of their cost accounting system in 1999, but only four seized the day. In network B, Main Contractor B selected other areas than cost accounting and cost management to be developed and therefore no projects were carried out. On the other hand, network B is younger than network A, which may be a cause of the lighter emphasis on the transparency of cost information.

In the cost management development projects described in this research, ABC was selected as a primary tool for improving the cost accounting of individual firms. The selection was based on three facts:

- The supplier firms that took part in the development of cost accounting and cost management were in need of more accurate product and customer cost.
- The nature of business in these firms was multi–product with large volume variation so that the firm environments were likely to be reminiscent of the descriptions that favor ABC.
- The researchers the participating firms worked with were designing applications of ABC for different accounting environments. Hence, the ABC competencies became available for the firms by giving the researchers an opportunity to use firm environments as implementation cases.

However, the researchers were aware of the weaknesses of ABC. Even if ABC was used in the development of some firms, it was not taken as a ”given” method for cost accounting. The features of the cost accounting applications, systems, and implementations in the case firms are reported in many publications (articles III – V; Anttila et al., 2002; Kulmala & Paranko, 2002; Lyly-Yrjänäinen, 2002; Seppänen et al., 2002; Varis, 2001; Ruohola, 2001; Kulmala & Varis, 2001; Kulmala & Paranko, 2001; Lahikainen & Paranko, 2001; Lyly-Yrjänäinen & Paranko, 2001; Agbejule, 2000; Happonen, 2000; Kulmala et al., 2000; Lahikainen et al., 2000; Lyly-Yrjänäinen et al., 2000; Kulmala, 1999).

In this research, the focus is not on describing the development of accounting methods or applications in detail. The focus is on

- what were the present state and needs of cost management before development efforts were conducted,
- how the cost accounting development happened in the network,
- how the development of cost accounting supported cost management in the network,
- what were the motives, circumstances, and results of the cost management development projects, and
- how the inter–organizational use of cost information changed and supported the networked way of doing business.

Hence, the question of accounting methods was approached from the network perspective just as other questions in this research.

4.3 Research setting

4.3.1 Structure of cost information in a supply network

The cost of a product depends on the direct material and labor used, as well as on the operations inside a firm, allocated as overheads, necessary to produce and sell the product (Burch, 1994, p. 131). In this research, the total cost of a product is based on two elements: material bought outside a firm and operations conducted inside a firm. In other words, direct labor and overhead costs are separated from material cost because they occur inside a firm, while the material cost is a price paid to the material supplier. One of the elements in a firm’s total product cost is therefore the price of material bought. In this sense, outsourced or subcontracted work is also analyzed as direct material cost. The difference between the terms ”cost” and ”price” is that cost is

sacrificed to achieve an object (to produce a product, for example), while price is the amount of money given in exchange for something (to get the ownership of material, for example). In production, the cost usually occurs before a producer can set a price for a product. In practice, many services are priced in the offering phase without knowledge of the cost that will occur.

If there were perfect competition in the market, the price would include all the information about the material, its producer, etc. (Begg et al., 1997, p. 125). However, in the typical market there is either oligopoly or monopolistic competition. Assumptions based on a perfect market are not valid in these cases. Hence, prices hide – from the customer's perspective – the actual costs of the operations conducted at the material supplier's. The costs of the supplier's operations and of the way in which the customer-supplier relationship is managed are not visible to the customer. As a starting point for the empirical analysis, this invisibility of cost information is an underlying assumption in this research.

The illustrative framework of this research is presented in Figure 12. The fictitious network, illustrating both the upstream network model (see Figure 1) and the empirical networks of this research (see Figure 8 and Figure 9), consists of six individual firms. Three of them are suppliers (Suppliers 1, 2, and 3) to the Main Contractor and two of them are subcontractors (Subcontractors 1 and 2) to the three suppliers. The network has the End Customer, but there could be many end customers. All the firms have a cost structure of their own, illustrated by five cost elements and the total product costs under the bottom lines. The arrows between firms describe the supply relations. The arrows are cut in order to illustrate the fact that the buyer firm sees the purchasing price only, while the selling firm may know the cost structure behind the product's selling price.

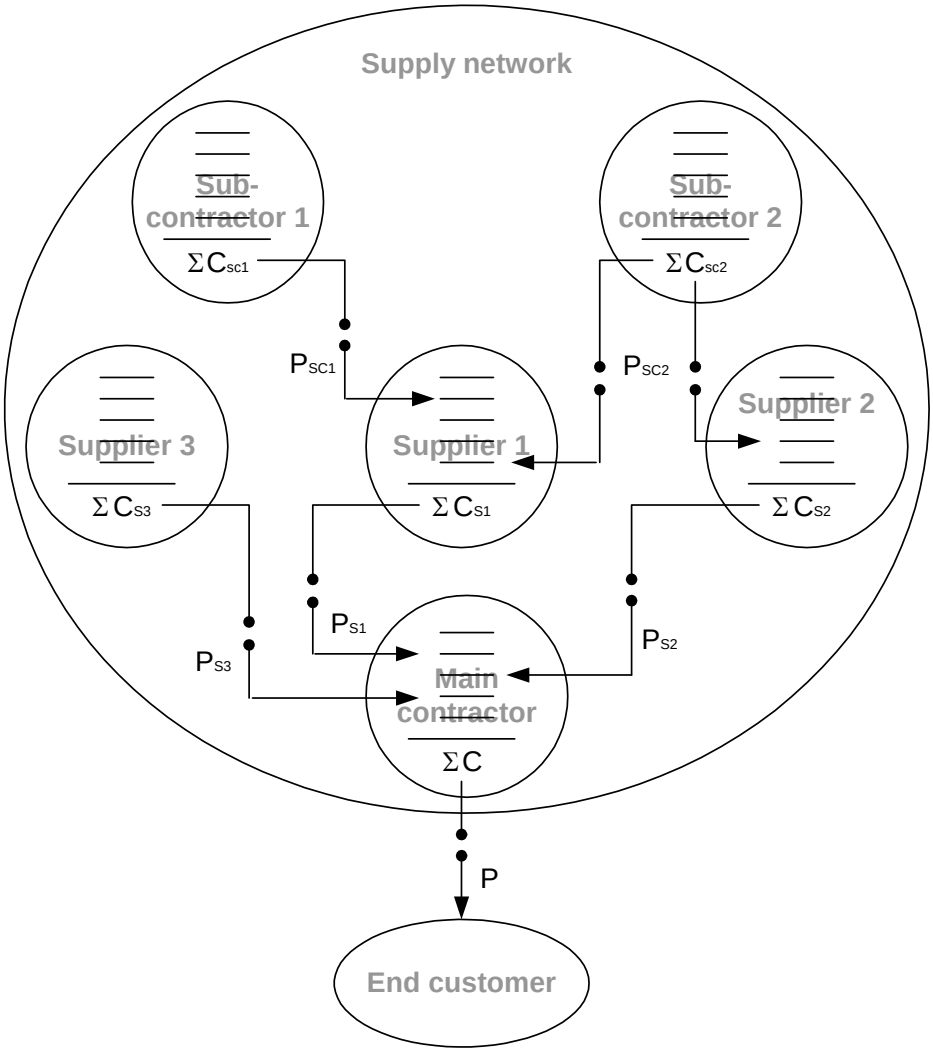

Figure 12. The illustrative framework of the research.

The research setting of this research is built in detail in the article I. The major focus in the article is on OBA and cost information transfer between network firms. However, Figure 12 is what should be kept in mind in the following chapter where specific issues related to critical success factors and open cost information are summarized from the theoretical point of view.

4.3.2 Linking the critical success factors of partnerships with open cost information

The research setting builds on two earlier discussions regarding the factors influencing relationships between firms:

- On the six primary characteristics of partnership success examined by Mohr & Spekman (1994). The characteristics are commitment, trust, coordination, communication quality, participation, and joint problem solving.
- On the relationship between trust and information in relationships, alliances, and networks by Tomkins (2001). The analysis concerning relationships was extended to the network context because networks are formed from configurations of alliances and relationships.

On the other hand, there are at least seven empirical manufacturing industry related case studies on OBA available in the European context: Kulmala et al. (forthcoming, article IV), Axelsson et al. (2002), Seppänen et al. (2002), Mouritsen et al. (2001), Dahlgren et al. (2001), Frimanson & Lind (2000), and Seal et al. (1999). In contrast to the other studies, Axelsson et al. (2002, six case studies in Sweden in the early 1990's) and Seal et al. (1999, a case study in U.K. in the middle 1990's) found no open–book practices at all. As the case studies are from manufacturing industry, they fit within the limitation of this research.

Following the argumentation of Tomkins, it is reasonable to expect that issues that have been considered essential for partnership success are somehow important also in networks. However, Tomkins mentions that networks are more complex than dyadic relationships and alliances (p. 164). The characteristics mentioned by Mohr & Spekman (1994, pp. 137-139, see Chapter 1.1.2) were positively connected with the success of partnerships. Seven other characteristics were also tested, but there was no observation of their connection with the success of partnerships. To build and refine all these characteristics in a relationship, information is needed. The information needed in developing relationships is divided into two groups: information to warrant trust and information to master events collaboratively (Tomkins, 2001, p. 172). The characteristics of Mohr & Spekman emphasize different kinds of information and they are thus, in this study, connected to information groups of Tomkins as follows:

- Commitment and trust emphasize information related to warranting trust.
- Coordination, communication quality, participation, and joint problem solving emphasize information related to mastering events collaboratively.

The research questions concerning the link between OBA and the critical success factors of partnerships (see article I) derive from earlier theories of cost accounting and from the discussions of Mohr & Spekman and Tomkins.

Two issues were analyzed from the trust–warranting information point of view: commitment and trust. First, openness of cost information is typically restricted to customer–supplier relationships. Network–wide openness, so that a firm could have cost information from a firm that has no customer–supplier relationship with it, has not been reported. Hence, the limit for commitment seems to be in the actual placement of purchase orders and the making of payments. This means that there is no evidence on such commitment to a network that could make the members open to all other members in the network. Second, trust is mentioned to be both a requirement for and a consequence of OBA, and empirical evidence on the issue is very limited. Although it is not the purpose of this research, it would have relevancy for practitioners if this research suggested which of the statements could be more relevant or whether they are equally relevant.

Four issues were analyzed from the event–mastering information point of view: coordination, quality of information, participation, and joint problem solving. First, coordination should be noticed as cost reductions. Open–book practices slightly support the interpretation that cost reductions are likely if OBA is applied. However, the cost reductions reported might have been caused by other factors and OBA may be just a means to visualize them. Second, the standardization of accounting methods and systems within networks is almost an unstudied topic. Therefore, the question of

to which extent networks emphasize standardized information should be addressed in this research. Third, the participation issue was approached from the perspective of the inter–organizationality of different accounting situations. OBA has been applied especially when calculating and controlling the efficiency of activities, analyzing product and customer profitability, increasing cost awareness of organizations, and improving production processes. In this research more detailed descriptions on how this has been or can be done are given. Fourth, joint problem solving was supported one–way only: cost information was delivered from suppliers to customers. Furthermore, profitability discussions concerning the trade between firms cover only dyadic relationships, so that network perspectives seem to be neglected in most of the cases. Hence, joint problem solving also seems to lack multilaterality.

In the empirical part of this research, all these issues are addressed. However, the perspectives are different: While the research setting of this research was built around analyzing transparency of cost information between firms, the empirical research concerns a wider scope in cost accounting, i.e. present state, needs, and development. It is important to note that two out of the seven OBA cases were due to the conduction of this research. Hence, some of the six issues analyzed in detail in the article I are not addressed by other studies at all.

5 RESULTS

Most of the empirical results of the research are presented in detail in the articles II – V. On the other hand, a minor part of the detailed data that has been unnecessary for the focus of the articles is analyzed here as original data. Both the published and the original data are summarized here from the development point of view and are thus organized following the idea of Figure 10.

5.1 Present state of networks' cost management

The analysis of both networks was begun with the present state analysis of cost management. The present state analysis was phase 1 of the empirical research, as illustrated in Figure 10. The number of responding suppliers was 12, with seven A-suppliers and five B-suppliers. The supplier representatives were either the owner–managers (small manufacturers) or top managers (medium–sized manufacturers and service firms). The number of responding main contractor representatives (managers of different functions) was 13, with seven from network A and six from network B. Part of the questions in this phase did not relate to a specific main contractor or to a specific supplier.

5.1.1 Situations for using accounting information

Network suppliers were allowed to select how important cost information is in different situations. The results are illustrated in Table 10. The suppliers selected only part of the list (14 situations; see the article I), but added two situations: stocking decisions and reducing costs. The points were given 3–2–1 from the most important to the third most important. As can be seen, many situations were given only a few points.

Situation	Network A	Network B	Total points
Pricing and offer calculation	13	15	28
Product mix selection	8	6	14
Production process selection	3	4	7
Operations development	5	-	5
Stocking decisions	5	-	5
Customer mix selection	3	2	5
Increasing cost awareness within an organization	1	2	3
Make-or-buy and outsourcing decision	2	1	3
Investment decision	2	-	2
Reducing costs	-	1	1

Table 10. Importance of cost information in different situations for suppliers.

It became clear that pricing was the most important situation in which these suppliers needed cost information. This may be due to the low number of customers and the great importance of the price in defining the profit for an annual contract. The importance of product mix selection indicated interest in analyzing products through their profitability. The situations that were not in the theoretical list can be explained as follows: Service firms in network A were interested in utilizing cost information to decide which products and how to stock, and one firm in network B did not have cost

reductions a targets for its operations, but strove rather for cost reductions in occasional projects.

5.1.2 Satisfaction with suppliers' cost information

Satisfaction with suppliers' cost information was requested in relation to seven variables: usefulness in decision–making, scope, presentation form, reliability, availability, topicality, and comprehensibility. The main contractors answered also this question, because their satisfaction with suppliers' cost information is important concerning the inter–organizational use of cost information. Figure 13 illustrates the results.

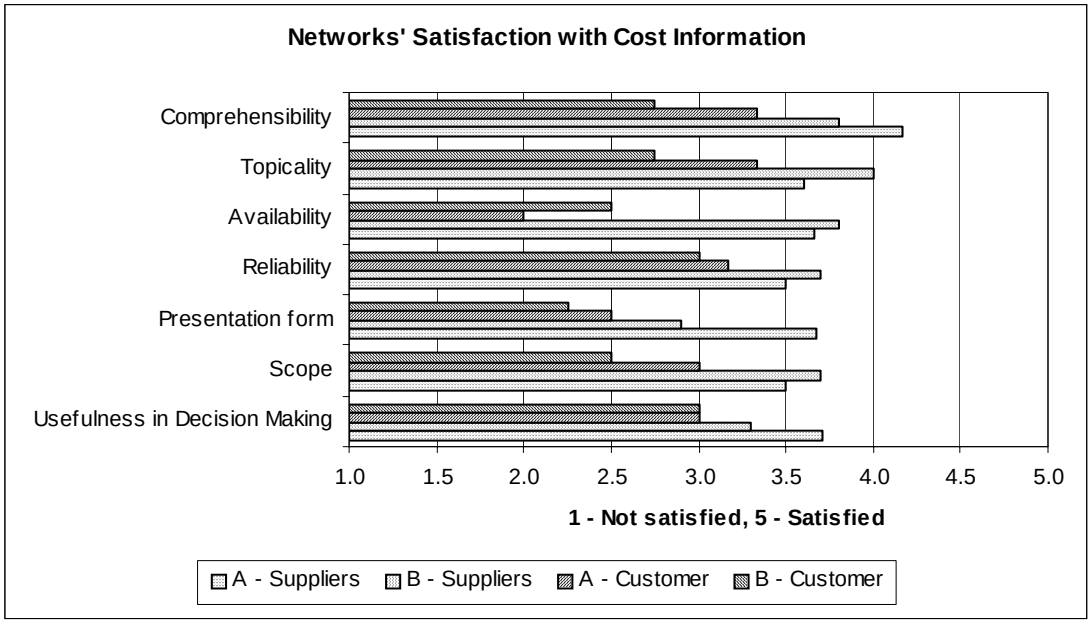

Figure 13. Networks' satisfaction with suppliers' cost information. ("Customer" refers to main contractor)

A major note can be added to the results: suppliers are more satisfied with their cost information than the main contractors are. This may be due to three reasons: Cost information is not shared, the main contractors demand a higher level of information quality than the suppliers, or the information is changed during the transfer. Comparing the cost information transferred before the development projects (see articles II and III) and the main contractors' weakest satisfaction with the availability variable, the first reason is the most likely one. However, the result is not a big surprise because people tend to be more satisfied with themselves than with others.

5.1.3 Tracing of direct costs

The basis for knowing product cost is to know the direct material consumption and work time used for each product. Job order numbers are used to identify different jobs. The use of job order numbers makes it possible to identify direct materials and salaries (labor time) used to manufacture a product. The results are presented in Table 11. The three service firms were not asked for job order numbers and material consumption because their material control was based on purchase and sales orders and on inventories, and direct labor control was not used.

Direct cost knowledge	Network A	Network B	Total
Job order numbers are used	2/5	4/4	6/9
Material consumption is recorded	1/5	2/4	3/9
”Direct cost of products is known in our firm”	5/7	3/5	8/12
Direct cost known (examined by the author)	2/7	2/5	4/12

Table 11. Direct cost tracing at suppliers.

The use of job order numbers was more common than recording material consumption. One of the reasons was that labor time was held to be an important measure for both labor productivity and controlling the labor profitability of different products. In many firms, material consumption was calculated by standards which led to difficulties in cases of quality failures. Although eight firms mentioned that they knew the direct cost well, a couple of deeper questions about the accuracy in the use of bar code system or about the assignment of the work time of a warehouseman, for example, was enough to reveal that direct cost was known accurately only in four firms.

5.1.4 Allocation of indirect costs

Indirect costs were allocated mostly on an ad hoc basis. In network A, one firm used a coefficient for indirect labor costs and the coefficient was determined according to the direct labor hours. One firm added an extra 2.50 €/h and another firm used a 3% coefficient for indirect material costs. In network B, one firm used an indirect material coefficient sometimes, and another firm used machine hour and assembly labor coefficients. All these firms were middle–sized manufacturers.

In other firms, overheads were allocated according to the production volume or the monetary value of production. There were no firms in case networks that systematically used indirect cost or overhead assignment. Most of the firms did not assign indirect material and indirect work to products. Furthermore, many suppliers did not understand the questions on overheads and their allocation or assignment, but stated that overheads are taken into account in pricing. From the analytical point of view, it was not possible to do this accurately.

The basis for knowing product cost accurately was weak. Comparing the situation with earlier studies on Finnish accounting practices (see Table 8), the case suppliers were not using complete job order costing, process costing, or any other accounting method as described in the literature. However, most of these suppliers would have mentioned job order costing if they were responding to a survey.

5.1.5 Cost structure

Suppliers’ cost structure (see Table 12) was analyzed through financial reports and explanations given in interviews. What is important is the difference between the networks. Manufacturers of network A use more external services, a fact which can be related to the type of firm and network size: middle–sized manufacturers of network A have their own supply networks, while manufacturers of network B make more inside their own firms.

	Network A		Network B	
% of total cost	**Manufacturers**	**Service firms**	**Manufacturers**	**Service firms**
Material	44	73	33	83
External services	17	5	7	7
Labor	30	17	47	9
Rents	3	1	4	-
Depreciation	4	1	8	1
Interests	2	1	1	-
Other	-	2	-	-

Table 12. Cost structure of suppliers.

The cost structure of the service firms reveals that component supply and logistics are their business and design services are only a small part of it. The only service firm in network B does not have design function at all. One service firm in network A pays group contribution to the consolidated company. Comparing suppliers' cost structure with earlier studies (see Table 8), the percentage of direct labor is higher and the percentage of material cost is lower. However, the firms that have participated in surveys have been larger. The smaller the firm, the more there is in–house manufacturing compared with purchases.

5.1.6 Discussion with the main contractor

Answers were elicited from the representatives of the main contractors regarding the issues that are on the table when discussing with the suppliers. A total of 13 persons at managerial level in the main contractors' organizations answered the question by selecting as many important discussion topics as were necessary according to their experience. The results are presented in Table 13. The interviews indicated that discussions on influencing cost and on what the current cost level is meant primarily discussion on how to reduce cost. An interesting observation was that both main contractors kept up the discussion on suppliers' cost structure concerning whether the suppliers should own or rent the facilities and machinery. Some of the suppliers included old facilities in cost calculations so that almost no real estate cost existed, and some of the suppliers were located in areas of lower rent than others. In some cases, main contractors even gave mild criticism to suppliers regarding their side businesses that were seen as harmful to the business with the main contractors.

Topic	**Network A (7 respondents)**	**Network B (6 respondents)**	**Total (13 respondents)**
Influencing costs	6	4	10
Current cost level	5	2	7
Cost structure	2	3	5
Target costs	5	-	5
Trends in suppliers' cost	2	3	5
Cost accounting systems	2	2	4
Cost accounting concepts	-	1	1

Table 13. Major topics of discussion between suppliers and main contractors.

Target costing is a topic that polarizes the networks: In network A most of the representatives mentioned TC, but in network B none of them did this. As will be illustrated later, the awareness of Main Contractor B in this area was weak. This also

indicates that the discussion between suppliers and the main contractor depends on the needs and initiations of the main contractor. Cost accounting systems were of special interest in some customer–supplier relationships, mostly due to evident need to improve the suppliers' direct cost registration. Furthermore, theoretical discussion on cost accounting concepts did not exist apart from the argumentation in network B where the service firm did not accept the formula according to which the main contractor intended to calculate the profit of the service firm.

5.1.7 Suppliers' possibilities to influence the main contractor

Answers were also elicited from the representatives of the main contractors regarding the factors on which the suppliers have influence in the eyes of main contractors. The same respondents as with the previous question answered by selecting as many factors as were necessary according to their experience. The results are presented in Table 14. The price and delivery time of end products were recognized as the most important factors on which the suppliers have direct or indirect influence. Direct influence means that the activity of a supplier is part of the end product and indirect influence means that the activity of a supplier causes another activity by a main contractor, which in turn is part of the end product.

Factor	Network A (7 respondents)	Network B (6 respondents)	Total (13 respondents)
End product price	6	5	11
Delivery times	6	5	11
Component selection	7	3	10
Construction changes	5	3	8
Product structure/modules	1	1	2
Operations management	1	-	1
Service of end customers	-	-	-
After sales	-	-	-

Table 14. Supplier–influenced factors.

As can be seen, all the four major factors relate to the management of costs. By lower priced components and efficient operations, by short through–put time, and by suggesting construction changes toward easier assemblies, the suppliers were encouraged to initiate discussion with main contractors. Main contractors felt that they have provided the suppliers with opportunities to influence. Five suppliers in network A and two in network B gave examples of how they had influenced the main contractor in the previous year. However, some suppliers felt that they did not have the best possible opportunities to influence the end product due to a lack of win–win arrangements, as stated by a managing director of an A-supplier:

> *"If we develop or improve something, the main contractor takes most of the benefit"*

5.2 Objectives

The analysis of both networks was continued with the need analysis of cost management. The need analysis was phase 2 of the empirical research as illustrated in Figure 10.

5.2.1 Why to build and maintain a supplier network?

Main contractors' cooperation with network members was designed to be, and it actually was, more intense than with other suppliers, which means that it also calls for more input. Hence, there should be a reason for such input. Representatives of the main contractors were asked about the motives to build and maintain a supplier network. Table 15 summarizes the results. The representatives were allowed to select up to three most important motives. Cost reduction and increasing competitiveness seemed to be the most important motives. However, the motive issue is complex, as the purchasing manager of Main Contractor A stated:

> *"Cost reduction is a practical method to improve competitiveness. I see cost reduction as a tool, not as a motive."*

The interpretation of the results is that the increase in competitiveness is the underlying objective and somehow also an assumption for networking. The other motives mentioned are more or less a practical means to reach this objective. Relying on this interpretation, the practical motive in these networks is primarily cost reduction.

Motive	Main Contractor A	Main Contractor B	Total
To increase competitiveness	5	5	10
To reduce cost	6	4	10
To increase and improve cooperation	2	3	5
To increase openness	1	2	3
To secure stability of business	1	1	2
To know partners better	1	1	2
To increase economic thinking	2	-	2
To standardize concept systems	-	1	1
To improve methodicalness	-	-	-
To select partners	-	-	-

Table 15. Main contractors' motives for networking.

The analysis of firms' motives for joining or taking part in networks can be compared with earlier literature (see Table 7). The major difference between this research and earlier literature is that marketing and technology issues were not at the top in this research; rather the cost–reductive perspective was what ruled the main contractors' thinking. However, increasing competitiveness, development of cooperative operations, and cost savings were in the top–five lists of earlier studies. The development phase of an industry and particular needs of a firm may explain the networking motives to a very large extent. Hence, it is not possible to say whether cost reduction is the most important motive for other firms, even though they are in

mechanical engineering. However, mechanical engineering seems to be a mature line of business, which indicates emphasis on cost efficiency.

5.2.2 Customers for cost information

Who would use the cost information if suppliers gave it to main contractors? A common assumption is that cost information is something for the finance and accounting department and it is provided for external reporting. This research indicates that this is not the case. On the contrary, internal cost information from suppliers appears to be primarily needed for main contractors' purchasing and product design (see Table 16). The representatives of main contractors (13 respondents) selected the three most important functions that would utilize supplier–given cost information and up to three situations in which to utilize it for each function. Once again, all situations on the theoretical list (14 situations; see the article I) were not used, but one was added: supplier selection. The results echo the need for cost reductions that was already illustrated above. Furthermore, many interviewees felt that product design would have a severe impact on the supply chain's cost by taking suppliers' production into account if cost information about production methods were available.

Customer for cost information / Situation for its use	**Purchasing**	**Product design**	**Production**	**Marketing**	**Finance & accounting**	**After sales**	**Total**
Reducing costs	11	8	4	2			25
Increasing cost awareness within an organization	5	6	2	4			17
Product development decisions	2	8		5			15
Pricing and offer calculation	5			3		1	8
Supplier selection	8						8
Production process selection	1	1	5				7
Make-or-buy and outsourcing decision	2		4				6
Benchmarking	2	2		1			5
Product mix selection		2		1		1	4
Investment decision		1	3				4
Cost center control					2		2
Stocking decisions						1	1
Customer mix selection				1			1
Budgeting					1		1
Total by function	36	28	18	17	3	3	105

Table 16. Customers for cost information by functions.

If one compares the results with the supplier side needs (see Table 10), one notices that there are differences. First, cost reductions were considered important by only one supplier representative, while almost two thirds (25/39) of the opinions on the main contractor side emphasize them. Hence, the cost pressure in these networks derives clearly from the experiences of main contractors. Second, pricing and offer calculation is not as important on the main contractor side as it is on the supplier side. This may be due to the more advanced accounting systems and the longer period of analyzing the end product markets and market prices, which create guidelines for prices independently of the main contractor's cost. Furthermore, suppliers have to do offer calculations more often due to small batch sizes and changes in delivery

parameters. Third, product development is at the top of the main contractors' list, both as a function and as an accounting situation, but the suppliers do not have this function to such a degree that it would be considered an important user of cost information.

From this research and especially from the cost management development point of view, a note on the results is important: None of the network B representatives mentioned partner selection as a motive for networking (see Chapter 5.2.1). However, six out of those eight who were willing to select suppliers after seeing their cost information, were from Main Contractor B (see Table 16). Hence, the intended situations for the use of cost information clearly indicate willingness to select partners according to the open cost information gained through networking. This is a minor controversy in the answers of the representatives of Main Contractor B. The controversy may be due to misunderstanding the questions or to the milestones of network development. The latter is the more likely explanation because Main Contractor B representatives had selected network B suppliers once, and at the time of the present state and needs analyses they were continuously analyzing a new appropriate supplier base for the network. Hence, the original motives that they stated in the motive question related to the earlier situation and in this question of how to use cost information they were thinking about the future.

5.2.3 Importance of competitive factors

Main contractors were asked to place in order of importance for them suppliers' delivery time, quality, price, and delivery accuracy. The order was the same in both networks: Good delivery accuracy, high quality, low price, and short delivery time. Even if the cost reduction was very important both as a motive for building a supplier network and as a situation in which to utilize suppliers' cost information, low price was ranked third on the list. Regardless of experienced cost pressures, delivery accuracy and quality were assessed as more important factors in creating a supplier profile. However, these issues increase the end product's cost if they are on a weak basis.

5.2.4 Influencing suppliers

Answers were elicited regarding the main contractors' influence on the suppliers' accounting through four issues:

- What is the figure, price or profit, in a supplier's product–based calculation that the main contractors want to control?
- What is the style in which this figure should be examined?
- In which phase of production should the intervention be made?
- Which of the suppliers' economic figures matters the most?

The results of the first three questions are illustrated in Table 17. The first issue was clear; almost all the respondents wanted to control the price[4] of suppliers. Only one representative of Main Contractor A wanted to control the profit, indicating that s/he

[4] In this context, price is what the main contractor pays to the supplier for a specific subassembly, component, or service. The price is not the suppliers' price level in general. The same logic holds for the profit side.

wanted to fix prices so that the main contractor would not be the most profitable customer for suppliers.

Statement	Main Contractor A	Main Contractor B	Total
We want to control suppliers' price	6	6	12
We want to control suppliers' profit	1	0	1
We want a kind of right to audit suppliers	5	2	7
We want to see preliminary cost calculations	1	2	3
We want to see actual cost calculations	6	2	8

Table 17. How main contractors wanted to influence suppliers' accounting.

In network A, the main contractor was very eager to reserve a right for its representatives to audit suppliers' product cost calculations and even book–keeping. This was not the common will in network B. The reasons for such a desire were mentioned to be the weak understanding of cost accounting on the supplier side, the need to create a trustworthy basis for cost–based pricing and win–win arrangements, and the possibility to identify cost reduction potential. What explains the differences between networks could be the interest in TC. As discussion of TC was common in network A, it is natural that the initiator, Main Contractor A, wants to analyze suppliers' cost structure in depth. This, in turn, creates pressure to see everything about costs. On the other hand, TC was not a discussion topic in network B, which may explain why there was no eagerness to audit the suppliers. It should be noted that six interviewees were skeptical of the possibility of access to the figures of independent firms and did not answer "yes" to this question.

The stage where an intervention is made in the suppliers' cost calculations could be before or after a product or service is delivered. Main contractors were more interested in seeing the actual cost calculations than the preliminary ones. Actual calculations were considered more accurate and almost no preliminary calculations existed. On the other hand, some of the interviewees felt that preliminary intervention is the only way to make changes in the suppliers' production and thereby reduce cost. Two representatives did not answer this question.

The fourth perspective regarding the main contractor's influence on the suppliers was gained through analyzing how important a supplier's economic figures were in the eyes of main contractors when making decisions. The decisions made by main contractors explain to a high degree for example stocking and production flow at suppliers'. Table 18 illustrates the results. The representatives were asked to give points for each of the figures on a scale of 1 to 5.

Suppliers' economic figure (Scale 1 – no interest, 5 – high interest)	Main Contractor A	Main Contractor B	Total
Direct cost	4.6	4.6	4.6
Profitability	4.3	4.8	4.5
Capital turnover	3.3	3.9	3.6
Liquidity	2.7	3.5	3.0
Solidity	2.3	3.2	2.7

Table 18. Main contractors' interest in suppliers' economic figures.

As can be noted, direct cost holds the pole position just before profitability figures. In the long run, suppliers' profitability was important for main contractors in order to guarantee stability in doing business with them. The continuity of the relationships is based perhaps more than anything else on the economic success, i.e. profitability, of the participants. Hence, problems regarding liquidity and solidity, for example, might be easier to stand and solve than ones regarding profitability. Furthermore, the fact that the customer–supplier relationships had lasted for several years might have led to the situation in which the liquidity and solidity of suppliers is at a "sufficient" or "normal" level, so that they do not cause any concerns at the main contractors'.

The question of what measures are used for profitability emerged during the research. A connection with the promoted measure and the cost structure of the suppliers was found: The more interest and depreciation cost a firm had, the more it was interested in measuring profitability with return on investment (ROI) or return on equity (ROE). On the other hand, main contractors seemed to underestimate the significance of suppliers' capital costs. They were primarily interested in the absolute profitability of each sales transaction or each year. This may be due to main contractors' thinking that suppliers' other customers should also participate in amortizing capital costs. From the network perspective, selecting of how profitability is measured is very important because the network members operate with different cost structures. Main contractors' policy in profitability negotiations may favor either suppliers' operating with their own equipment or suppliers' operating with leased equipment. Hence, here networks face a decision on fair and versatile profitability measurement. This decision may depend, to a high degree, on purchasers and on how they understand win-win from the perspective of suppliers' ROI or ROE.

5.2.5 Perspectives on cost

The perspective from which costs are analyzed may determine how accounting systems are developed. Therefore, it was necessary to elicit the opinions of main contractors' representatives on the issues. They were allowed to select up to five most important perspectives on the costs of an end product. The results are presented in Table 19. Interest in total product cost of the supply chain and in what the cost is when the product is ready at the main contractor's indicates clear orientation toward managing the cost accumulation of the supply chain.

Perspectives on product cost	Main Contractor A	Main Contractor B	Total
Total cost of the supply chain	7	6	13
Total cost at main contractor's	7	5	12
Direct and indirect manufacturing cost	6	2	8
Total cost at supplier's	4	3	7
Cost of functions' (purchasing, etc.)	4	2	6
Direct manufacturing cost	1	2	3
Life cycle cost	3	-	3
Environmental cost	-	-	-

Table 19. Importance of different perspectives on product cost.

The low interest in direct manufacturing cost can be explained by the fact that many main contractor representatives take them for granted because this is the best that is available at the moment. On the basis of these results, it is unrealistic to believe that

LCC or environmental accounting will play an important role in networks in the near future. However, external pressure in the form of legislation, acts of government, and changes in the after sales markets may change these attitudes.

5.2.6 Suppliers' objectives

The suppliers' objectives in the inter–organizational use of cost information were linked to three issues. First, the power of main contractors was considered so strong that most of the suppliers felt that they had to share some of the information in order to stay as members in the network. The membership was important at least because of the sales volume. When some openness was considered a necessity, a system for fair sharing of profits gained by joined development was needed. Second, the information that was to be shared was desired to be limited and controlled by suppliers. For example, the eagerness of Main Contractor A in auditing its suppliers was considered as too strong behavior. Third, the main contractor was expected to help in developing suppliers' accounting systems. Most of the suppliers felt that the main contractor had more advanced knowledge of cost accounting. Furthermore, suppliers felt that organizing external resources, i.e. researchers and consultants, was a responsibility of the main contractor.

5.3 Development

5.3.1 Development – filling the gap between present state and needs

A comparison of main contractors' and suppliers' needs in cost management produces the hatched area of phase 2 in Figure 10. This consists mainly of four issues:

1. Both the suppliers and main contractors think that cost management in networks would be better organized if the suppliers' cost accounting systems produced relevant, accurate, and useful cost information. The same information would be of special interest for suppliers in pricing and for main contractors in purchasing and in product design.
2. Main contractors and most of the suppliers think that at least part of the suppliers' cost information should be shared with the main contractor in order to satisfy the main contractor's wishes and in this way improve the competitive position of a supplier, to implement the transparency of the cost accumulation in the supply chain as a whole and in this way find lower cost solutions, or to get the main contractor involved in developing a supplier's cost accounting systems.
3. Many of the participating firms felt that fairness should be considered if cost information is shared between the parties. There could be many ways to ensure fairness, which was experienced as a need to build win–win solutions into the customer–supplier relationships. The attitudes indicate that win–win might be on the one hand a prerequisite for cost information sharing and on the other hand win–win might call for cost information in order to be fairly implemented.
4. Cost reductions were strongly emphasized, which indicates a specific need to apply the TC approach. However, no practices emerged.

Description of the development of the accounting systems in the network firms covers all the five cases in network A. As described in Chapter 4.2.3, four cost management development projects were carried out during this research (suppliers 1 – 4) and one was started before the research (5th, MSM2). In this chapter, the projects are approached from the perspectives of the four issues that were mentioned to be the most actual needs: ABC implementations, open–book practices, win–win implementations, and TC. Furthermore, the multilateral perspective on cost information in networks is covered in order to compare the illustrative and theoretical framework of Figure 12 with the empirical practices.

5.3.2 ABC implementations

Five ABC implementations were carried out in network A. All the projects resulted in launching ABC at the supplier's. Table 20 summarizes the ABC implementations. Few important notes on the projects and their results are necessary. First, the larger the supplier the more detailed the ABC system that was implemented. Hence, the question of firm size and its effect on the accounting systems in this research was in line with earlier theories. Second, the motives for implementing ABC, the major benefits, and the use of the systems varied a lot between the suppliers. Hence, the firm–specific needs are what matters in the implementations. Third, none of the implementers was disappointed with the experiences from the implementation. This indicates that ABC implementation, even if it is not carried out as suggested by theories, helps management in one way or another. The benefits seem to relate mostly to improved cost and profitability information. Fourth, only in two out of the five cases was ABC implemented with minor changes compared with theoretical ABC. A reason for this may be scarce resources. As the CFO of the 5th supplier stated:

> *"The ABC system is not used in our factory as it should be in the sense of strictly following the theoretical approach. We do not have, and cannot hire, a dedicated person for updating and maintaining the ABC system, which would be needed. Therefore we gave up in the number of drivers and in the period of updating."*

Fifth, five out of eight network A members took initiatives in ABC implementations. This quite high percentage may have been a result of the customer's recommendations and suggestions to improve cost accounting, the continuous communication between the network and cost accounting researchers, and government–subvented funding for the development of the network.

System features	1st (MSM1)	2nd (SC2)	3rd (SC3)	4th (SC1)	5th (MSM2)
Main driver for building ABC system	Need for accurate product and customer cost	Need to improve pricing	Need to show cost efficiency to the main contractor	No specified need	CFO's curiosity to know customer–specific cost
System scope	All the products	10 sample products from four-category product portfolio	The service of one product group to the main contractor's facility	The service of product groups to the main contractor's facility	All the customers
System type	Updated monthly	One–time calculation	One–time calculation	One–time calculation	Updated quarterly
Features of theoretical ABC system	All, except continuous driver definition	Process modeling	Principles of indirect cost and overhead assignment	Principles of indirect cost assignment	All, except the low number of drivers
Costs included in the system	All	One business area, no overheads	One facility, indirect cost and overheads	One facility, no overheads	All
Customer–specific profitability	Known	Three sample products	One customer, one product group	One customer	Known
Major benefit for the supplier	Accurate assignment of indirect cost	Understanding of the relations between product cost structure and product classification	Understanding of the relation between batch size and customer profitability	Under-standing of the "whale curve" effect between products	Accurate knowledge of customer profitability
Use	Used in most of the economic decisions	Sales personnel estimates costs when offering a product or subassembly	Product and service cost is shown to customers in order to show cost efficiency	What if – analyses, decisions on batch sizes	Customer profitability analysis and control
Time	1999-2001	1999-2000	2000	2000-2001	1996-1999
Documented and reported (Articles of this research excluded)	Anttila et al., 2002; Kulmala & Paranko, 2002; Seppänen et al., 2002; Ruohola, 2001; Lahikainen & Paranko, 2001; Happonen, 2000; Kulmala et al., 2000; Lahikainen et al., 2000; Kulmala, 1999	Anttila et al., 2002; Kulmala & Paranko, 2002; Lyly-Yrjänäinen, 2002; Seppänen et al., 2002; Lyly-Yrjänäinen & Paranko, 2001; Lyly-Yrjänäinen et al., 2000; Kulmala, 1999	Anttila et al., 2002; Kulmala & Paranko, 2002; Seppänen et al., 2002; Varis, 2001	Seppänen et al., 2002; Varis, 2001	Agbejule, 2000

Table 20. ABC implementations in network A.

No changes were made to the cost accounting of small suppliers (small 1, small 2, and small 3). However, many issues related to cost information and cost accounting were discussed due to the development efforts. These discussions have had a significant

role in the improvements gained. Table 21 summarizes the major changes in cost accounting and improvements gained.

Issue	**1st (MSM1)**	**2nd (SC2)**	**3rd (SC3)**	**4th (SC1)**	**5th (MSM2)**
Direct cost knowledge	Ok already in 1999	Gained	Gained	Gained	Ok already in 1999
Indirect cost assignment	ABC	Calculated once	Calculated once	Calculated once	ABC
New measure-ment for indirect cost	Work–time registration (blue-collar) and personnel estimates (white-collar)	Personnel estimates and interviews	Personnel estimates and interviews	Personnel estimates and interviews	Follow–up study with personnel estimates and interviews
New solutions of accounting problems	Replacement cost replaced purchasing prices in *valuation*. Estimated life–time replaced statutory depreciation times, and measured resource time replaced estimated in *assignment.*	*Problem of scope* solved innovatively by taking the cumulative life cycle revenues and costs of customers into account.			*Assignment* according to the principles of ABC, driver measure-ment instead of former estimates
Problems unsolved		*Measurement problem* inadequately solved (registration system defective)	No steady solutions to accounting problems	No steady solutions to accounting problems	

Table 21. Improvements in suppliers' cost accounting.

The major changes (compared with the old accounting systems) concerning the accounting problems occurred in the projects of the 1st and the 2nd suppliers. There were new approaches in the one–time calculations of the 3rd and the 4th supplier (for example in the assignment of real estate and administration costs, in the depreciation times used, and in the working time measurement). However, these changes were not permanent because no new accounting systems were implemented. Furthermore, in the 5th case, no other changes were made but the assigment was changed to follow the principles of ABC.

In all the case firms, the results of new cost accounting were compared with the results of the earlier accounting system. In the 5th case, almost no change was observed in the results. The CFO of the 5th supplier mentioned:

> *"Now we have scientifically proved that our earlier knowledge on the business and its profitability was good."*

In four other cases the results led either to big or small surprises. The biggest surprises in all service firms (SC1, SC2, SC3) came through two issues (Seppänen et al., 2002; Varis, 2001): The cost of tied–up capital was much less than the management assumed, and the effect of batch sizes on the customer profitability was very significant. These observations also led to changes in the behavior of these suppliers.

Today, they pay more attention to the pricing instead of to stock minimization and maximization of warehouse turnover rate. Furthermore, they have also negotiated larger batch sizes and less replenishment per month with the customer. Finally, as illustrated in the article IV, there were big differences in the product profitability in the case of the 1st supplier. However, in this case the supplier's representatives mentioned very early in the present state analysis that they expect their old system to produce biased product costs. Hence, the surprises were expected but no clear ideas of their direction and dimension existed.

5.3.3 Open–book practices

Two open–book practices emerged in network A during the research. The first practice was a dyadic OBA case based on the ABC implementation of the 1st supplier and the cost information needs of the Main Contractor. In this case, the 1st supplier provided Main Contractor A with the same cost data as it has on the products that are sold to the Main Contractor. The case is described in detail in the articles III – V. The second practice was based on a potential change in the competitive position of the 3rd supplier. By opening the books this supplier had a possibility to increase sales. The case was multilateral so that the 3rd supplier opened its cost information concerning one product group to five of its customers, some of them also being members of network A. This case is reported in the articles III and V.

The open–book practices in this research had five evident similarities:

- Opened cost information was based on ABC
- Openness was limited to firm/s buying from a particular supplier
- Customer/s had an important role in motivating the supplier to open books
- The result of the openness was increased sales to the supplier
- The parties involved in the open–book practice feel the process fair and beneficial and they are going to use it in the future as well

Three major differences in the practices emerged:

- The first case was dyadic while the second case was multilateral
- Openness in the first case covered all the costs of all the supplier's products to the customer while in the second case only some of the cost elements of one product group and a closely related service was covered
- In the first case, the supplier considers openness with one customer as a way to do long–term business, while the supplier of the second case would like to open books to any customer if the requirement of increasing sales in the short–term were met.

Comparing the two cases with the research setting (see Figure 12), full–scale openness in network A was not reached. In the case of the 1st supplier, a dyadic practice occurred and one of the invisible cost information walls between Main Contractor and the Supplier levels was brought down. In the case of the 3rd supplier, many invisible walls were torn down, but only in the upstream supply chain direction from the Subcontractor level to the Suppliers and to the Main Contractor. No parallel openness with the Subcontractor level was obtained.

5.3.4 Win–win

Measurement of and striving for win–win was approached in the same two cases in which openness was reached. However, "win–win" as a label was mentioned only in the first case. The procedure of implementing win–win in the first case took two years (1999-2001) and was conducted as follows:

1. The supplier's cost accounting was developed so that accurate ABC-information in product cost and profitability was available.
2. The supplier and the customer made an agreement on the principles according to which the cost of suppliers in the trade between these partners is accounted (the depreciation methods and assignment principles, for example, were agreed).
3. The supplier and the customer made an agreement on the principles according to which the profitability (supplier's perspective) in the trade between these partners is measured and what the target values for these measures are.
4. The supplier gave the same cost information to the customer as they had.
5. The profitability differences between different products sold to the customer were first agreed to remain unbalanced. They were later slightly balanced so that none of the products would be unprofitable, and the customer would gain price reduction for a product that was extremely profitable.

The supplier's sales volume to this customer increased smoothly (from 25% in 1998 to 35% in 2002, measured as the customer's purchases of the supplier's total sales on average). The parties talk about this procedure as a win–win procedure. Furthermore, the biggest cost savings emerged in the product that was jointly developed.

Win–win in the second case was reached in four months (year 2000) by a completely different procedure:

1. The customer demanded the supplier to reduce the prices by 20%.
2. The customer provided the supplier with an incentive: if cost reductions are proved, some of the largest network members will buy a product group and a related service from the supplier.
3. The supplier's cost was accounted with the ABC method.
4. Slight reorganization was made in the supplier's process in order to reduce cost.
5. The calculated cost was introduced to the network members in a multilateral gathering.
6. The network members agreed to shift purchases of the product group to this supplier.

The network members were not ready to shift their purchases immediately. However, in fall 2001 the agreement was reached to such a degree that all the firms committed to it had shifted some or all their purchases of this product to the 3rd supplier.

5.3.5 Target costing and inter–organizational cost management

The primary objective for both main contractors was to increase competitiveness by reducing total costs of the network. This indicates that the main contractors consider themselves responsible for managing the total accumulation of cost. The studied networks fulfill the prerequisite of decreasing end product price in the framework of Cooper & Slagmulder (1999b). It should be noted that the framework is TC–

dominated. When the requirements of the framework (see the article III and Table 22) were expressed to the main contractors, they tended to see their actions as more positive than the authors did. This means that the main contractors claimed to act in a certain way, but it was obvious that their opinions were not objective. For example, the purchasing manager of Main Contractor A said that in negotiations they always take into account the suppliers' profitability, but the triangulation from the supplier side revealed that the issue is not that simple. First, there was no common agreement on how this concern would or should be seen, and second, the measurement of profitability had been on a weak basis, as was illustrated earlier. Table 22 illustrates the current situation, not only main contractors' opinions, in the networks' inter–organizational cost management practices.

Requirement[5]	**Network A**	**Network B**
1. The firm sets specific cost–reduction objectives for suppliers.	True	Partly true
2. The firm helps its customers and/or supplier find ways to achieve their cost–reduction objectives.	True	Partly true
3. The firm takes into account the profitability of its suppliers when negotiating component pricing with them.	Partly true	False
4. The firm is continuously making its buyer–supplier interfaces more efficient.	Partly true	False

Table 22. The requirements for inter–organizational cost management and networks' positions as regards them.

Main Contractor A met partly all the four requirements. The main contractor had set specific cost-reduction objectives for suppliers (3% to 15% depending on the product group). Main Contractor A helped all the suppliers to achieve these objectives, but the emphasis was on certain suppliers. Five suppliers had advanced significantly in developing cost accounting systems and cost management practices. Main Contractor A took part in win–win negotiations in order to ensure the profitability of suppliers. Two open–book practices had been completed. In the first one the main contractor and the 1st A-supplier defined profitability measures for the relationship and agreed on the target values for these measures. In the second one the 3rd A-supplier showed 20% cost reduction of a product group, which led the main contractor to recommend that this supplier should serve the whole network. Some practices to make buyer-supplier interfaces more efficient exist for example in the area of information and communication infrastructure. Despite three A–suppliers that have not been willing to follow the five pioneers, Main Contractor A seems to be driving the fast lane toward inter–organizational cost management.

Main Contractor B met two of the requirements partly. The main contractor set general cost-reduction objectives for suppliers. The objectives were mentioned generally as one of Main Contractor B representative stated:

> *"The price for us should decrease 2-5% annually."*

5 Requirements marked "True" are met in all customer–supplier relationships of the network, those marked "Partly true" are met in some of the customer–supplier relationships of the network, and those marked "False" are not met in any of the customer–supplier relationships of the network

There were no specific cost–reduction objectives. As mentioned earlier, there was no discussion of target costs in network B. Main Contractor B helped one of the suppliers to design lower–cost subassemblies. The main contractor mainly expected suppliers to independently achieve cost savings in production and logistics. The expectations were not based on accurate product costs but on the total amount of costs. There were no procedures that could indicate that the main contractor takes into account suppliers' profitability in price negotiations. However, some of the main contractor representatives mentioned that they are interested in being profitable customers. As far as customer–supplier interface efficiency is concerned, there were no continuous and systematic methods for developing the interfaces. Hence, Main Contractor B has a long way to go to inter–organizational cost management.

5.3.6 Multilaterality

The issues of network–wide cost management raised in the article I (boundaries of cost information openness, relation of trust and cost information openness, coordination of end product's cost accumulation, quality of cost information in the sense of improving communication and standardizing member firms' cost accounting, participation of management accounting in accounting situations that are inter–organizational by nature, and joint problem solving with the help of shared cost information) are of special importance on the road toward cost accounting in networks. The empirical evidence in this research indicates that firms are rather far from multilateral consideration of these issues. General discussions at the multilateral level exist and one early step toward multilateral actions occurred as well (3rd A–supplier), but most of the practices seemed to consider either a firm (2nd, 4th and 5th A–suppliers) or a customer–supplier relationship (1st A–supplier). Hence, the dyadic step seems to be easier to take than the multilateral step.

Multilaterally shared cost information occurred in two cases in this research. First, the 3rd supplier opened its books to many customers. Such a procedure or result has not been reported in earlier network–wide management accounting studies (Dahlgren et al., 2001; Frimanson & Lind, 2000). Second, network A began to purchase painting material jointly (Mikkola 2002). The joint purchase procedure that led to 15% savings in painting material cost in network A, called for revealing suppliers' purchase prices and contracts to each other and to the main contractor. However, in the joint purchase case, no detailed cost information analysis was conducted. The procedure was primarily conducted by the managing director of the Small A, which refers to the quasi–firm style of management (see Hyötyläinen, 2000; Räsänen & Koivisto, 2000; Hyötyläinen & Simons, 1998; Dubois & Håkansson, 1997; Kuivanen & Hyötyläinen, 1997; Lamming, 1993; Jarillo, 1988) in network A.

This research offers evidence of the non–importance of standardizing the cost accounting systems in networks. To manage network cost accumulation, no expressed or hidden need to create network–wide standardized accounting systems was identified. The major needs of main contractors emphasized the amount and quality of suppliers' cost information, not the way the information is produced. The only context in which standardization was considered important were the concepts. Networks could benefit from standardized definitions for certain concepts in order, for example, to avoid arguing about depreciation methods instead of analyzing the reasons for product profitability. Empirical evidence from the networks does not speak for standardizing

or consolidating the cost accounting systems of network members. Hence, this research supports the earlier statements of Dahlgren et al. (2001) and Tomkins (2001). However, at the same time the results are in line with Holmberg (2000), because the network firms are primarily oriented toward measuring costs across the whole supply chain, not only in individual firms. This indicates that the issues of which entity to measure and how to measure could be separately approached in networks.

Although the detailed cost information of suppliers was not revealed to the Main Contractor in most of the cases, the consequences of different actions were discussed. Two examples of the results of these discussions are the joint purchase of materials, which required open analysis of purchasing contracts and purchase prices (see article III, Anttila et al., 2002, Mikkola, 2002), and the change in batch sizes of the deliveries of the service firms (see Anttila et al., 2002; Seppänen et al., 2002, Varis, 2001). Both of these acts led to cost reductions, which convinced the participating firms that the procedure applied was beneficial. However, willingness to cooperate in network–wide openness, involving detailed cost information of firms, was only limited.

5.4 Customer–supplier relationship as a determinant of progress

This chapter is based on the article V, which concentrates on analyzing customer–supplier relationships and their management in the light of inter–organizational development of cost management. In this sense, a detailed case study of three of the cost management development projects and customer–supplier relationships in network A was carried out (1st, 2nd, and 3rd A–suppliers). The results of the projects were presented also in the previous chapter.

Comparing the cases with cost management literature, the multilateral openness attained in case 3 is uncommon. Most of the cases reported relate to dyadic practices (Cooper & Slagmulder, 1999b; Mouritsen et al., 2001). The one–way openness in cases 1 and 3 illustrates the problem of imbalance of power: Cost information shared only one–way may whittle away confidence at the supplier's and lead to conditional openness. Conditional openness may not be the most suitable approach in strategic partnerships. OBA was achieved in two out of three customer–supplier relationships studied. The effect of the main contractor's attitude and power was significant, because the main contractor did not show any openness regarding its own cost information. These cases lengthen the list of the many one–way open–book practices (Seal et al., 1999; Mouritsen et al., 2001), which reinforces the argument of Stuart et al. (1998, p. 84) according to which

> *"… the tiered supplier partnership model clearly focuses on benefiting the buyer."*

This study brings in evidence of benefit also for the suppliers in the spirit of Ellram's (1995) functionality statement. In the cases 1 and 3 there was a win-win situation. Case 1 emphasizes the importance of inter–organizational process assessment and win-win solutions in the strategic relationship category. On the other hand, the strategic supplier 2 was not involved in any open–book procedure due to the main contractor's weak power over this supplier. Another explanation could be that the main contractor could not create a sufficiently attractive win–win solution for the

supplier 2 to participate. In case 3, the nature of process assessment was mainly benchmarking on the main contractor's side. The win–win solution was based only on increasing volume, compared with the product mix profitability analysis in case 1.

Case 2 seems to be a normal cost–efficiency improvement project using ABC; inter–organizationality does not substantially appear in cost information use. Many of the experienced development results could have been reached in normal intra–firm cost accounting development projects without the inter–organizational approach.

The analysis of customer–supplier relationships revealed features that explain to a large extent the reasons for the results of cost management development projects. In case 1, the supplier's cost information became open and modern cost accounting techniques were used. The most important driver for the results was the supplier's continuous improvement capability and the parties' commitment to long–term cooperation. In case 2, the supplier hid its improved cost information from the main contractor. Recent history revealed that the supplier was a bit disappointed with the behavior of the main contractor. Hence, trust in the customer–supplier relationship was not sufficient for the supplier to share cost information. Furthermore, the supplier had much power in technology issues and the main contractor accounted only for 7% of the annual sales. In case 3, the openness of the supplier's cost information was expanded to the whole network. The main reason for this was the sales increase promised to the primarily short–term and trade–oriented facility manager.

Three suppliers in the network took a totally different approach for cost management development with the main contractor even if the main contractor's initial goals were the same with all suppliers. In addition, the supplier of case 1 was one of the customers of the supplier in case 3, and responsible for part of the volume increase for this supplier. Hence, it is reasonable to believe that the network approach to customer–supplier relationships (Håkansson & Snehota, 1989; Anderson et al., 1994; Dubois & Pedersen, 2002) is appropriate also for cost management development analysis, instead of the use of a single purchasing portfolio.

On the basis of empirical cases, there seems to be a need to consider the nature of customer–supplier relationships in cost management development. In the cost management development projects, the main contractor selected important suppliers to be pioneers in cost management development. Process assessment in case 1 followed the idea of joint process assessment (Ellram, 1996) in strategic partnerships. Balance of power and trust did not prevail in case 2. This and the lack of direct win–win situation explains to a large extent the supplier's unwillingness toward openness. Because substitution is rather easy in the leverage relationship category, benchmarking could help in managing these purchases. Low unit cost was of great importance for the main contractor in this category (case 3).

Major differences in the case studies were explained by the nature and characteristics of each relationship. Cost information transfer and utilization depended on the balance of power between firms, on the trust between personnel, on the volume of firms' mutual business, and on the quality of suppliers' cost information. Although this could have been seen beforehand because all the issues mentioned have been described to influence the nature of customer–supplier relationships (Virolainen, 1998; Mohr & Spekman, 1994; Porter, 1980), the new finding was that a customer can

proceed with the objectives if an appropriate approach and incentives are applied with different suppliers.

The selection of the customer's point of view for the cost reduction was supported by the case evidence, according to which inter–organizational cost management seems to be the customer's responsibility: the customer carries mostly the burden of cost accumulation in the supply chain. The nature of customer–supplier relationships should be considered when setting goals for inter–organizational cost management development. Because cost management tool selection depends on the purpose of and the possibilities for the use of cost information, it is necessary to select which suppliers to involve in TC projects, for example, and which not.

At least five issues limit the generalization of the results of this particular study (article V): First, the relationships studied belong to the same network. The effect of a single customer on objectives and results might be severe. Second, the features of the theoretical frameworks were not put in priority order. Relationships might be completely different if this priority order were established and communicated to the interviewees. Third, the study was carried out in manufacturing industry. Cost pressure in today's manufacturing makes it important for almost all firms to develop cost awareness. Fourth, a specific accounting situation may demand a certain focus in the use of cost information regardless of a customer–supplier relationship's nature. Fifth, in line with Dubois & Pedersen (2002), this study represents a critical and also limitedly studied approach of not recommending purchasing portfolios for all purchasing-related connections, such as inter–organizational cost management, for example.

6 CONCLUSIONS AND DISCUSSION

6.1 Synthesis of the doctrine

The synthesis of earlier literature is built on connecting cost management and its role in supply chain management, especially in networks. The creation of networks in the manufacturing industry is a result of convergent or divergent networking processes, or of both of these. In this research, the case networks were experiencing the convergent phase. The evolution of subcontracting through concentration on core competencies and the decreasing number of customer–supplier relationships have led the paradigm of competition to slide toward competition between networks instead of competition only between individual firms. This has created a need to classify and analyze networks from the managerial perspective in order to find the most efficient procedures for management of different types of networks.

What is needed in networks can be estimated through customer–supplier relationships, which are the building blocks of networks. The critical success factors include commitment, trust, participation, joint problem solving, coordination, information sharing, and shared values. Furthermore, the way in which win–win is implemented may have a severe impact on the success of partnerships and networks. The motives for joining a network are typical motives for doing any business, but they reflect a desire to increase the speed of business development. Helping to implement technological and marketing–related possibilities faster and more cost efficiently than by creating these by oneself describes the role of networks. Information sharing and open communication are requirements for multilateral network management and development. These facts call for a quasi–firm approach to network management. However, characteristics of quasi–firm and runner–managed approaches may be present in all networks. Whatever the managerial approach to a network is, without multilaterality the benefits of efficiency are not fully utilized.

Since networks are formed to improve the competitive position of network firms, efficient and effective cost management is expected to belong to the practical tools when striving for success. In order to conduct effective and efficient cost management, cost accounting should be well–functioning. The major problems in cost accounting are as follows:

- accounting problems are hard to solve and they are not necessarily connected with specific accounting methods,
- the registrative function of cost accounting is at least partly neglected,
- management accounting systems do not produce useful information for those who could use cost information to reduce cost, and
- adoption of modern management accounting innovations is slow and the innovations are utilised only partly.

In the framework of unbundling management accounting innovations (Bjørnenak & Olson, 1999; see Figure 5), the perspective of the cost information user, the internal customer, is not taken into account to the degree that is needed. This might be one reason for the perceived inefficiency of cost management.

Attitudes play a central role in proceeding from firm–level problems to problems in inter–organizational cost accounting. Opening up cost information to another party is something that is considered to include risks, and only few detailed empirical cases have been reported. This is why the inter–organizational use of modern accounting methods is limited. It is reasonable to presume that inter–organizational cost management is at least part of network cost management in manufacturing industry. Furthermore, cost pressure and profitability are driving forces behind the supply base evolution. Hence, it is surprising how little cost accounting and cost management are analyzed in network contexts. From the viewpoint of cost management and its development, relationships in a network should be deeply analyzed in order to identify how the approaches to cost management and development efforts could be designed similarly in many relationships. Earlier management accounting literature seems to lack the versatile analysis of customer–supplier relationships in networks even if the concern on the issue is not a new one (see Andersson et al., 1994).

The characteristics for analysis in a network's cost accounting were:

- cost elements of individual firms building up from external material and outsourced work bought from suppliers, and from internal operations conducted,
- structure of the network organized to follow the material flow in the supply, and
- the "invisible walls" that prevent network members from seeing other members' cost information.

Understanding of these elements, connected with participants' willingness to remove the walls, would make the cost structure of a network's end product, i.e. cost accumulation in a supply network, visible. Furthermore, the learning perspective also calls for parallel information sharing between same–level actors in the network, although this cannot be argued directly from the perspective of the end product's cost structure.

6.2 Contribution

The contribution of this research is mainly in the areas of describing the present state, needs, and development of networks concerning cost accounting and cost management. Since the secondary research questions were posed in order to support the primary research question, they are addressed first. Most of the references in this chapter are used without page numbers because they either refer to the main idea of the referred text or they have been introduced in detail in earlier chapters.

6.2.1 Secondary research questions

The focus of the research was on small and medium–sized Finnish firms belonging to networks of larger main contractors. In the spirit of secondary research questions (Q1 – Q5), a comparison of the results of this research with earlier theories is made concerning

- current practices and needs of network members' cost accounting and cost management,
- ABC implementations,
- cost information openness,

- win–win practices,
- TC and inter–organizational cost management,
- multilaterality of cost information, and
- customer–supplier relationships as a determinant on the improvements gained in cost management of a network

Q1: How do networks of manufacturing firms account and manage costs?

The most important accounting situations in which cost information was used and needed in both case networks were pricing and offer calculation, product mix selection, and production process selection. This is in line with the studies of Dahlgren et al. (2001) and Frimanson & Lind (2000) which emphasized inter–organizational utilization of cost information in pricing and production process selection. However, at least product mix selection in general is widely expected to be a very important accounting situation for all kinds of firms, regardless of network relationships.

In this research, the main contractors were less satisfied with suppliers' cost information than the suppliers were with their own cost information. This was the case concerning all variables that were elicited for (comprehensibility, availability, topicality, usefullness in decision making, presentation form, scope, and reliability). The major reason for main contractors' dissatisfaction was the limited transfer of suppliers' cost information to main contractors.

The tracing of direct cost in case networks was conducted poorly. It is typical that indirect cost assignment and direct cost tracing depend on each other, so that the weak situation in direct costing makes the allocation of indirect cost very inaccurate if the allocation is based on direct cost measurement. This was the case in many case firms where allocation of indirect cost was the common accounting pattern and only few firms used coefficients or assignment. Hence, the reasons for poor indirect costing were limited use of job order numbers and incomplete material consumption follow–up by orders. These reasons led direct costing, on which indirect costing was mainly based, to fail. To summarize, the situation in the case networks was weaker than in the firms studied by Hyvönen & Vuorinen (2001, pp. 11-12), Järvenpää (1998), Lukka & Granlund (1996), Malmi (1996, p. 249), and Laitinen (1995). However, the analysis of this research was conducted in firms that were smaller on average than the earlier units of analyses. Furthermore, the case firms of this research had not participated in development of cost accounting at the time of the present state analysis.

Comparing suppliers' cost structure in this research with earlier Finnish studies (adding Karjalainen (1997) to the ones mentioned above), the percentage of direct labor is higher and the percentage of material cost is lower. This is reasonable because the position of a firm in a supply chain influences the amount of purchases: the lower the level of the firm, the less it buys outsourced work and the more there is in–house manufacturing. This research considered both the supplier and subcontractor levels in supply chains while earlier studies concentrated more on main contractor and supplier levels.

Inter–organizational cost management may, at least partly, be analyzed on the basis of the discussions between suppliers and main contractor and the possibilities of

suppliers to influence the main contractor. How to influence the cost level, what is the suppliers' cost level, and what is the suppliers' cost structure were among the most important topics. In the network A, TC was an important issue for suppliers, but in the network B it was of no importance. The suppliers felt, in general, that they can have, and that they also have, influence on the main contractor's end product prices, delivery times, component selection, and construction changes. All of these issues have been on the lists of dyadic cost management studies (Mouritsen, 2001; Seal et al., 1999; Cullen et al., 1999, Berry et al., 1997). The network studies have not considered these issues so far. This research provides detailed data from networks not only from dyadic partnerships.

Q2: What are the needs of network firms' cost accounting?

To increase competitiveness and to reduce costs were the two major motives for main contractors to build the network (see Table 15). The major difference between this research and literature is that marketing and technology issues were not at the top in this research but have been obtained as typical motives in recent network studies (see Kulmala et al., 2002, p. 39; Ebers & Jarillo, 1998, p. 5; Forström et al., 1997, pp. 51-52). However, increasing competitiveness, development of cooperative operations, and cost savings have existed also in the top–five lists of earlier studies. In this research, the major problem in striving for cost reductions was limited and insufficient access to suppliers' cost information.

This research indicated that purchasing and product design were the main contractors' internal customers for cost information delivered by suppliers (see Table 16). Reducing costs, increasing cost awareness within organizations, and developing products were the situations in which the internal customers would need the information. Furthermore, the accounting department was not considered a significant internal customer. The results are in line with some earlier statements (see Trent & Monzcka, 1998; Uusi-Rauva & Paranko, 1998; Ellram, 1996, 1995) on the roles of different functions in accounting: the accounting department should produce cost information in reasonable and useful form for other departments that use the information in decision–making. Furthermore, this research slightly supports the interpretation that the significance of purchasing and product design in achieving cost reductions seems to be increasing. In the comparison, it should be remembered, however, that the earlier studies do not consider the network perspective.

The main contractors in case networks had a strong objective to influence the suppliers. A right to audit the suppliers and open access to suppliers' actual cost accounting was demanded. This interest can be explained by the main contractors' actual need to see the total costs from the perspective of both the supply chain and the main contractor's facility. The research supports earlier studies that have emphasized the importance of managing the cost accumulation in supply chains (Mouritsen, 2001; Cooper & Slagmulder, 1999b, 1998; Uusi-Rauva & Paranko, 1998; Carr & Ng, 1995; Cooper & Yoshikawa, 1994). In spite of strong emphasis on cost reductions, the main contractors were not interested in adjusting the profit margins of the suppliers. A surprising result of this research was that the life cycle perspective attracted only limited interest, although it has been an issue of increasing interest in the literature during last decade (Bjørnenak & Olson, 1999, pp. 333-335; Kaplan & Atkinson, 1998, p. 236).

The suppliers' objectives in the inter–organizational use of cost information were linked to three issues. First, the power of main contractors was considered so strong that most of the suppliers felt that they had to share some of the information in order to remain members of the network. When some openness was considered as a necessity, a system for fair sharing of profits gained by joint development was needed. Second, the suppliers wanted to limit and control the information that was to be shared. Third, main contractors were expected to help in developing suppliers' accounting systems. Most of the suppliers felt that the main contractor had more advanced knowledge of cost accounting. The two first issues are expressed in earlier literature. In this research, the common fact was experienced that larger firms have more developed accounting systems than smaller firms (see e.g. Malmi, 1996), so that larger firms calling for cost information should help smaller firms to produce it. This was a new point of view on the development.

Q3: How are cost accounting and cost management developed in business relationships of a network in the sense of cost information accuracy, cost information sharing, and cost–based win–win solutions?

The case of developing cost information to be more accurate is analyzed in the context of the five ABC implementations in network A (see Table 20). The benefits of the systems have been smaller than Ness & Cucuzza (1995, p. 132) state regarding Chrysler's case (12.7 MUSD). On the other hand, the scale of business was larger in that case, while in this research the measurement was not financial and exact, but rather was based on subjective assessment. In this research, all the five cases were experienced as somehow beneficial. This is not in line with the study of Karjalainen (1997), in which five out of nine cases had negative net benefits. In this research, the theoretical puritanism in following the ABC guidelines was at the same level as it was in the study of Karjalainen (1997): development was incremental, did not lead to complete ABC, and the ABC built was more or less a modification of the existing cost accounting system. However, the same benefit which Malmi (1996) mentions increased awareness of the occurrence of costs was typically observed in the cases in this research. It is clear that current cost information on cost–objects in the case firms is more accurate than at the time of the present state analyses.

To summarize the two open–book cases in this research, they are exceptional compared with earlier literature (see Axelsson et al., 2002; Dahlgren et al., 2001; Mouritsen et al., 2001; Frimanson & Lind, 2000; Seal et al., 1999; Cooper & Slagmulder, 1999b, 1998) regarding both the quality of cost information and the scope of openness. The quality of cost information was improved by conducting a cost management development project at the suppliers' before the disclosure of cost data. The scope of openness in the two cases covered all customer–specific costs, not only variable or direct costs.

The win–win solutions of this research occurred through step–by–step processes. No win–win implementations were made on an ad hoc basis or fast; rather they were based on cost analysis and took over one year to realize. The agreement on how to account costs, how to measure the profitability, and the way in which product profitability were balanced (the first case), and the multilateral openness and change in purchasing policy followed (the second case) complete earlier win–win literature

(see Spekman et al., 2002; Lazar, 2000; Spina & Zotteri, 2000; Cooper & Slagmulder, 1999b; Söllner, 1997; Dyer, 1996; Hines, 1996; Frey & Schlosser, 1993). Generally speaking, this research emphasizes the importance of building win–win on accurate and open cost information. The cases in which this was done were successful (1st and 3rd A–suppliers) and the cases in which this was not done (2nd and 4th A–suppliers) have not proceeded significantly in the implementation of win–win.

Q4: How do manufacturing networks utilize modern cost accounting and cost management tools such as inter–organizational cost management, target costing, and open–book management?

The use of inter–organizational cost management was very limited at the time of the present state analyses. Comparing the case networks with the theoretical framework of Cooper & Slagmulder (1999b), had a long way to go. However, network A gained significant progress during the research, and today this network already meets two out of the four requirements. Hence, it is likely that the development described concerning network A represents, mainly symbolically, the first steps on the road toward full–scale use of inter–organizational cost management.

The framework of Cooper & Slagmulder (1999b) is TC–oriented. Therefore, it also assesses the networks through the use of TC. In this sense, network A had taken the first steps, both in principle and in practices, but network B was not even aware of the possibilities of TC. The primary explanation for this was the main contractors' cost presssure; which was due to two reasons. First, Main Contractor A operated in the mining and construction industry in which cost pressure was according to the interviewees experienced as harder than it was experienced in network B, which operated in the pulp and paper industry. Second, Main Contractor B's end product experienced the position of quality leader in the market, while Main Contractor A's end product competed more with efficiency of the production process.

The use of TC is not extensive in Finland (Hyvönen & Vuorinen, 2001; Järvenpää, 1998; Lukka & Granlund, 1996; Laitinen, 1995), but in Japan it is a common approach (Kato & Boer, 1995). This research indicates that TC may, at least in manufacturing industry, increase its popularity as a cost management approach in future years because the firms that participated in the first steps with the Main Contractor in network A were middle–sized. Earlier literature indicates that smaller firms are mostly not aware of the approach, as was the case in network B, and some of the larger firms utilize TC techniques. However, it is too far–reaching to say anything about practices in general after this research, because of the small sample.

Multilaterally shared cost information occurred in two cases in this research. First, the 3rd supplier opened its books to many customers. Such a procedure or result has not been reported in earlier network–wide management accounting studies (Dahlgren et al., 2001; Frimanson & Lind, 2000). Second, a joint purchase procedure that led to 15% savings in material cost in network A called for the suppliers to reveal their purchase prices and contracts to each other and to the main contractor. However, in the joint purchase case, no detailed cost information analysis was conducted. The procedure was primarily conducted by the managing director of the Small A, which refers to the quasi–firm style of management (see Hyötyläinen, 2000; Räsänen & Koivisto, 2000; Hyötyläinen & Simons, 1998; Dubois & Håkansson, 1997; Kuivanen

& Hyötyläinen, 1997; Lamming, 1993; Jarillo, 1988) in network A. Hence, this research provides multilateral open–book management literature with two examples. It is, however, necessary to mention that the practices that emerged during the research were occasional examples, not yet established ways of doing business.

Q5: How do the differences in customer–supplier relationships explain the actions of network members?

The literature on purchasing shows a trend toward the classification and portfolio management approaches in the context of customer–supplier relationships (Lehtinen, 2001; KTM, 2000; Bensaou, 1999; Sakki, 1999; Torppala, 1999; Trent & Monczka, 1998; Virolainen, 1998; Matikainen, 1998; Kapoor & Gupta, 1997; Olsen & Ellram, 1997; Ellram, 1996; Koskinen et al., 1995; Lehtinen, 1991; Krapfel et al., 1991; Campbell, 1985; Kraljic, 1983; Fiocca, 1982). This approach was selected for analysis in three cost management development cases in a firm network (see article V). Major differences were found between the results: suppliers' objectives, actions taken in customer–supplier relationships, and the results of the projects were different, although the main contractor's initial objective was the same in all cases.

In this sense, the case studies of this research emphasized the behavioral side in the open use of cost information. Cost information transfer and utilization depended on

- *the balance of power between firms* (The 2nd Supplier had such a technological position that the Main Contractor could not force it into openness. They continued the business relationship as usual although the Supplier did not provide them with any cost information. The 1st and the 3rd suppliers opened their books in order to improve or maintain their positions as suppliers.)
- *the trust between personnel* (The reason for the 2nd Supplier's suspiciousness toward open–book management was the unfair treatment experienced from the Main Contractor's side. Even if the purchasing manager of the Main Contractor had changed, the mistrust of the Supplier's business line director did not disappear. On the other hand, the 1st Supplier felt that the Main Contractor was its best customer.)
- *the volume of firms' mutual business* (The 3rd Supplier would not have opened its books without a likely chance of increasing the sales to the network. The 1st Supplier had increased its sales to the Main Contractor for ten years. The 2nd Supplier did not meet high–volume or increasing sales.)
- *the state of the supplier's cost accounting* (The 2nd supplier had concentrated less on cost accounting development than other suppliers, so that it had less high–quality cost information to be shared with the main contractor.)

Järvenpää (2001), Lind (2000), Nurmilaakso (2000), Hines (1996), and Hopwood (1996) have considered a network's cost accounting theoretically but have not analyzed the effect of customer–supplier relationships on the network's cost accounting practices in detail. In the empirical studies (see Dahlgren, 2001; Frimanson & Lind, 2000), all the parallel–level participants (suppliers or customers) have acted similarly because of an agreement, joint ownership, or customers' equal power over the supplier. This research describes a network in which different actions were taken in different relationships and explains the reasons for this. Compared with the literature mentioned above, the approach in this research is new.

Although this was not studied in detail, it is possible that the customer–supplier relationships have an influence on the development of suppliers' cost accounting. At least in the studied networks, asset specificity and asymmetry of power seemed to prevail to some extent. Their effect was not directly studied, but the list above reflects these phenomena lying in the background. Which suppliers take part in the development, in which direction the systems are developed, for which purpose the systems are developed, and which are the cost–objects of primary interest are questions that may have inter–organizational nature in networks. However, the data of this research does not offer an opportunity to analyze what the effect of customer–supplier relationships and other issues is on these questions.

No single portfolio model explained the differences. This observation indicates that the suggested portfolios should be used versatilely, not relying on one or two models only. The results concerning the perspective of cost management support the earlier findings of Vesalainen (2002), Fletcher & Barrett (2001), Halinen & Törnroos (1998), and Anderson et al. (1994). In the studies mentioned above, networks were mentioned to be systems created of many individual customer–supplier relationships. These, in turn, cannot be managed similarly by main contractors. Hence, in line with Dubois & Pedersen (2002), this research presents the critical approach of not recommending purchasing portfolios for all purchasing–related functions, such as inter–organizational cost management, for example.

6.2.2 Primary research question

Answering the primary research question was the primary objective of this research.

PQ: What kind of challenges does the networked way of doing business set for cost accounting and cost management in networked firms?

The research indicates three requirements for efficient and effective cost management in networks:

I In order to know the individual cost elements in individual member firms, the cost accounting of member firms should be organized so that it produces relevant, accurate, and usefully presented information on the cost elements and the total cost of end products. In this research, no indication was found that would support standardization of cost accounting methods and systems within networks. The primary purpose of producing and utilizing high–quality cost information does not depend on the accounting method used. In networks, individual firms have different internal needs for their accounting systems, but the underlying need to know costs still remains.

II In order to meet the requirements of inter–organizational activities in cost management, network firms should share at least part or all of their product or customer–specific cost information with their customers / suppliers so that consecutive firms in a supply chain can cooperate from the same starting point for cost reductions. In this cost information sharing, an open cost model or the cost structure of partners' mutual business might be a powerful tool. However, the cost model or preferred cost structure should be jointly built and the accounting rules concerning the model should be accepted by both parties before applying them.

III In order to find out the best practices and to boost learning between network members, firms should open up their cost information multilaterally at least in situations where the benefit for the whole network is expected to be tangential to the benefits of an individual firm.

The requirements can be understood also as steps that a network and individual member firms of a network should take on the road to establishing network accounting and network–wide cost management. The first requirement was easiest to be fulfilled in the case studies. Hence, this research indicates that skeptical attitudes and prejudices are the major obstacles in inter–organizationalizing cost information. However, the rationality of network–wide thinking is highly dependent on the relationships in the network: what is the actual commitment of individual firms, what is the state of trust between network members, and how do the firms manage their risks?

Beside the requirements, this research indicated four emerging challenges for cost management in manufacturing networks (see the articles):

1. A customer is an important cost–object in a network. The long–term approach to a network calls for knowledge as to whether participating in the network is profitable or not. If the customer profitability is weak or even negative in the network context, a firm should participate in cooperative cost–reduction efforts or abandon the network.
2. Participating in a network may mean volume changes due to division of duties, which demands that an individual firm should produce part of the network's end product. Before taking this production responsibility, the impact on profitability of possible change in production volume should be known. In calculating this profitability impact, the focus should be put on the difference between the current and the to–be cost structure of suppliers. For example, in small or medium–sized firms, static calculations based on current product costs (calculated using ABC, job order costing, or other method) does not take into account costs that emerge due to the actual need to build new production facilities.
3. Implementing fair win–win improves the likelihood of positive results in cooperation between firms. Ad hoc based win–win or win–win that cannot be measured may lead to non–agreement on what the inputs and outputs of each party are in a relationship. Cost–based win–win, in which the accounting rules are accepted first and the results taken into account only second, improves the likelihood of a process that is experienced as fair. Furthermore, transparency in this kind of win–win, in which all the members know the accounting rules and how the results are used, could lead to the avoidance of problems deriving from misunderstandings.
4. Identifying the cost reduction potential of inter–organizational process changes and cooperative operations within a network is more likely if cost information from network members is available than when it is not. The two joint purchase cases (volume centralization in the 3rd Supplier and joint purchase of finishing painting) led to cost savings that would not have occurred without network–wide openness of cost information. On the other hand, promises of increased or centralized volume that are based on expectations of potential increase in sales or market share should be avoided in order to not weaken suppliers' trust.

It is important to notice that there might be other challenges for cost management in networks as well, but these were the ones that are obvious as a result of this research.

6.2.3 Support of critical success factors

The research questions in the article I concerning the link between OBA and the critical success factors of partnerships derive from earlier theories of cost accounting and from the discussions of Mohr & Spekman (1994) and Tomkins (2001). As the critical success factors within networks were the fundamental elements of the research setting in this research, the networks studied are summarized from the perspective of how the cost management in networks A and B supported the critical success factors. Two issues were analyzed from the trust–warranting information point of view: commitment and trust. Four issues were analyzed from the event–mastering information point of view: coordination, quality of information, participation, and joint problem solving. The summary is presented in Table 23 and it is based on the research questions presented in article I.

Information type (Tomkins, 2001)	**Characteristics** (Mohr & Spekman, 1994)	**Empirical evidence on cost management**
Information to warrant trust	Commitment	The boundaries of openness concerning cost information were limited to customer–supplier relationships. No openness was found between network members that do not trade with each other.
	Trust	The lack of trust prevented one open–book practice from taking place. In two cases, incentives for suppliers were inviting to such a degree that openness occurred. Hence, trust was at least at an adequate level. In most of the customer–supplier relationships, openness did not occur. However, it was not really a major target so that trust did not play a role in these cases.
Information to master events collaboratively	Coordination	Open–book management helped coordination and resulted in cost reductions in two cases, of which one involved a dyadic and one a multilateral practice. On the whole, discussions of costs in networks was experienced as coordination–improving.
	Communication quality	The most important features for communication on cost information were relevancy, accuracy, and usefulness. The methods for producing cost information were not of primary importance and no standardization of accounting systems and solutions of accounting problems were needed. However, all the development projects in network A were based on ABC and some of the accounting problems were solved similarly in the five independent development projects.
	Participation	Accounting situations that seemed to emphasize network members' participation were end product pricing, offer calculation, profitability calculation of products and customers, product mix selection, product and process development, and increasing cost awareness within organizations.
	Joint problem solving	Cost information was actively utilized in the multilateral joint purchase case in network A. In balancing the profitability of 1st A–supplier, cost information played a central role. In other problems, cost information may have supported joint problem solving, but has not been the primary decision–making variable.

Table 23. Summary of the critical success factors from the cost management point of view in the networks studied.

The major conclusion on how cost management in networks supported the characteristics that are related to the success of the networks is that only few practical examples of each of the characteristics occurred. However, the development projects

indicate that the future, on the road described in this research, might provide more versatile practices and a larger number of examples. It is reasonable to expect, relying on the evidence of this research, that especially event–mastering could benefit from cost information. More unclear is the trust–warranting side. Could cost management support commitment to such a degree that also firms not trading with each other shared cost information? This research leaves the question of trust unanswered.

6.3 Assessment of the research

6.3.1 Relevancy

The issue this research is about, cost management in firm networks, was relevant at least for four reasons. First, networking is becoming more and more a common way of doing business and, as such, it is not any more an automatic machine for being better than others. Therefore, network firms should also pay attention to cost management. Second, the literature review and the analysis of the scope of today's on–going management science conferences indicated that increased attention is paid to networking and its many perspectives. Third, the issues of this research, cost accounting and cost management, were limitedly approached in network studies, especially from the point of view of empirical descriptions and practices. Fourth, the analyses and development carried out with the research subjects led to continuous interest in the systematic development and modeling of the accumulation of cost in networks. The research questions, hence, were considered relevant in the business environment.

6.3.2 Validity

Validity is a question of whether the measures selected are measuring what was intended or something else. In this research, the present state, needs, and development of network firms' cost accounting and cost management were to be analyzed. How the supplier firms account their costs was analyzed. Who needs information on costs, what for, and in which situations was analyzed as well. Furthermore, the development of network A was described. Referring to Figure 12, the research setting used in this research could be the same in any part of the supply network, so that the same methods could be applied in the analysis of Main Contractors in their relationships with End Customers. However, this research lacks the analysis of main contractors' cost accounting. This research was designed to address supplier–level firms, because earlier literature has concentrated more on larger firms.

On the cost management side, only a short period of time was covered in both networks. This glimpse does not offer a solid basis for longitudinal analysis. This weakens the validity of the research. However, the use and the inter–organizationality of modern cost management tools were covered in the research as well as this was possible. The research methods used were derived from the theory of the use of the tools, so that the analysis was based on identifying the features of the tools and not only on questions like "does your company use target costing?" This is an important way to increase the validity of the research, as noted by Karjalainen (1997) in the case of ABC implementations.

6.3.3 Reliability

Reliability, in this research as well as in most studies, is a question of whether it is possible to obtain the same results if someone else conducts the research instead of the researcher. A cynical answer to the question would be no, because in case studies the researcher always influences the research subjects.

In this research, the researcher's influence in analyzing the present state of cost accounting was very slight, because this phase of the research was an objective one based on facts. In the need analyses, the influence of the researcher depends on who are interviewed and what is elicited for. It is possible that the researcher did not have complete understanding when concentrating on certain issues. The reliability, in this sense, could have been improved by interviewing more persons per firm that are involved in cost management and by involving more research subjects in the research. In the present state analyses of the networks, the time difference between cases was avoided by conducting the studies at almost the same time after the start of the networks and during the same economic trend.

The development of cost management in this research was highly dependent on external researchers. Without the work of almost ten external researchers (see e.g. Table 20) in the different phases and on the different topics during the research, there would possibly be nothing to tell about cost management development in networks. Furthermore, one of the articles was action research oriented, which implicitly means that the researchers try to have an influence on the research subject.

In the follow-up of network A, the cost management development operations were strictly registered in order to understand external researchers' effect on firms. Furthermore, in explorative studies, the researcher's understanding of the context may be essential in certain interpretations. The longitudinal period of the network A (introduced in the article III) follow-up was three years (1998 – 2001). The follow-up of network A was carried out by keeping close contact with the network firms. This was possible because the researcher followed the cost management development projects of each of the firms (three of them introduced in the article V, highlights of one of them illustrated in the article IV, and all of them introduced in the article III) and participated in the network meetings twice a year.

The similarities between the two networks analyzed in the article III were metal industry operations and manufacturing technology. Differences between these networks occurred, so that network B (introduced in the article III) could be expected not to be a copy of network A. Main Contractor B was a product factory without marketing responsibilities, while Main Contractor A was a global actor. The sales volume of network B was one tenth of the network A sales volume. Regional and cultural differences were avoided by studying networks in the same geographical area.

In this research, the access to confidential information was secured thanks to the fact that the researcher had known the interviewees over a two–year period while participating in network A development. Data from network B was used in a way that does not call for confidential information.

To summarize, if some other researcher without the researcher's connection with the persons involved in the development of networks approached the issues, the results might be different. However, considering the research approach, which was qualitative and action–oriented based on the hermeneutic paradigm, the results have the level of reliability that was expected.

6.3.4 Generalizability

The generalizability of this research relies on contextual generalization logic (see Lukka & Kasanen, 1995). Hence, by describing the constraints of a study, the researcher outlines an environment in which the results have a meaning. On the other hand, outside the environment the results might be irrelevant. The constraints of this research are contextual in nature. At least four types of limitations exist:

- *Time*. The research was carried out during the years 1998-2001. It is not clear that the external circumstances related to the economical, political, environmental, and technological trends of that time would influence the business of other times in a similar way. For example, the stability and durability of the network relationships and win–win solutions will undergo a hard test during the next economic downtrend.
- *Place*. The research was carried out in Finland. Cultural differences might mean that the behavioral patterns of people and organizations in other geographical areas would not lead to similar results. Generally speaking, the Scandinavian countries are overrepresented in development–oriented network studies, which means that the network–orientation of the geographic area may have led to results that would not have been reached in other areas.
- *Industry*. The research concerns mechanical engineering industry. Applying managerial implications in other industries calls for detailed analysis of the industry's structure and business logic.
- *Competitive strategy*. The goals of the firms may vary within an industry due to different competitive strategies. The firms studied had selected to adapt to the dominating market price and not to own all the manufacturing.

The challenges of networking for cost management are contextual findings as well. This means that by changing the research subjects, other challenges could have surfaced. For example, if the personnel of network A firms had used their time on other issues instead of joint purchases, the researcher might not have been able to identify the importance of joint purchases for cost reductions in networks.

The effect of Main Contractor A on the results is obvious. Both the network and the customer–supplier relationship analyses are slightly biased because they follow the needs and objectives of this actor. This, in turn, leads to the actual need to conduct a primarily descriptive research, which is a contributive selection, however, due to the limited literature on cost management in firm networks.

Despite the constraints of the research, the multiple–case selection of networks and customer–supplier relationships helped to avoid the problem of relying only on single case observations. Concerning supply networks, the present state and need analyses of cost management were conducted in two independent networks. Furthermore, cost

information openness was analyzed in many customer–supplier relationships. The results were not the same and explanations for the differences were provided.

The findings represent the most topical issues in the environment considered. Hence, it is reasonable to believe that the results of this research are important in any manufacturing network. However, the results might not be complete, so longer and more extensive analyses might provide the academic community not with different, but with more results.

6.4 Managerial Implications

Managerial implications of this research include three perspectives on how to produce and utilize cost information in networks. The perspectives are the effect of a runner of the network on the network development, the relationship between the requirements and the challenges of cost management in networks, and the likely obstacles to network–wide cost management.

First, the runners of networks, i.e. the main contractors, seemed to be strong actors although the analyzed networks applied development and management methods typical of quasi–firm oriented networks. The main contractors were nearer to the end customers and these parties had more negotiations, on average, than other parties in the network. Furthermore, more or less, the network members were selected by the main contractors. Therefore, it is not a surprise that the needs and the word of the main contractor were of great importance, even to such a degree that probably all, or at least most, of the development described in this research would not have happened in network A if Main Contractor A had not selected cost management as one of the primary development areas in the network. As the case of network B indicates, the lack of endogenous motivation to carry out large–scale inter–organizational development projects with suppliers led to almost no development at all. It could be argued that in cost accounting development does not happen occasionally; rather it has to be motivated, started, and carried out. This work, motivating and organizing it, was done by Main Contractor A. Hence, the role of runners in developing cost accounting and cost management in networks should not be underestimated. If none of the firms takes the primary responsibility, the shared responsibility for a new and doubtful issue may end up as the responsibility of no–one.

Joint strategy was initiated by Main Contractor A. Network A developed a network strategy after the present state analysis of cost management (Räsänen & Koivisto, 2000). The strategy was jointly formulated and all the firms were committed to it. The joint strategy process and commitment to implement the strategy created pressure on cost issues and, hence, boosted the development of individual firms' cost accounting and cost management in the network. This proposition is supported by the fact that network B also took a couple of steps toward joint strategy, but the time horizon of this research was not wide enough to follow whether it was implemented and whether there will be development also in cost management. Compared with the study of Palin (1998), collective network strategy is a new phenomenon. The data of Palin was gathered from two neighboring provinces of the Tampere region in 1995. It is reasonable to suppose that the distance of 100-200 kilometres and the difference of five years do not explain the evolution of collective network strategy. The

interpretation according to which collective network strategy supports the development of cost management in networks is also backed up by Christopher (1998), who mentioned collective strategy as one of the three critical success factors in networks.

Second, a question of the relationship between the requirements and the challenges mentioned may pop up. Table 24 illustrates a setting in which management should pay attention: The challenges cannot be responded to without sophisticated information on costs. Therefore, the requirements are like prerequisites for responding to more complex cost management challenges in networks. Accurate cost information and sharing it (the requirements, see p. 108) make cost reductions possible, but do not warrant them. The utilization of cost information is another issue and calls for setting the participants to work on the challenges.

Cost management challenges	**Minimum requirements to respond to a challenge**
Member firms know their actual customer profitability	I
Member firms know the volume change impact on their profitability	I, probably II
Win–win is implemented fairly and based on cost information	I and II, probably III
Cost reduction potential of joint operations is known for the network	I, and II or III

Table 24. Suggested relations of the requirements and the challenges of cost management in networks.

Third, the likely obstacles that were either removed or that prevented inter–organizational cost management were of five types:

1. *An organization is not committed to the network.* The positions of the network firms should depend enough, but not too much, on the success of the network. The underlying motive of feeling being part of something should exist if input–demanding development is expected to happen in any area of cooperation. The strong position and low trust prevented the 2nd A-Supplier from opening its books.
2. *An organization does not feel that improvements in cost accounting could support their business in any way.* Both networks of this research included firms that were completely satisfied with their cost accounting even if it was obvious that the very basic issues in internal costing were misunderstood or neglected. This obstacle was avoided in the case of the 4th A-Supplier by providing the firm with examples of what can be gained with the development work.
3. *An organization does not have resources to develop cost accounting.* Most of the small firms in this research could not participate in the development of cost accounting due to the lack of resources, time, or competence. The resources organized by the main contractor, or the runner of the network, can help to avoid this obstacle (in this research, the external resources were the researchers that developed ABC systems for five A–suppliers).
4. *An organization is not willing to reveal its cost information to other firms.* It is not common to share internal cost data in detail with customers or suppliers. In order to get network firms to do this, it is necessary for the runner or the firm that is most eager for openness to guarantee other parties a fair process for how the information is utilized and to point out with clear calculations what can be gained through the procedure. Bare persuasion and

the use of dominant position in the network may lead to short–term results or opportunism.

5. *An organization does not feel that cost reductions are necessary.* Network B as a whole was not sure whether it should strive aggressively for cost reductions. Utilization of such cost management tools as TC or LCC calls for conscious need for them and only few firms use them for trial or fun. A major problem in this consciousness is that it is easy to hide the problems linked to weak knowledge of product profitability behind other urgent problems.

The list is of high importance for practitioners building and developing supply networks. This research provides practitioners with examples of how firms may act in different situations.

6.5 Further research

Three major directions of further research are evident as a result of this research: In order to avoid problems regarding reliability, generalization, and contextuality, a larger number of networks should be analyzed regarding what the present state and needs are in cost accounting and cost management. On the other hand, detailed measurement of the results of cost management development in networks should be carried out. Finally, what challenges emerge after the cost accounting in network firms is well–organized and complete openness concerning cost information is reality?

The first research suggestion is the road of continuous improvements and refinement of the research setting presented in the research. There are at least the following ways to improve:

- More data could improve reliability and generalizability (more networks, more firms, more different–tier suppliers involved)
- A more diversified perspective on networks could help to avoid the biased results (downstream networking analysis, more main contractors, and the opinions of passive firms taken into account better)
- Industry comparison could help in separating industry–specific issues from the general ones, and thereby tackle the generalizability and contextuality problems (non–manufacturing industry networks)
- The research method in the needs analysis (interviews, semi–structured questionnaires, participatory observations) should be developed so that the dependency of the results on the research subjects and the researcher could be decreased.
- All the supply tiers should be included in the present state analysis of cost accounting in order to avoid the analysis of a specific supplier level. For example, Main Contractor A had tried ABC with different functions and with different business areas with prominent results so that the cost differences between products have been more transparent (Piekkala, 1999). The information on activity–based calculations is continuously used in decision–making, but ABC is not used as the major internal cost accounting system. Although the analysis and development of cost accounting on the customer

side was not the focus of this research, this would be a natural extension of the research.

- The scope of the research should be widened so that also non-Scandinavian networks and networks at different times would be analyzed. This could reduce the contextuality, improve the generalizability, and bring in the cultural side of the phenomenon.
- The follow–up of networks should be longer than in this research in order to improve the validity.
- The network position of a supplier that belongs to many networks, i.e. sells to many main contractors, should be better analyzed. It is expected that one main contractor is not the common setting and one main contractor may not have power over the need to serve other main contractors. The more complex the network setting, the more complex might also be the openness of cost information. For example, situations in which providing one main contractor with cost information leads to another main contractor pressuring the supplier might not be desired.

The second research suggestion is the road of major changes in the approach. This direction is near to the quantitative approach. In this research, the measurement of the consequences of cost management development was of little interest. No exact measures and target values for cost management development projects were set during the development work. Hence, the research was about what can be done, how it is done, and what the changes are. Concerning the explorative nature of this research, the setting provides useful information. If explanatory nature is expected to such a degree that the comparison of different activities and the measurement of inputs and outputs should be analyzed at the level of expressing the coefficients of determination, the research setting should be removed from development of firms toward building measures for networks that have already worked on the cost management issues.

The third research suggestion looks at the future: what will come after the cost accounting in network firms is well–organized and complete openness concerning cost information is reality? Is it possible that all, or at least most, of the members of a network have accounting systems that provide the users with relevant, accurate, and useful information on the costs of the cost–objects? Will there be time that experiences the disclosure of cost information as a common way of doing business? If the answer to both of the questions is no, it would be interesting to know why the situation that seems to be like a dream for at least some network enthusiasts, is not reached. If the answer is yes, the development of cost accounting and attitudes may have done their work in making cost management as easy as it can be from the viewpoint of management of cost accumulation. In this case, further research should concentrate on identifying the next major obstacles to efficient and effective cost management, and finding out means to remove them.

Since networking has been a widely discussed issue in recent years, it is reasonable to expect comparable issues, i.e. “isms”, to pop up. An interesting question would be how the next frontier of business paradigms, the one that comes after networking, challenges cost management?

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