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Erno Salmela – Anita Lukka

VALUE ADDED LOGISTICS IN SUPPLY AND DEMAND CHAINS

SMILE

Part 1
EBUSINESS BETWEEN GLOBAL COMPANY AND ITS LOCAL SME SUPPLIER NETWORK

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VALUE ADDED LOGISTICS IN SUPPLY AND DEMAND CHAINS (VALOSADE)
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EBUSINESS BETWEEN GLOBAL COMPANY AND ITS LOCAL SME SUPPLIER NETWORK

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ABSTRACT

VALOSADE (Value Added Logistics in Supply and Demand Chains) is the research project of Anita Lukka´s VALORE (Value Added Logistics Research) research team in Lappeenranta University of Technology. VALOSADE is included in ELO (Ebusiness logistics) technology program of Tekes (Finnish Technology Agency). SMILE (SME-sector, Internet applications and Logistical Efficiency) is one of four subprojects of VALOSADE. SMILE research focuses on case network that is composed of small and medium sized mechanical maintenance service providers and global wood processing customers. Basic principle of SMILE study is communication and ebusiness in supply and demand network.

This first phase of research concentrates on creating backgrounds for SMILE study and for ebusiness solutions of maintenance case network. The focus is on general trends of ebusiness in supply chains and networks of different industries; total ebusiness system architecture of company networks; ebusiness strategy of company network; information value chain; different factors, which influence on ebusiness solution of company network; and the correlation between ebusiness and competitive advantage. Literature, interviews and benchmarking were used as research methods in this qualitative case study.

Networks and end-to-end supply chains are the organizational structures, which can add value for end customer. Information is one of the key factors in these decentralized structures. Because of decentralization of business, information is produced and used in different companies and in different information systems. Information refinement services are needed to manage information flows in company networks between different systems. Furthermore, some new solutions like network information systems are utilised in optimising network performance and in standardizing network common processes. Some cases have however indicated, that utilization of ebusiness in decentralized business model is not always a necessity, but value-add of ICT must be defined case-specifically.

In the theory part of report, different ebusiness and architecture models are introduced. These models are compared to empirical case data in research results. The biggest difference between theory and empirical data is that models are mainly developed for large-scale companies – not for SMEs. This is due to that implemented network ebusiness solutions are mainly large company centered. Genuine SME network centred ebusiness models are quite rare, and the study in that area has been few in number.

Business relationships between customer and their SME suppliers are nowadays concentrated more on collaborative tactical and strategic initiatives besides transaction based operational initiatives. However, ebusiness systems are further mainly based on exchange of operational transactional data. Collaborative ebusiness solutions are in planning or pilot phase in most case companies. Furthermore, many ebusiness solutions are nowadays between two participants, but network and end-to-end supply chain transparency and information systems are quite rare.

Transaction volumes, data formats, the types of exchanged information, information criticality, type and duration of business relationship, internal information systems of partners, processes and operation models (e.g. different ordering models) differ among network companies, and furthermore companies are at different stages on networking and ebusiness readiness. Because of former factors, different customer-supplier combinations in network must utilise totally different ebusiness architectures, technologies, systems and standards.

Key words: ebusiness, networking, supply chain, SME

CONTENTS

ABBREVIATIONS

ASP. Application service providing.
CPFR. Collaborative planning, forecasting and replenishment.
EBXML. Electronic Business using eXtensible Markup Language.
EC. Electronic commerce.
EDGE. Enhanced Data GSM Environment.
EDI. Electronic data interchange.
EDYNET. The research project name “Ebusiness and Dynamic Networks in Alliances and Partnerships”.
ELO. Ebusiness logistics. The technology project name of Tekes (Finnish Technology Agency).
ERP. Enterprise resource planning.
GPRS. General Packet Radio Services.
HTML. Hyper Text Markup Language.
ICT. Information and communication technology.
IT. Information technology.
MRO. Maintenance, repairs and operations.
OEM. Original equipment manufacturer.
PDA. Personal Digital Assistant.
R&D. Research and development.
SME. Small and medium sized enterprises.
SMILE. The research project name “SME sector, Internet applications and logistical efficiency”.
VALORE. The name of the research group. “Value Added Logistics Research”.
VALOSADE. The research project name. “Value Added Logistics of Supply and Demand Chains”.
VAN. Value Added Network.
WLAN. Wireless Local Area Network.
XML. Extensible Markup Language.

FIGURES

TABLES

1. INTRODUCTION

Finland is high-cost business area, so competitive advantage is achieved with effective processes, low invested capital, knowledge and innovations, and quality. Finnish companies cannot compete in routine labour-specific industries, but in knowledge-specific industries and operations like expertise services and R&D. The mega trends like globalisation and high demand fluctuation force companies and supply chains to innovate new business models to gain and maintain competitive position. Networking, outsourcing, and information and communication technology are considered as general tools and means to respond these challenges.

Communication is essential in networked decentralized organizations. Information is one of the key resources in these new organizational structures. People are working in an interactive way in intra-organizational and inter-organizational teams. Some cases have however indicated, that utilization of information and communication technology in decentralized business model is not always a necessity, but value adding of ICT must be defined case-specifically.

Because of decentralization of business, information is produced and used in different companies and in different information systems. Information refinement services are needed to manage information flows in company networks between different systems. Furthermore, some new solutions like network information systems are needed for optimising network performance. Total network information system architecture must be flexible because of network dynamic in changing environment.

Rapid development and diffusion of computers and telecommunication infrastructure and service have increased business interest towards ebusiness. Ebusiness between companies and consumer ecommerce is increasing, although consumer ecommerce expectations were extremely oversized. According to Boston Consulting Group (2001), in 2001 five to ten per cent of business-to-business sales were transacted over the Internet. By 2005, figure is expected to increase to 30-50%.

This report concentrates on ebusiness between global companies and their national or local SME supplier networks, especially in Finland. The Finnish ebusiness solutions were chosen as study object, because they present first-rate level in Europe and even in world class. Large-scale companies utilize ebusiness solutions progressively in global supply chains and those solutions are extensively studied. Instead, small enterprises usually are outsiders in ebusiness solutions of supply chain, but in Finland solutions are implemented even for small enterprises or SME company networks. The Finnish business culture differs for example from USA, which highly utilizes ebusiness application in business. In USA business relationships are usually based on competition, while in Finland relationships are more long-term partnerships. This is also reflected in ebusiness systems. In USA different market places and auctions are common, while in Finland solutions concentrate on long-term communication and integration.

This report states the beginning for SMILE research and it provides backgrounds for further research. SMILE research project and research methodology are introduced in chapter 2. Chapter 3 aggregates backgrounds for entire SMILE research and it includes theory about outsourcing, networking, hub company in supply chain, future business requirements, and characteristics of SMEs. In chapter 4 are introduced characteristics and backgrounds of ebusiness, Internet, system integration, ecollaboration, and information hub model. In chapter 5 are presented generic research results from as-is-state of ebusiness and networks in Finland, and some future considerations. Also transparency and information value chain, network and ebusiness strategy, system architecture of the company network, the role of ICT from the perspective of competitive advantage, and change management are considered. Chapter 6 includes conclusions and further review of SMILE research.

2. RESEARCH GOALS AND METHODOLOGY

2.1 SMILE, VALOSADE and ELO

VALOSADE (Value Added Logistics in Supply and Demand Chains) is the research project of Anita Lukka´s VALORE research team in Lappeenranta University of Technology. VALOSADE is included in ELO (Ebusiness logistics) technology program of Tekes (Finnish Technology Agency). SMILE (SME-sector, Internet applications and Logistical Efficiency) is one of four subprojects of VALOSADE. SMILE research is focusing on case network that is composed of small and medium sized mechanical maintenance service providers and wood processing customers in South Karelia. These wood processing customers are business units of global forest companies. This case network is one part of broader maintenance network (e.g. machine suppliers, engineering agencies, hydraulic and electrical maintenance) of principals. SMILE is closely connected (table 1) to another VALOSADE subproject, EDYNET (Ebusiness and Dynamic Networks in Alliances and Partnerships), in which new scenarios, strategies and business models of network will be studied (Salo, 2004). The aim of the SMILE is to develop a model how SME network can be managed with information system. Information system acts as a contact point between global principals and SME supplier network, and on the other hand system provides standardized electronic processes for supplier network.

Table 1. Connectivity of SMILE and EDYNET researches.

EDYNET	**Common**	**SMILE**
-network strategies -network scenarios -network business models	-structures, roles -processes	-ebusiness opportunities -ebusiness model -information flows -network information systems

ELO expert group has utilised Logistics Technology Roadmap that is a practical tool for future forecasting of business and business environmental changes. University of Cambridge Institute of Manufacturing has developed this roadmap model. (Tekes web site, 2004). In figure 1 the positions of SMILE and EDYNET projects are presented within the roadmap model.

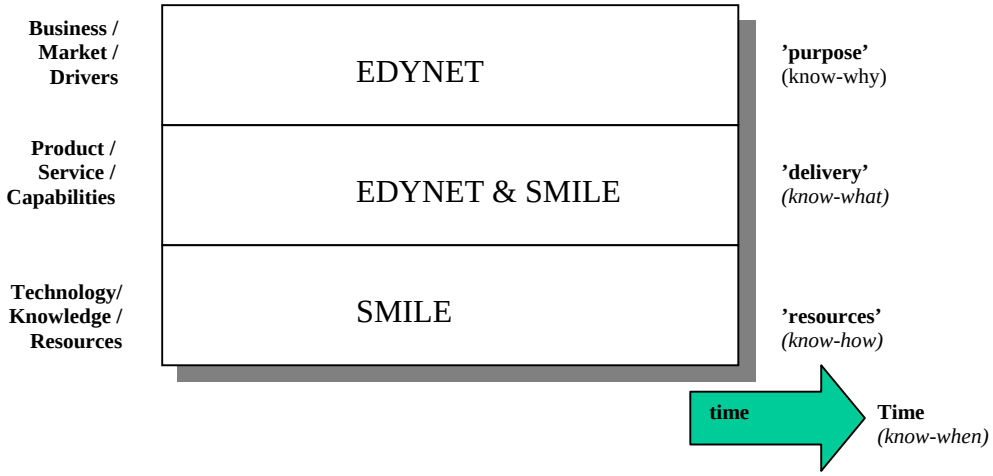

Figure 1. Technology roadmap and positions of SMILE and EDYNET within roadmap.

2.2 Research problem and research questions

Basic principle of SMILE study is communication and ebusiness in supply and demand network of global customers and SME service provider network. The SMILE study does not concentrate exclusively on computer based ebusiness systems but extensively on communication between participants via different information channels.

Research questions of the study are (1) what communication needs are between principals and SME network service providers; (2) what kind of ebusiness architecture is needed between the customer and SME network; (3) what kind of ebusiness solutions and processes add value between customer and SME network; (4) what system integration needs are between partners; (5) which factors and how they effect on ebusiness architecture; (6) what kind of advantages can be attained by ebusiness solution in maintenance service business; and (7) relevance of time factor, which consists of long-term planning (resource planning), mid-term planning at master-scheduling level (rough-cut capacity planning), short term planning at the detailed or work-centre level (capacity requirements planning) and operational processes (e.g. froze orders).

Main picture of the SMILE research is presented in figure 2.

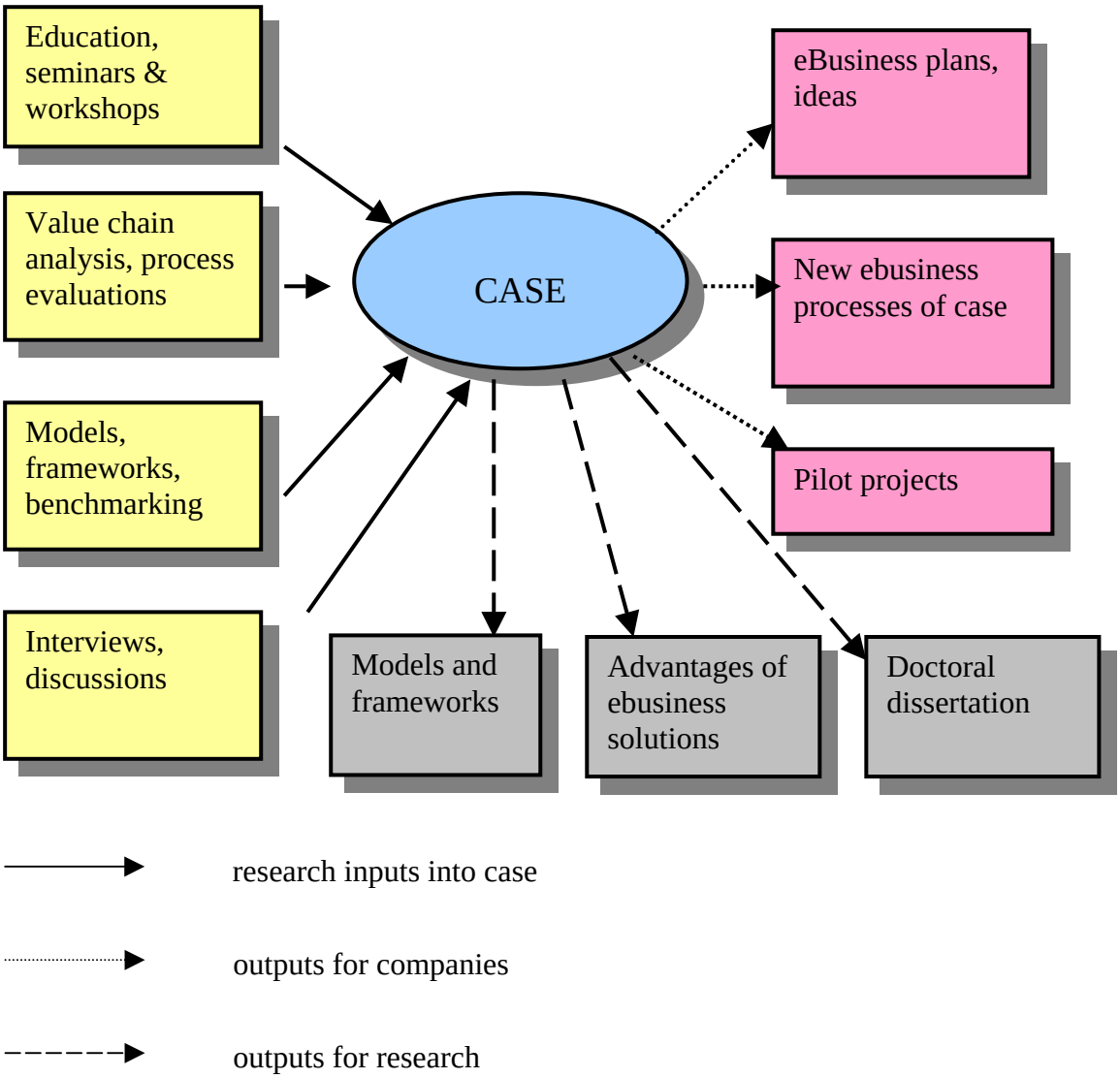

Figure 2. Main picture of SMILE. Inputs and outputs of SMILE study.

2.3 Research methodology and process

SMILE research strategy is qualitative and applied case study. The qualitative and case study was chosen to gain deep access to the practices of information systems of case networks.

This report concentrates on generic as-is-state of ebusiness in Finnish networks, and some future considerations. Maintenance network case will be studied in more detail in further research.

In this first research phase, (1) literature review of best practices; (2) Finnish ebusiness best practices in different industries (about 15 cases); (3) benchmarking of four cases (maintenance and operations network, machinery industry network, mold network for plastic industry, and media and communication network); and (4) interviews (interviews were performed with IT consultants, process consultants, operators and end users of systems; totally 12 interviews were carried out; workshops were also used as a study method) are applied as study methods. According to Riggs and Robbins (1997), best practices and benchmarking are not synonyms. Benchmarking is systematic and ongoing, while best practices are only sharing of good ideas. With benchmarking organization needs for improvement by comparing own business with own industry or outside industry are assessed. Best practices are actually a part of benchmarking. Best practice analysis, without the complete understanding of the work process and clearly identified process boundaries, can be only marginally beneficial.

2.4 Concepts

The main concepts of this report are introduced in this chapter.

Networking is cooperation between business partners in horizontal and vertical chains. Networking concept is used when there are more than two cooperative partners.

Supply chain network. A network of connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users. (Christopher, 1, 1998.).

Supply chain management is a valuable and widely applied approach to logistics problems. However, it is fuzzy in the sense that the scope of the investigated supply chain system may be anything between a minor activity and a highly complex relationship chain of several independent suppliers and customers (Cooper et.all, 1997).

The concept “supply chain management” is widely used, although it is not a chain but a network and ideally it should be “demand” not “supply” that drives it. (Christopher, 2, 1998).

Supply chain management clearly lacks the ability to deal with all logistics problems and thus fails to incorporate logistics in a paradigmatic sense. Major misfits are: 1) Supply chain management touches only companies´ internal materials, information and money-flow management, or inter-company level management of these flows in cases where the linkages of the companies are clearly identifiable. Larger scale issues concerning a certain line of activities or macroeconomic scale activities are left outside of the scope of supply chain management. 2) It is not able to accommodate complex networks, with many companies operating with conflicting goals within the supply web. (Vafidis, Dimitrios, 2002, p.42) .
In this report, supply chain management is related to **network management** where linkages of the companies are always not clearly identifiable.

Ebusiness is integration of business partners, processes and information systems by utilising Internet technologies. Figure 3 describes the scope of ebusiness.

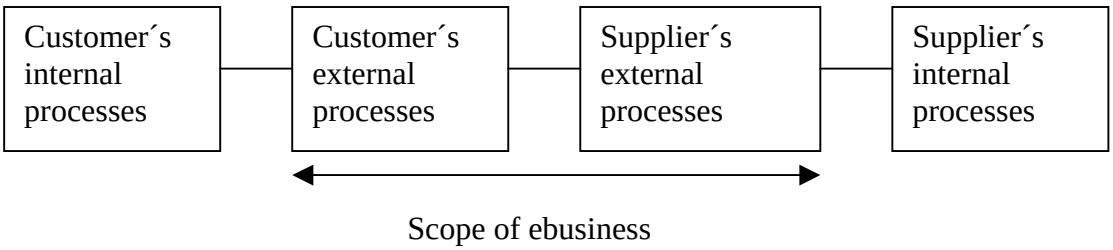

Figure 3. Scope of ebusiness.

Ebusiness model is a method of doing business in Internet by which a company can generate revenue to sustain in business or a method that support business and help to gain and maintain competitive advantage.

Network information hub is an information system that coordinates information flows and manages material flows in network.

SME (small and medium sized enterprise) means in this study a company that employs less than 250 employees and whose turnover is less than 40 million euros. Micro sized enterprises employs 1-9 employees, small sized enterprises 10-50 employees and medium sized enterprises 51-250 employees. This is the Finnish scale for SME definition. (Yrittäjät web site, 2003).

3. RESEARCH BACKGROUND

In this chapter, the general background for SMILE study is presented. Case related background is introduced in next research report. Background is derived from researcher's own experience of networks and information systems (researcher has been project manager in small Internet solution enterprise for 5 years), interviews and seminars, literature, and EDYNET research.

3.1 Successful business and competitive advantage of the 2000´s

The successful businesses of the first decade of 2000 requires new kind of tactics, business models and tools. Effective business design and execution depends on how technology is used to deliver services faster, cheaper, and with better quality than competitors.

Kalakota & Robinson (2000) present the following basic requirements for business success:

- Be customer focused. Create customer central processes.
- Value creation is a continuous process. Even the best business designs can have short life spans.
- Transform business processes into digital form. Digital information is more efficient to create, search, refine, maintain and share.
- Decentralize management but centralize coordination. Integration efforts to coordinate complementary but independent companies of network must find ways to deal with the inability to control everything from one point. This approach calls for breaking up large applications into smaller pieces that each have defined responsibilities and can communicate with each other.
- Create ebusiness application architecture. The architecture addresses three critical elements: (1) interface for customers and suppliers, (2) integration of processes and information systems and (3) innovation of more advanced applications that improve business.
- Integrate, but plan for continuous growth and change. The value from technology investment should be maximized in changing environment.

According to Christopher (2, 1998) real competitive advantage comes from a combination of loyal customers, committed customers and a superior supply chain. First, customer is demanding higher levels of performance from suppliers, particularly with respect to delivery service. The challenge to organizations and supply chains is to recognize the service level requirements of the customer segments and to restructure their logistics processes to fulfill those requirements. Increasing customer retention provides higher earnings through customer lifetime. Second, companies focus on time when they manage their operations and formulate their strategies. The ability to move quickly, whether it is in new product development or in replenishing customers´ inventories, is increasingly recognized as a source of competitive advantage. Time reduction does not only lead to faster response to customer needs, but can lead to cost reduction and greater flexibility. Third, to make supply chains and networks more effective in satisfying end customer needs requires cooperation between organizations in the network. This can be achieved through inter-organizational process integration and information sharing.

In modern, fast changing environment, the companies´ competitive capability depends on agility, adaptability, and alignment (AAA). Agility helps to respond to uncertainties with speed and effectiveness; adaptability helps to adjust to the shifts in the supply chains and networks, and alignment helps in synchronizing multiple interests and incentives. Agility and adaptability include the aspects of preparedness and readiness in crises situations, design flexibility, supply flexibility, performance management, and tracking and tracing. Alignment concerns alignment of information, identity, and incentive. Information alignment means sharing common knowledge, to achieve visibility for better planning. Identity alignment means that the roles and responsibilities of the partners are clear in order to act efficiently and with flexibility. Incentive alignment means accountability of cost, risk, and gains; all partners should share equitably, and agree on overall performance measures and targets. (Lee, 2004 & Lukka, 2004).

Nickles et.al. (1998) catalogues nine key outcomes for leading firms which will enhance their competitive advantage by exploiting information:

- new customer / vendor relationships (e.g. electronic catalogues and request bids);
- new insights about customers and markets (e.g. gathering knowledge about end customers);

- market efficiencies and channels fully exploited (e.g. electronic over-stocks sales by optimising trade-off between price and inventory costs);
- transformed products and services (some traditionally physically distributed products like software can be replaced with digital distribution);
- restructured multi-enterprise / cross-industry value chains (manage supply chain or network of different firms with information);
- the capacity for real-time decisions and simulated outcomes (optimal decisions by utilizing information and simulation of alternatives in supply chain when changes take place);
- the ability to manage global complexity and mass customization (contacts to end customers to respond local and customized market requirements);
- the radical acceleration or elimination of traditional processes (e.g. digitalized bank services); and
- continuous innovation of supply chain processes and information utilization.

3.2 Characteristics of SMEs

Business models of SMEs and operations usually differ considerably from large companies. Thus business relationships and ebusiness solutions also differ from the ones that are between big companies. Some important characteristics of SMEs and SME information systems in the perspective of this study are introduced in table 2.

Table 2. Characteristics of SMEs and SME information systems.

Characteristics of SMEs	**Characteristics of SME information systems**
Environment adaptation is the source of competitive advantage.	Medium-sized companies have ERP systems. They have also developed intranet and extranet services. EDI connections and customer extranets are used when customer requires.
Business and especially IT and ebusiness planning are not used to full extent.	Micro and small enterprises rarely have multi module ERP systems. Email, Internet connection, office software and invoicing/financial application and a few computers can be in use. Only a few persons use IT in micro and small companies.
Personnel is multi-skilled and thus resource utilization is good.	Internet utilisation is mainly coming for small companies from information searching and Internet mass marketing web sites.
Transparency in internal communication because of flat and non-bureaucratic organization structure.	In SME network there are great differences between companies how they utilise information and communication technology.
Small companies have not big resources to develop their business and operations. For example contracts from customers must be large-scaled in order to make investment decisions.	SMEs lack of knowledge and resources how to take advantage of information and communication technology. SMEs rarely comprehend how Internet can add value for the business.
Large customers often have negotiation power against SMEs.	SMEs lack system planning and definition knowledge. Because of adaptive role in supply chain, SME´s business can change quickly. Thus information system must be flexible enough to respond these changes. SMEs often have not information technology strategy and thus system development is not systematic. (Kettunen & Simons, 2001).
SMEs usually have small transaction volumes, and they interact with a small number of trading partners.	Business software is planned for big companies and they are too expensive and heavy for SMEs.
Processes are rarely standardized because of flexibility requirements.	Supply chain networking contrives new requirements for information systems of SMEs. (Kettunen & Simons, 2001).
Small enterprises often operate on local markets.	SMEs find less benefit through intranet than big businesses because of characteristics of closer physical location of staff on single sites and greater personal familiarity amongst them. (Chapman et.al., 2000).
	Non-standardised processes are difficult to manage with information systems.
	Implementation of information system often is faster than in large companies.

3.3 Expectations of global customer for its SME suppliers

Because of hard global competition customers place strict demands on their local SME suppliers. Price competition contrives cost reduction pressures for entire supply chain. Thus customers require SME suppliers to cut costs and to improve quality and responsiveness. Supplier performance is evaluated continually by globally set performance metrics and local SME suppliers are compared to global supplier performance.

Customers wait for more responsibility and expertise in manufacturing technology development, part design and service concept design. Virtual and teamwork in inter-organisational projects will be increased between customers and their suppliers. Personnel move flexibly among different organisations. In common business processes development value-add targets for end customers of the supply chain are even greater possibility than cost reduction targets.

The current trend in many industries has been towards reduced supplier base to achieve high-intensity relationships with the chosen suppliers. SME suppliers must standardize their service processes and bundle up services and materials to service entities. Thus first tier suppliers operate as system suppliers, which manage their own sub-network.

In Finland customers aim to achieve total optimisation in cooperation with long-term supplier relationships. Even single source strategy is used in valuable and complex services, parts and subassemblies. Contracts especially with critical material suppliers and system suppliers are long-term and cooperation is deep. Long-term contracts are also used in critical indirect services and materials; for example in factory maintenance. Small suppliers rarely are first tier suppliers for global customers in direct material but operate at lower level in network. Small enterprises are used as first tier supplier more in indirect MRO procurements like maintenance, cleaning and guarding services.

SME suppliers contrive a relatively large part of administration costs of customers´ total administration costs, because of transaction volumes can be large but total value minor. Integrated ERP and ebusiness systems are tools to reduce these administration costs. Thus principals wait for their SME suppliers´ ebusiness readiness.

3.4 Networking and outsourcing

In the past the business model was transactional, meaning that products and services were bought and sold on short-term basis, and there was little enthusiasm for longer-term relationships. The result was often high-cost, low-quality product or service for the end customer of the supply chain. Today supply chains and networks are competing against each other. Supply chain must be managed as a broader unit, in which supply chain partners search for optimized solutions for extended value chain to add value for end customer. Multilateral strategies, goals and measures, transparent information and confidence are needed. Processes must be reengineered inter-organizationally. Supply network consists of many supply chains. Supply chains have their own managers, but furthermore different supply chains in network can have common network managers like system suppliers. Networked companies can belong to many different supply chains and these different supply chains can be competitors. Furthermore companies can be both partners and competitors simultaneously. Thus information cannot be totally transparent. The role of data security will be emphasized in the future.

Supply chains and networks must be dynamic because of changing environmental factors. Different kind of dynamic in network can be:

1) Participants change in network. Network strategy defines what kind of companies should be in network..
2) Customer needs define network participants. Suitable suppliers are chosen for customer project.
3) Participants change their business (e.g. new products and services).
4) Roles and responsibilities change in network for example in outsourcing decisions, mergers and acquisitions.
5) Quick response in event changes (e.g. exceptions, gap between demand and supply).
6) Competition inside network is needed in order to maintain competitiveness of the network. Cycles of when competition is needed to carry out depend for example on characteristics of the services or products.

In network different partner combinations have different characteristics and thus different relationship models. In figure 4, the effect of strategic significance and product expertise on relationship model is presented.

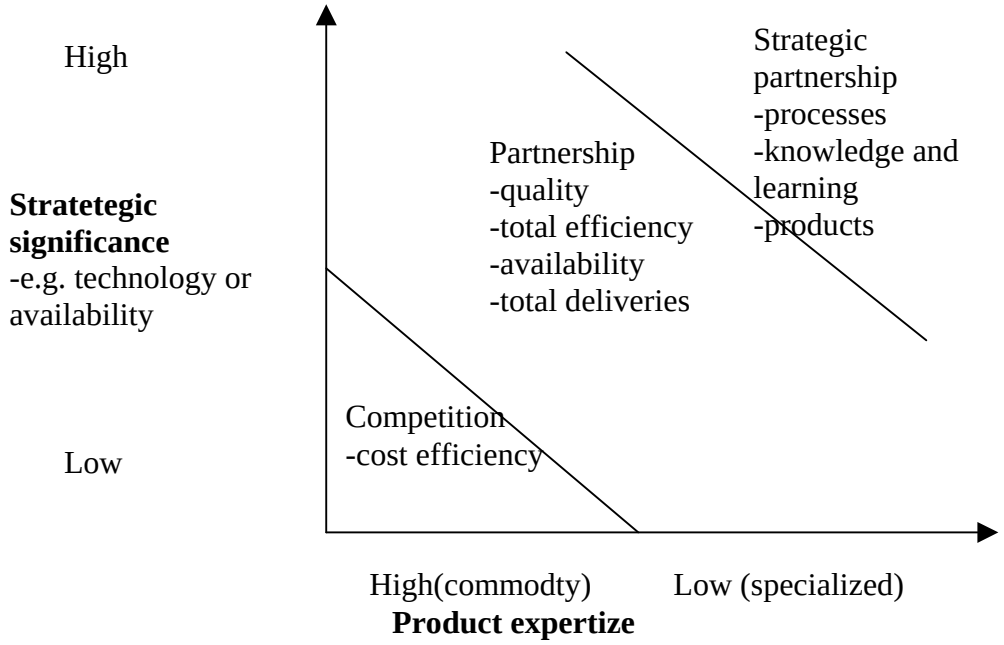

Figure 4. The effect of strategic significance and product expertise on relationship model. (Raunio, 2003).

In partnership and strategic suppliers do not only provide physical resources like raw materials, components and products, but also they supply competencies and capabilities, which more often than not will be knowledge based rather than product based. They response to the perceived customer needs to outsource an activities of their customers. (Christopher, 2, 1998).

In figure 5, some business relationship types, and ordering and replenishment models are presented. According to figure, order and replenishment models and utilized media will change, when relationship will deepen.

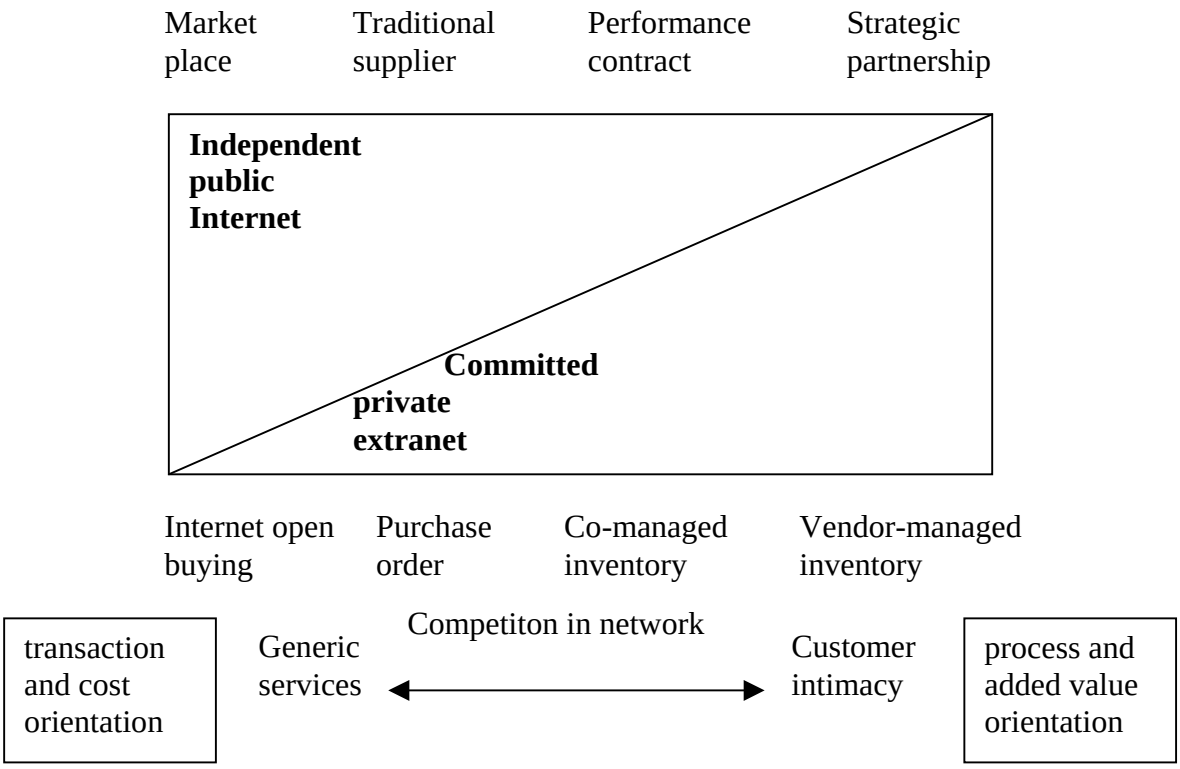

Figure 5. Different ordering and replenishment in different business relationships. (Poteri, 2003).

Lewis (1995) has studied number of companies, which have strong partnerships with suppliers. Typical benefits from partnerships include:

- ongoing cost reduction that can double those possible through marketing transactions;
- quality improvements that exceed that individual firms can do alone;
- design cycle times 20 to 75 per cent shorter than in traditional relationships;
- increased operating flexibility, which in some firms has yielded an economic lot size of one;
- more value for end customer, including faster and better responses to new needs;
- enhanced leverage with technology, including earlier access to new concepts and more control over technological change; and
- more powerful competitive strategies, gained when a customer adds its suppliers´ expertise to its own.

Networking and outsourcing have been increasing especially in rapidly changing industries where demand is difficult to forecast and technology develops fast. Companies pursue to decrease equity in order to maximize return on capital and they focus on business, which adds most value for their customers. Prahalad and Hamel (1990) defined the idea of core

competencies. They advocated that a company should focus on its key operations, that it does well, and via these operations a company can gain competitive advantage.

Companies concentrate on their core business, and in the smooth demand they utilize their own resources. Outsourcing is utilized in erratic demand and uncertainty is moved to outside providers. Outside providers have their own business models and competencies, which concentrate on efficient manufacturing, location selections, management of decentralised customers in different industries, large volumes, and demand fluctuations management. These outside providers can provide large-scale shared services for other network companies. In networked model participants can share risks (e.g. investments), which arise from uncertainty of demand.

First step in outsourcing is purchasing of resources from outside provider when customer pursues cost efficiency but not added value. In second step outside provider delivers services, which are bundled with products; for example maintenance services. Third step is to outsource part of the management for outside provider. In this solution service provider adds remarkably value for customer and is strategic partner of customer. Customer company often has portfolio of these different outsourcing solutions. (Siltala, 2003).

Outsourcing evolution path can also be divided (1) internal services; (2) partial outsourcing for local SME suppliers (usually subcontracting of parts, services and subassemblies, but buyer has plan, design and management responsibility); (3) global outsourcing services; (4) local networking and hub companies/system deliverers; and (5) outsourcing the management of function, if function is not core competency.

Global companies are more and more centralising sourcing globally. Especially, contracts are global with large suppliers. Some part of procurement is decentralised to local business units. Local business units often have tactical and operational responsibility to procure from local suppliers. This provides also opportunity for competent local suppliers to grow into global business players when they perform extraordinarily well with local business unit of global company.

The sourcing strategy defines the network or supply chain structure. Questions in sourcing decisions can be for example (1) what is made internally; (2) what is vertically integrated; (3) what is outsourced; (4) how many partners are used; and (5) can the partners have their own sub networks.

Selecting suppliers based on tough criteria and actively managing the relationship (e.g. monitoring performance) on a regular basis helps customers to contribute to their bottom line. Good supplier assists in the effort by helping streamline internal processes, reduce inventory levels, improve customer service, provide technical assistance and manage costs better (Avery, 2003). Today value-added services (e.g. electronic invoicing, EDI, financial services, service level reporting, bundled services and materials) of suppliers are important criteria selection process.

Virtual organization concept is related to networking. Byrne (1993) defines virtual organization: "A virtual corporation is a temporary network of independent companies – suppliers, customers, even erstwhile rivals – linked by information technology to share skills, costs, and access to one another's markets. It will have neither central office nor an organization chart. "

According to Byrne (1993), virtual organizations are utilized to gain access into new markets or technologies, and break down market barriers to new products by rallying the required expertise or core competencies from group of companies

Virtual organization can have a manager or hub company, which manages other network companies. Some company in supply chain or network may concentrate on supply and demand chain or network management. Core competencies of supply chain manager are rabid creation of alliances that fulfill customer needs; high skilled financial accounting; rapid decision making; insightful negotiating; efficient transaction processing; intellectual capital, innovations, new concepts products and services; ability to design and implement outsourced networks rapidly; continuous monitoring and management of the sourced network; and customer management and customer channel control. (Means & Schneider, 2000).

Core competencies of supply chain manager are very immaterial operations. The hub model is introduced more specific in chapter 3.5.

Communication and therefore information technology usually is an important part of virtual organization, because wok tasks are shared between partners. Partners are not only keeping up to date with each other's work, but they also monitor progress of the whole work process and carry out their work simultaneously and in a complementary manner (Intorna, 2001).

Also large global companies utilise network management philosophies in their own business unit management. Some decisions are made centrally and globally but some responsibilities have been decentralised for local units. Network manager or hub is analogous to global company headquarter and network company is analogous to global company business unit.

Decentralized responsibilities, difficulty of coordination (Karhu, 2002), poor flow of information, inaccurate and untimely information (King at.all. 2002), and some external factors (e.g. trades unions can delay outsourcing) can set challenges and problems on network model and outsourcing. Furthermore opportunistic behaviour complicates cooperation and transparency in network. Opportunism decreases if participants know and trust each other, transactions are repetitive, contracts are long-term, and all participants benefit about cooperation.

Company networks can be divided different ways. For example Sherer (2003) divides networks into (1) joint learning and resource sharing (e.g. training) networks, and (2) joint production and marketing networks. Resource sharing network can also be called as horizontal network and joint production network as vertical network.

Joint production networks involve organized cooperation with a significant degree of interdependence and specific shared interests, and therefore they have greater risk than joint learning and resource sharing networks. Coordination of roles, priorities, decisions and timings, and standardization of services and products are important in network in which is production cooperation. Joint production networks involve discrete groups of firms who agree to cooperate to achieve benefits not available to them independently. However, long-term contracts generally are not used, nor are formal joint ventures established with specific division of ownership. Large companies have long formed strategic alliances either through formal joint ventures or long-term contracts. Different networks have different goals and success measures. For example, learning networks may be considered successful if a certain percentage of employees exhibit new skills learned through information sharing. While this

learning may be required in co-production networks, the co-production network still may be considered unsuccessful until these skills produce new products and ultimately new sales. Trust, commitment, careful partner selection, customer acceptance, partners locate in the same geographical area, information technology, and intermediary or network manager lead to success of manufacturing networks. Information technology is important in order to coordinate interdependent activities. According to study information technology is not perceived to be an important enabler of SME networks. Other factors are more important when network is formed. Information technology plays supporting role, but it is not sufficient for network success. SMEs may be small enough to mange information flow through less formal means. Due to higher coordination intensity, information technology is adopted quicker in co-production networks than networks with other objectives. (Sherer, 2003).

Although network companies belong to network, they are independent. They have for example their own strategies, financial accounting and customer relationships. Furthermore they can belong to other networks, which have their own strategies. Therefore, network rules cannot be too stiff. Companies run their own business, but simultaneously they must agree with network rules.

Networking, mergers and acquisitions enable rapid change and market penetration and make possible to provide one-stop-shop or full service for customers, when complementary competencies are combined. Furthermore in network, companies can share their resources, costs and risks in for example technology development. However, process integration and standardization and information system development are not rapid enough to respond the needs of customers.

From traditional industries, construction industry is very networked. New teams are formed for every new project and these teams disperse once the project is complete, thereby, contributing to the fragmentation. Also a construction project itself is a complex activity involving several multi-disciplinary participants. It is a team effort, which involves several inter-organisational activities and dialogues. However, the uptake of electronic commerce in construction has been relatively slow compared to other industries. It is seen that a majority of the industry players are unsure of the exact benefits of electronic commerce applications in construction. (Ruikar et.al., 2003). On the other hand relationships are short because construction business has traditionally been based on competition of suppliers for each

projects. Flexible web based project management systems for short-term relationships have been utilized until recently.

According to Korolainen (2002) some Finnish furniture industry companies have attained competitive advantage from network efficiency. In those successful cases is defined supply chain strategies, which includes clear partner roles and commitment rules. Furthermore, common information systems are used at information sharing among partners.

3.5 Hub company in supply chain or network

Network hub must manage both its customer and supplier network (figure 6). It can provide services also to other hubs. Traditionally the strongest firm in the chain (e.g. brand owner) has been the hub company. Supply chain can include many hubs like in food industry supply chain, in which large producers and retailers act as hubs. Nowadays large companies decrease their supplier base, which means that some SME suppliers must take responsibility of total deliveries and grow with customer. Those SME suppliers develop as hubs or system deliverers between their large customers and their SME suppliers. OEMs of electronics industry are examples of new hub companies in supply chain.

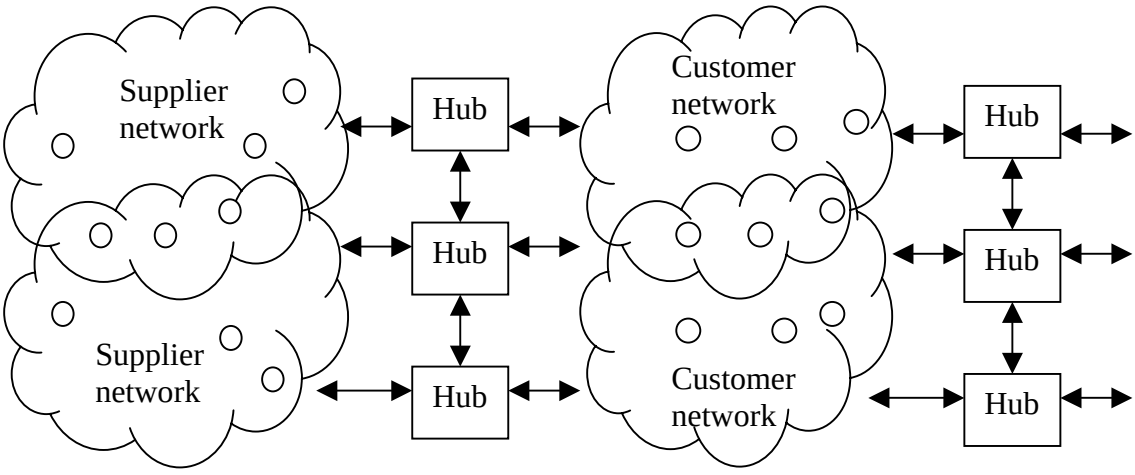

Figure 6. Network hub.

On the other hand every company in supply chain has its own customer and supplier networks and acts some kind of hub in the company network. In figure 7 is presented management areas in the perspective of the one company in vertical supply chain.

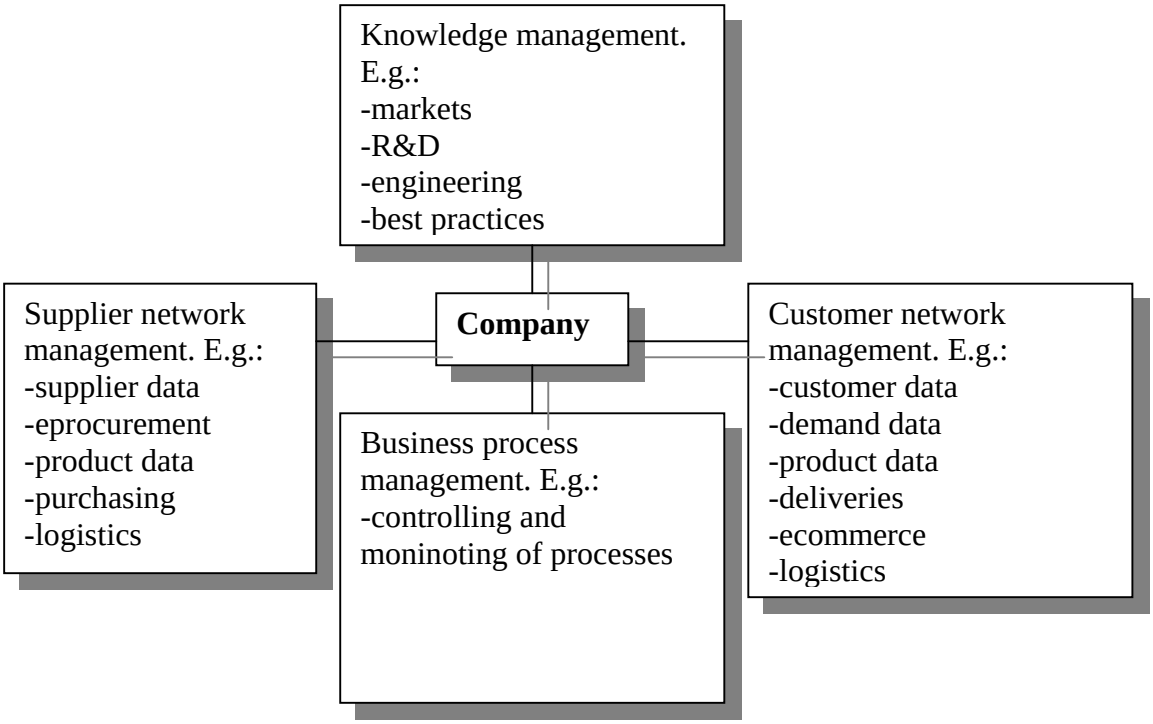

Figure 7. Company and its management needs in vertical supply chain (Laaksonen, 2001).

Hub company needs total management knowledge, deep industry knowledge, deep supplier and customer knowledge, and coordinating competence. Analogy to a hub in company network is a project manager in project team. Hub orchestrates the network by managing and aligning demand and supply. It aggregates customer needs, demand and quality requirements information from its customer network and forwards that information to its supplier network. Furthermore hub can manage economical trends and seasonal demand by having customer relationships from different industries. Hub makes decisions how to solve customer problems by optimising network resources from the perspectives of quality, costs, speed, flexibility and reliability. Hub company integrates various product and service components of different companies into one customer-oriented service offering, and therefore facilitates supplier relationship management of their customers.

One role of the hub is to market the network to new potential customers, if it is the goal of the network. Then sales personnel, sales support material and contract negotiation skills are needed. If the goal is to concentrate on present customer network, then the focus is on improving the existent customer relationships.

Hub company usually has some total responsibilities like total deliveries for customers including risk, financial and project management. Risks, costs and production can be

decentralised in supplier network but hub has total responsibility towards customer. On the other hand, hub can have responsibilities like marketing and sales towards its supplier network. Hub can even take management responsibilities from its suppliers and customers. In ultimate form it can even plan (e.g. budgets) and make decision on behalf of suppliers and customers.

Hub can provide horizontal services (e.g. information technology, human resource management, procurement, education) for network suppliers. It can for example coordinate network procurement by aggregating similar needs of network companies and thus achieve more negotiating power in direct and indirect material procurement. If the network consists of small number of suppliers, and the suppliers are small companies, then advantages can be modest.

Furthermore hub aggregates information of new technological choices and actions of competitors. Thus hub manages and shares business intelligence information in network, which makes it possible to proactively utilise opportunities and prevent threats.
Hub integrates customer network and supplier network processes and information systems if needed. It can develop common network information system. When a company operates as a hub, the information flow, which moves through it, increases exponentially related to situation it was a traditional supply chain company. Hub must have knowledge of supplier network capacity, products, services, process and inventories. The role of a hub is more in expertise, infomediary, information refinement and management than in manufacturing services. Hub company does not necessarily process all information like technical details, but it must manage the total information (e.g. share technical details for right companies and persons).

Hub company needs networking competences like ability to create relationships, network strategies (e.g. customer, service level, product/service strategies), network rules, and eventually organize and manage the network. To create networks requires especially marketing and social competences, and trustworthiness. In the beginning valuable ability of hub is to give up some of its operations and delegate them to network companies.

When SME supplier proceeds into being a hub, the business strategy and model will change. New structure requires re-organising. Some customer operations move to hub and some hub

company operations to its supplier network. Task of hub is to develop new total concepts to better serve customers. Hub must prove for customer and supplier network the value that hub model can add.

Cost accounting and cost knowledge of the network are necessities for hub company especially when it outsources its operation to its suppliers and proves to customers that hub model surpasses the traditional model.

Administration and transaction costs and safety margins must be minimized in the networked model, because otherwise competitive ability is lost because of costs. To avoid this, process and information system boundaries must be standardised. Effective invoice coordinating and payment allocating are important in networked model. This means that supplier network sends one invoice for customer and allocates customer payment for network suppliers. Costs and gross margins of different companies in network can be decreased because of economies of scale when companies concentrate on their core operations.

One of the best practices of a hub model is i-mode mobile phone service concept of Japanese NTT DoCoMo company (figure 8). I-mode operates between customers (cell phone users) and different service providers from different industries (e.g. content providers, cell phone manufactures, network providers). Its core business is customer and supplier relationships management. An information hub is a critical part of i-mode concept. The tasks of the information hub includes for example to bill customers from different services and to allocate revenues for supplier network. (Saarinen et.al., 2003)

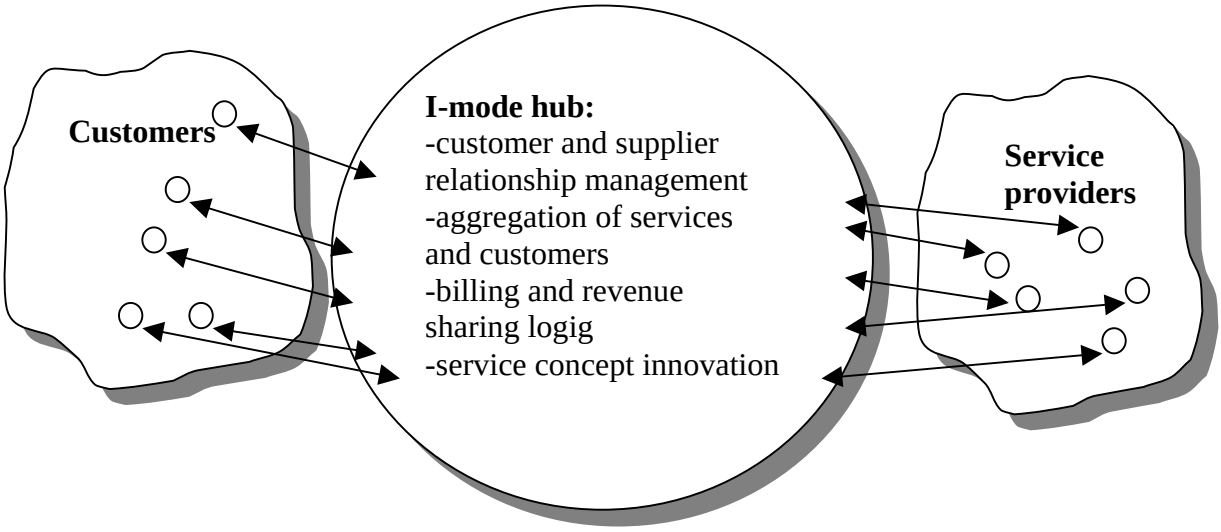

Figure 8. I-mode business model.

In Japan the networks of different industries compete against each other, when in Europe companies or supply chains compete against each other. In Europe there is not one customer relationship manager for example in mobile phone services for customers. Therefore, customers have many contact points to different suppliers and transactions between partners are ineffective. In Japan competition is based on services, while in Europe competition is based on price.

4. EBUSINESS IN SUPPLY CHAIN AND COMPANY NETWORK

4.1 IT and ebusiness background

The mega trends of information systems are (1) from technology central to business central; (2) from wide and complex total systems to decentralized small and simple services and applications; (3) from own system to leased system; (4) from proprietary and legacy systems to flexible and networked systems; (5) from customized systems to modulated systems; (6) wireless, mobility and new terminal devices; (7) the role of information system from support process to primary process. (Hiekkanen, 2003).

ERPs have been used since the beginning of 1990´s to attain and maintain competitive advantage of individual firm in supply chain. During the ERP wave big companies achieved a best practice model and standardization for internal processes. ERP optimises business of an individual company. Integrated ERP packages are based on real-time information. Once information is entered into the system, it is usable for every function or companies immediately. Also medium-sized companies have implemented enterprise wide ERPs at the end of 90´s and in the beginning of the 2000´s. Small companies use mainly financial and invoicing applications. Ebusiness and supply chain solutions make it possible to optimise end-to-end supply chain by integrating information systems of supply chain participants. Integration tools are needed to link different systems among network partners or even internally in a company. Software vendors emphasize that software support system integration. However, in practice it is not so easy because data coding is always different in systems of trading partners. Technologies do not solely solve integration issue. Example of integration of internal different systems of company is presented in figure 9. In the figure is also presented different user devices, which can display information.

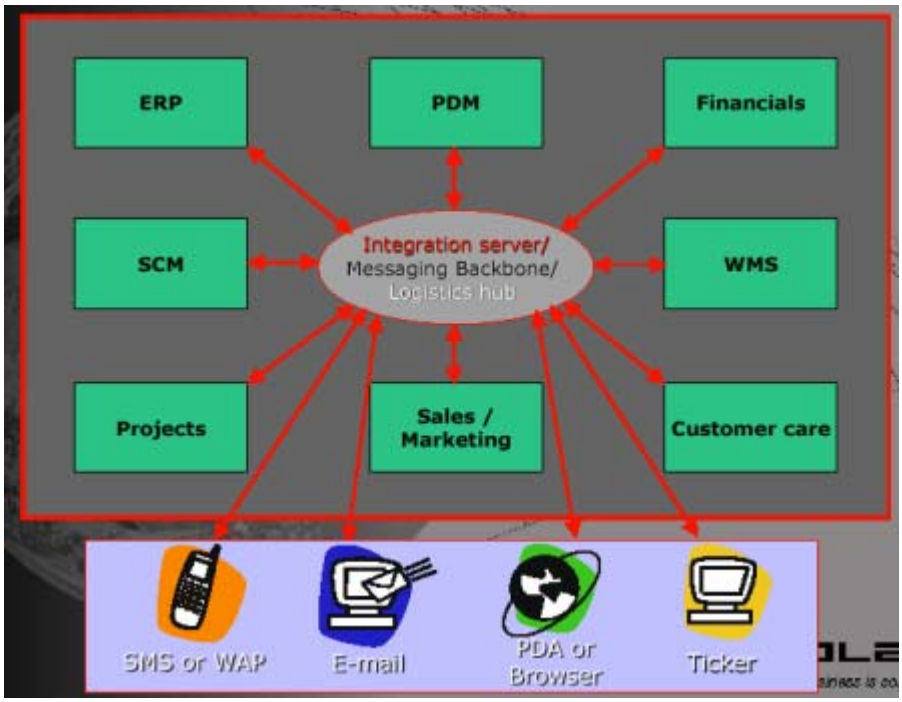

Figure 9. Integration of different systems internally in a company. (Puukilainen, 2002)

Networks may need total network information system or some integrated systems because of its effectiveness requirements. Network system can be used for example in (1) resource management (personnel, machines, equipment) in networked companies; (2)work supervision; (3) network deliveries management (e.g. order fulfillment); (4)efficiency control; and (5) financial management (Kettunen & Simons, 2001).

Network operations, processes and information systems should be developed in parallel. The task of the network information system can be coordination of information from different sources like network companies´ own ERPs. Information sharing and timings are crucial in networked business model. In order to make network model competitive, network resources, quality, delivery times etc. should be managed alike as one company. Network information systems have been utilised for example in inventory management where decentralised inventories are managed centrally. In figure 10 integration of different systems in a company network utilising operator is presented.

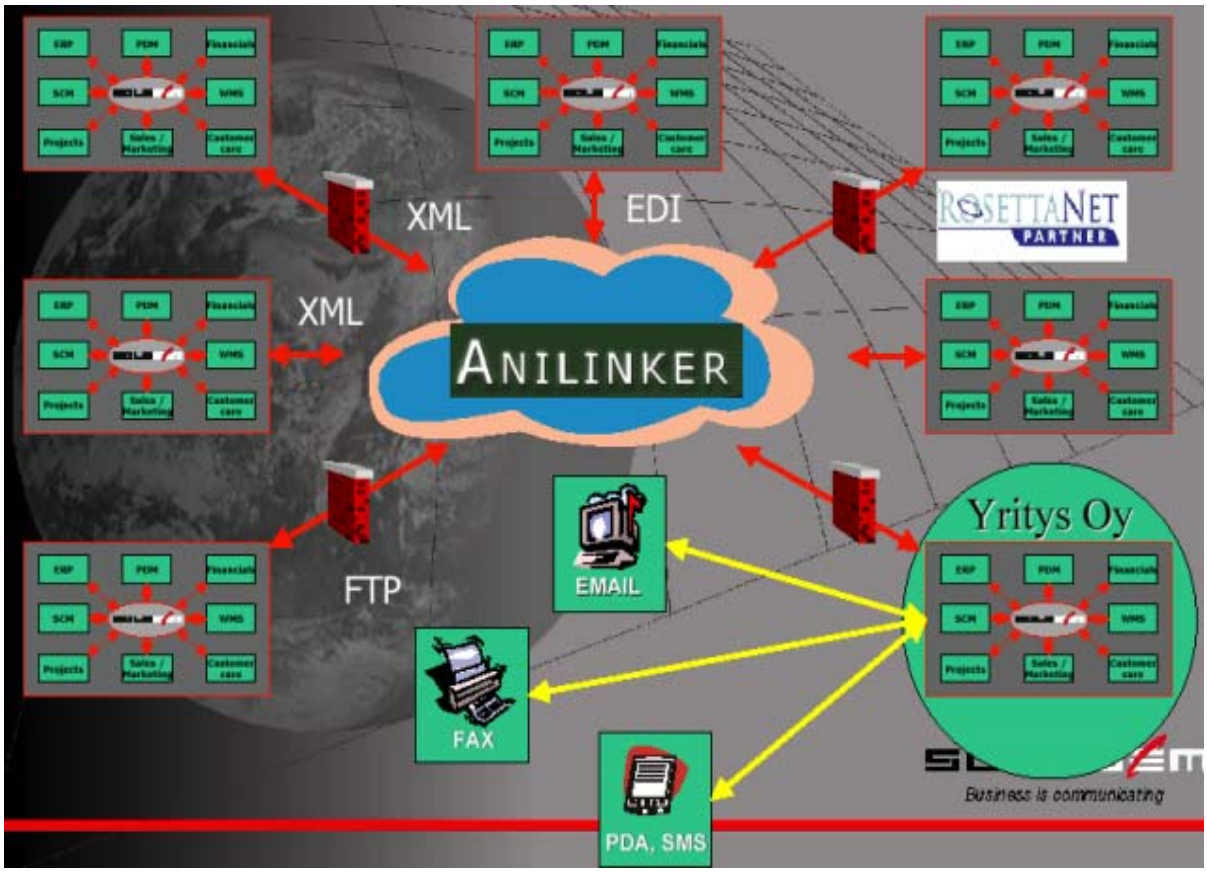

Figure 10. Integration of different systems in company network. (Puukilainen, 2002)

Network integration is a complex process. To create a business case there must be considered (1) technologies (e.g. xml, web services); (2) standards & processes: (e.g. RosettaNet or ebxml); (3) present information systems; (4) business network companies (e.g. suppliers, customers, banks, logistics service providers); (5) service providers/operators; (6) consultants; (7) software companies; and (8) integrators. Because of that complex entity, solid project management and planning skills are needed to create successful ebusiness network. Furthermore, common models and concepts are needed to help communication among different participants in network information system projects.

In networked supply chain numerous different ebusiness solutions are needed depending on partners´ readiness, development will and processes. This creates complexity in information exchange, as a following case example presents:

- from customer 1 forecasts and orders from customer´s extranet;
- from customer 2 orders and drawings via customer´s operator;
- from customer 3 orders are entered as batch file to supplier´s ERP;
- from other customers orders via phone, email and fax;

- orders to supplier 1 via supplier´s extranet; and
- orders to other suppliers via phone, email and fax

Furthermore, processes are always not completely automated. For example an order can be moved automatically from customer´s system to supplier´s system, but invoicing can be performed manually or semi-automatically via extranet.

Information system automation, integration, intelligence and information real-time needs must be considered case-specifically. Computer could perform automatically some transactions and decisions, while human is needed in some other transactions and decisions. A rule of thumb is that routinely and repetitive transactions and decisions should be computerized utilising automated messaging. Also some human-to-human interactions can be digitised; e.g. electronic discussion forums. Complex decision situations often are too difficult to model and computerize because of large number of parameters.

The study of the Scottish electronics industry suggests that the primary objective of firms in developing inter-organizational information system is not to improve efficiency of exiting information processing activities, but there is a recognition of the value-added that information can contribute to the business. Only 27 per cent of firms highlighted reduced costs, while 86 per cent were motivated by the potential to access a greater quantity of better quality information. However systems were used to support established business rather than to help the firms to generate new business opportunities or to support new collaboration models. 69 per cent of the surveyed firms suggested that the system had facilitated closer relationships with partners, but operation models and patterns remained virtually the same for 71 per cent of the firms. Nearly 50 per cent of firms have substantially reduced their use of traditional communication media such as postal services and telephone. (Li & Williams, 2001).

According to Vepsäläinen (2003), the study of 25 Finnish companies indicates that:

- Different ebusiness “isms” like customer relationship management (CRM), vendor management inventories (VMI), and collaborative forecasting, planning and replenishment (CPFR) are mainly in planning or pilot stage in Finnish companies.
- Visibility to customers and/or partners, and automation and collaboration through supply chain management (SCM) systems are in planning stage or in early

implementation in Finnish companies. Knowledge management, epurchasing and emarketplaces are considered or they are in planning stage.

- In 2002 the 60 per cent of studied companies had intra-enterprise information system integration, and 28 per cent of companies had inter-enterprise integration.
- Short-term plans are more likely to be done together with partner than longer terms plans. Joint planning is utilized in delivery schedule (69 per cent od companies), shipment composition (58 %), products (53 %), production schedules (49 %), material purchases (47 %), inventory levels (46 %), production plans (38 %) and marketing campaigns (30 %).

Different ebusiness application groups are introduced in table 3.

Table 3. Different ebusiness application groups.

Content management and publishing	E.g. catalogues, product information, support information and manuals (e.g. supplier manuals).
Knowledge management and business intelligence	E.g. elearning, market information, customer and supplier relationship management and competitor activities.
Integration applications	E.g. internal integration applications and integration applications between partners.
Transaction applications	E.g. ecommerce, ordering systems, auctions and exchanges.
Collaboration applications	E.g. product development, R&D, supply chain/network management (e.g. distributed manufacturing and project management) and planning and optimization (e.g. capacity and sales planning).

These application groups are considered more specific in the next research report. In another perspective, applications can be divided into **operational applications**, in which the goal is to make present business more efficient and to produce data into business intelligence applications, and into **business intelligence applications**, in which the goal is to support to observe the opportunities and to transform these opportunities to new business.

4.2 Internet as enabler and driver in supply chain

Nowadays, in many industries it is important to rapidly identify and develop new business concepts and create appropriate networks to do business. Business management process is

very dynamic because product and service life cycles are shorter. There is also need for an efficient transaction process, financial and brand management. (Means & Schneider, 2000). IT has dramatically transformed the way companies use their supply chain operations to achieve competitive differentiation. Successful firms have used IT to support their business strategies and priorities. (Nickles et.all, 1998). In the middle of 90´s Internet created a discontinuous technology shift, where potential options and management strategies for use of information technology became much broader and pervasive. New firms were created while large and medium-sized organizations began a process of transformation. (McFarlan, 2003). Internet has not just been an enabler but also a driver for new business models and value chain alternation. Some companies have restructured their supply chains. For example computer manufacturer Dell has moved to direct model in which it interacts with end customers. Necessity for value chain restructuring is to know cost effects of restructuring and value-adding possibilities for end customers. Margins and cost structures of as-is-state must be known. Also channel conflict risk should be considered.

IT and ebusiness strategy must always be aligned with company´s business strategy and supply chain or network strategy (figure 11). Supply chain and business strategies are starting points to IT and ebusiness strategy. However, new technological opportunities can re-shape supply chain and business strategies.

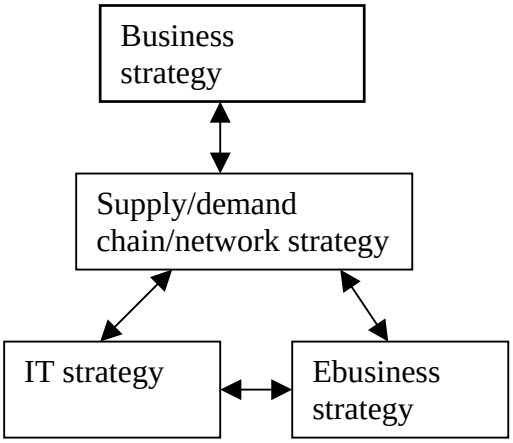

Figure 11. Alignment of strategies.

Ebusiness and supply chain strategy can involve for example (case Cisco corporation):

1) A single supply chain system. The entire supply chain is tuned to the same demand signal. Any change in one node of the chain is immediately transferred throughout the chain.
2) Information sharing in real time in supply chain system.
3) Direct fulfillment. Suppliers directly fill some orders. Fewer layers in supply chain.

Walter Haberland (2003) from StoraEnso presents the relationship of IT strategy and business strategy in figure 12.

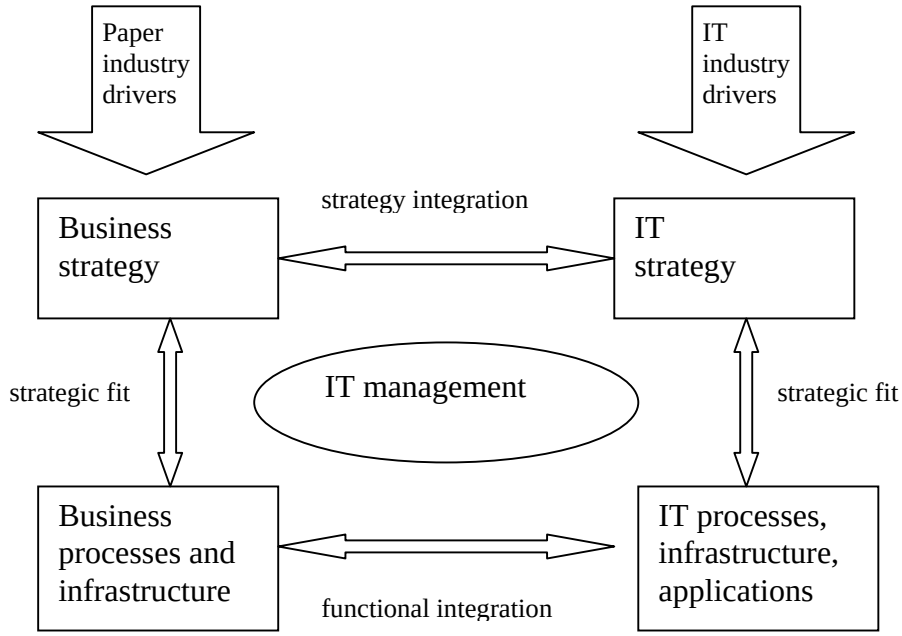

Figure 12. The relationship of IT strategy and business strategy.

In customer centred business customer needs and demand are the starting points of strategy processes and business model constructing. Process of creating customer centric business model and information system for new supply network is presented in table 4.

Table 4. Process of creating customer central business model.

1. Customer needs Customer central values, attitudes and activities in supply chain. Vision, business strategy and model, analyse of customers (e.g. customer profitability, needs), customer strategy and customer concepts.		
2. Network and/or supply chain strategy and structure.		
3. Business model of network or supply chain.		
4.Processes Business and network process streamlining, re-engineering, standardizing and integrating.	5. Organization Roles and responsibilities.	6.Enabling technology For example ICT.

Information systems provide tool in modern management. The information system project itself can be used as a management tool when business process is designed during the system project. Management has to be actively taking part together with specialists in the application design work to ensure the business vision is reflected in the systems. (Ruotila, 2003).

4.3 Ebusiness technologies, architectures and systems

According to Sawhney (2003), the Internet allows IT infrastructure to be decoupled from front-end applications so that systems can be agile and responsive at the applications level, yet be robust and scalable at the infrastructure level. A paradox of the utility computing paradigm is that infrastructure will become more centralized, while devices and user applications will become more decentralized. The Internet allows companies to resolve debates between specialization and generalization, centralization and decentralization, and scale versus focus through its ability to decouple systems, processes and companies. Centralization allows for better economies of scale and better coordination of activities across a company. The Internet lets companies centralize the back-end activities into a shared services organization that benefits from economies of scale while allowing front-end activities to be more decentralized and closer to customers. Decoupling is also reshaping the way companies decide the scope of their activities within the industry value chain. In the past companies believed that competitive advantage was gained through vertical integration. But it is difficult to be good at all activities in the value chain. It makes sense for companies to focus on what they do best and to outsource the rest. But if you cannot communicate effectively with partners and suppliers, the benefits of specialization are diluted because of the cost of coordinating activities across companies. With the Internet, companies no longer need to

compromise between specialization and integration. By reducing the cost of interaction between companies and their partners, the Internet allows companies to limit their operations to what they do best and to outsource non-core activities.

Network effect plays an important role in Internet business. When network of users extends, the value for users usually is adding. Therefore a critical user mass should be considered when ebusiness systems are developed. Internet auction, eBay, is good example of positive network effect on business.

Inter-organizational systems can take different forms: (a) dedicated system; (b) semi-closed systems such as Value Added Network (VAN); and (c) open systems such as Internet. Dedicated systems are built with an interface proprietary to a particular group of firms. The reasons for adopting this type of system are: (1) to lock in customers; (2) common standards were not available when these systems were implemented; and (3) confidence reasons. Semi-closed systems are based on standard, common purpose computing facilities and communication protocols using VANs. VANs establish an information link between the participants, and assist and add value to the communication process in some way. One of the most widely used standards for VANs is Electronic Data Interchange (EDI). EDI has been proven most effective in supporting operational applications, but not in more complex and strategically important applications and processes. In dedicated and semi-closed system categories, all parties involved in the systems are predetermined and have agreed to exchange information electronically. (Li & Williams, 2001). Large number of all suppliers can be technically unsophisticated and generally small to utilize traditional EDI solutions. Furthermore initial system set-up costs and on-going operational transaction costs exceed the operational benefits of system-to-system integration with traditional EDI. Therefore supply chains have begun to utilize Internet to solve the problem of EDI non-compliance of SMEs. Standard EDI messages can be sent via more cost-efficient Internet instead of VANs. Furthermore, more flexible Internet standards and formats (e.g. xml, html, web services) can be used in messaging instead of EDI standards. (Johnston et.all, 2001).

New kind of flexible information systems are needed in networked economy. The challenge is to combine efficiency, flexibility and customisation. Internet technologies have made possible to replace expensive, inflexible and complex point-to-point solutions like traditional EDI with solutions that use Internet and data security services. In Internet technology solutions

switching costs are much smaller than in traditional EDI solutions. Furthermore EDI do not support unstructured data like word documents and pictures. When the traditional EDI solutions apply to long-term business relationships, the Internet based solutions apply better to dynamic shorter-term relationships. However, Internet network and technologies are also utilized in long-term relationships because it provides cost-efficient and multifaceted solutions.

Johnston et.al. (2001) have studied Australia´s largest retail store chain, Coles Myer Limited. The case study describes how Coles Myer utilizes Internet-based EDI products to enable them to handle all their merchandise replenishments (approximately 10 000 suppliers) through a single centralized EC (electronic commerce) system. The starting point EDI infrastructure is presented in figure 13 and the target in figure 14. The traditional EDI infrastructure presented number of problems to Coles Myer. Firstly, there was the undesirability of maintaining multiple document distribution systems, including manual ones. Secondly, manual systems offered little opportunity to control the integrity of delivery data received from non-EDI suppliers. Thirdly, VAN-based approach did not provide reasonable solution for small suppliers, because of their lack of technical, financial and human resources. Besides some small suppliers have only manual business system. Coles Myer determined the following requirements for the new system:

- The system needs to support existing VAN-based EDI, because Coles Myer and its large suppliers had a considerable investment in that infrastructure. Internet system should leverage this existing infrastructure rather than replace it.
- There should be a single centralized system, intelligent gateway, to handle business documents from all applications of Coles Myer, and translates these documents to various formats, determined from a trading partner profile database.
- Internet hub should be used because its ability to interactively exchange information with small suppliers at low cost and in user-friendly form, for example via web browser.
- Data integrity between partners.
  (Johnston et.al. 2001)

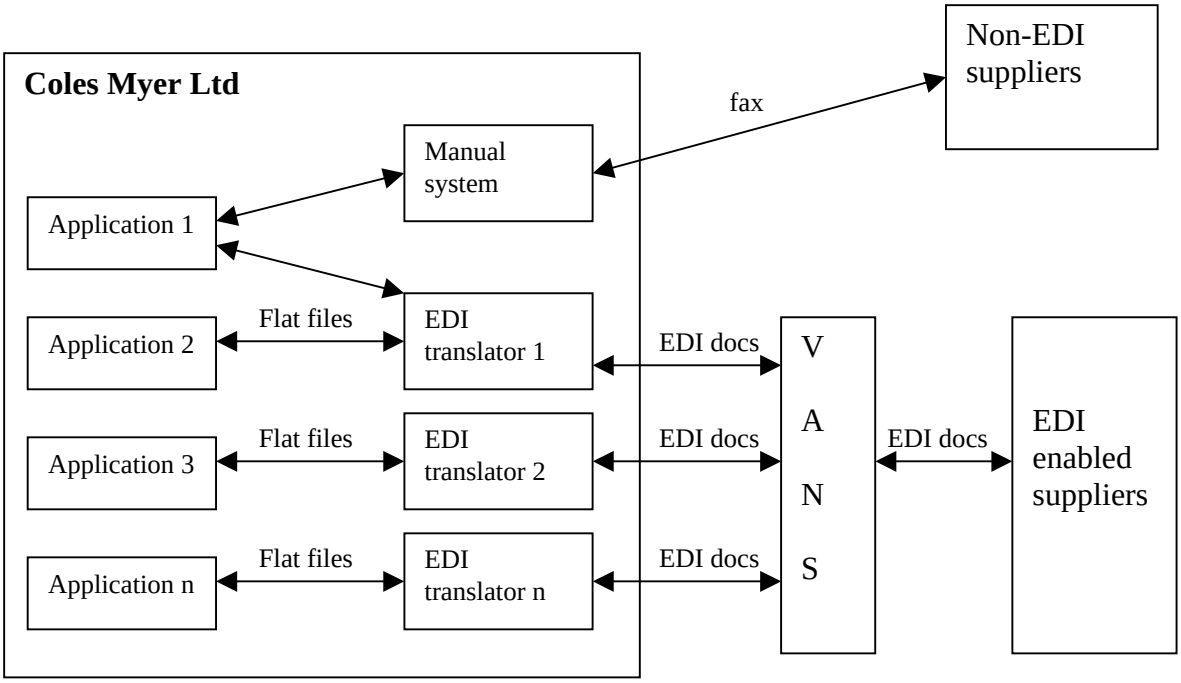

Figure 13. The starting point of EDI infrastructure at Coles Myer. (Johnston et.al. 2001).

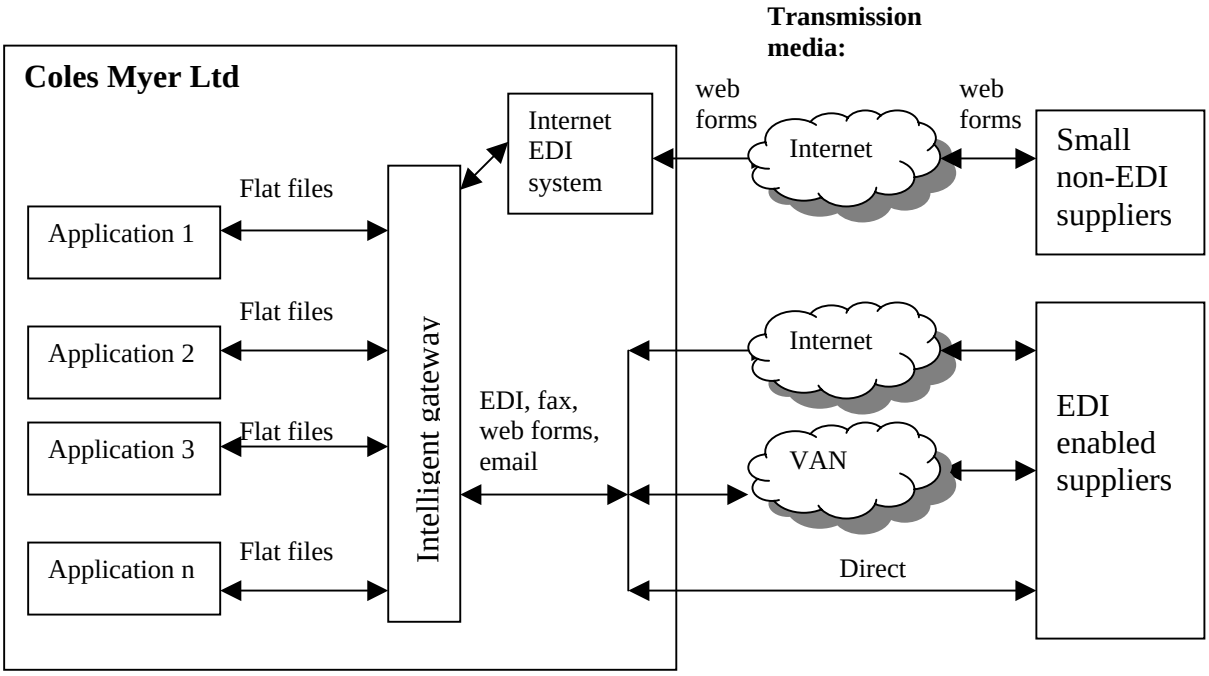

Figure 14. The target of electronic commerce infrastructure at Coles Myer. (Johnston et.al. 2001).

Information systems are traditionally based on client-server model. Internet will be more and more de facto environment in ICT. Most of software companies move their software as Internet enabled, and therefore they provide also thin clients-web browsers. Web browser can be user interface to different systems and user does not even know from which system information is provided for her. However this requires usually complex back end system integration. In the future web browser merges more and more to operating system and

desktop. Some systems are even programmed totally based on web technologies. When user interface is web browser there is no need to install system specific clients for users´ workstation. This is extremely important in network information systems because system users locate dispersed.

Web browser is good user interface when information structure is simple and data entries are minor. Web browser is not suitable to present complex information as complex order lines. However for example java applets can be used to diversify browser user interface. Different mobile devices like portable computers, PDAs (personal data assistants), cell phones, have become common. These devices have different display sizes and use functions. Therefore there is also need for different user interfaces. Mobile solutions suit especially for mobile employees like sales and service staff. Some characteristics of mobile devices are:

(1) mobility and independency of place (users carry a cell phone or other mobile device where ever they go); and (2) broad attainability (people can be reached at any time). GPRS, EDGE, WLAN and future technologies make possible to access easier and faster to information systems from mobile devices.

Peer-to-peer architecture is totally opposite for client-server model. Peer-to-peer architecture does not necessarily include servers, but information, applications and services are decentralised in different devices (i.e. workstations, mobile phones) in network. This brings however great requirements for data security. This architecture model is not very common in traditional business, but network business models support this kind of decentralized management systems. Web services are one technology, which supports this model. Napster has been the most famous example of peer-to-peer system.

4.4 Eprocurement and ecollaboration

Suitable business processes and people skills must be in place before systems are implemented. Next step is to share manufacturing and design information.

Procurement is a narrower concept than collaboration. On the other hand they are complementary. Eprocurement is concentrated more on commercial transactions between supplier and customer at the operational level when ecollaboration is concentrated broader on

common processes of supplier and customer at tactical and strategic level. Eprocurement is just an enabler of efficiency and therefore it frees up staff for more strategic work. Eprocurement has been successful but the real test for ebusiness is its ability to improve supplier relationships like supplier performance and management. When in procurement communication is between purchaser and seller, in collaboration different functions like marketing, R&D, quality, purchasing communicate (figure 15) to achieve optimal solution inter-organizationally and inter-functionally. Thus different teams or even people are networked to increase the effectiveness of the entire value chain. For example supplier defines customer needs and try to find the most suitable solution collaboratively with customer. Simultaneously when customers decrease amount of their supplier, the relationships with selected suppliers will deepen and the communication increase considerably.

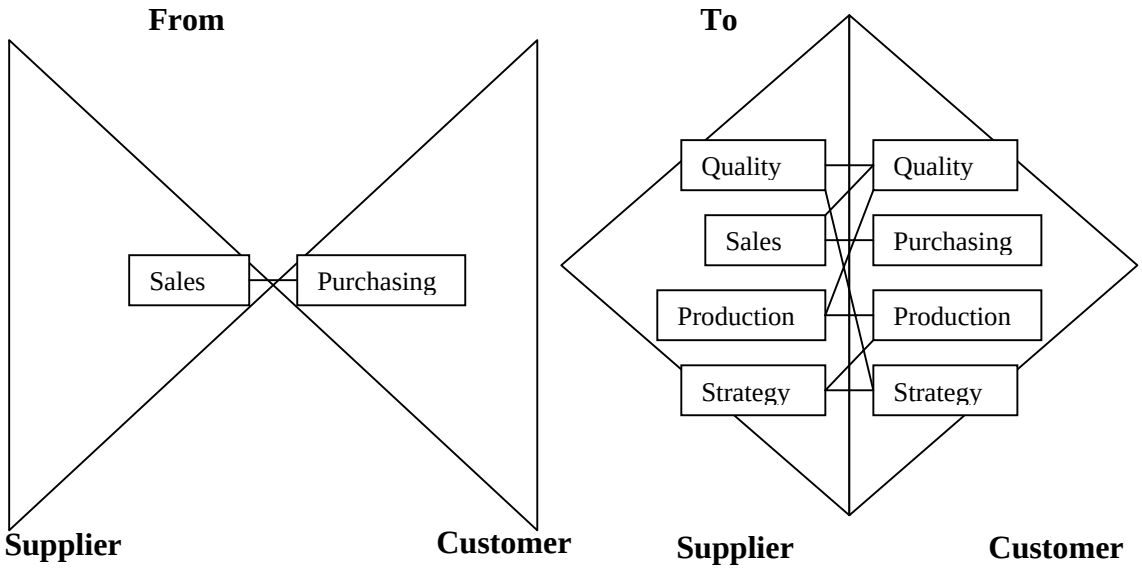

Figure 15. Creating closer relationships with supply chain partners. (Christopher, 2, 1998).

Order, order confirmation and invoicing are examples of procurement transactions. Ecollaboration can include for example cooperative forecasts, common R&D documents, quality reports and drawings. Vendor managed inventory (VMI) and especially co-managed inventory (CMI) are examples of collaboration in supply chain. In CMI, customer and supplier jointly plan appropriate inventory levels taking into account promotional activity, competitive activities, network capacities and so on. Customer no longer places orders on the supplier, but instead shares information on actual demand or inventory usage on a continuing basis. This helps supplier to plan and schedule production and transportation more efficiently. On the other hand customer can manage demand and plan sales, when it knows network

capacity that is utilised to fulfill customer orders. Other benefits are reduced duplicated inventories, improved service level, improved delivery accuracy and enhanced customer cash flow.

The main barriers to the development of collaborative information systems exist at three levels. At the first level technical barriers have to overcome – particularly in terms of system reliability and in managing incompatible standards and networks. The second level barrier is that companies are not ready to share strategic and tactical information such as forecasts for their business partners. The third level barrier is due to differences between collaborating firms – in terms of goals culture, structure, procedures and code practices (Li & Williams, 2001).

4.5 Network information systems

The type of network information system should be considered case-specifically. If the relationship is deep and long-term (e.g. partnership or strategic alliance), the system integration is reasonable. If process integration degree between partners is high, partners may need common systems. In short-term relationships, the deep system integration can be risk, because departure can be difficult or investments in integration can be unprofitable. An operational integration-information system integration matrix is presented in figure 16.

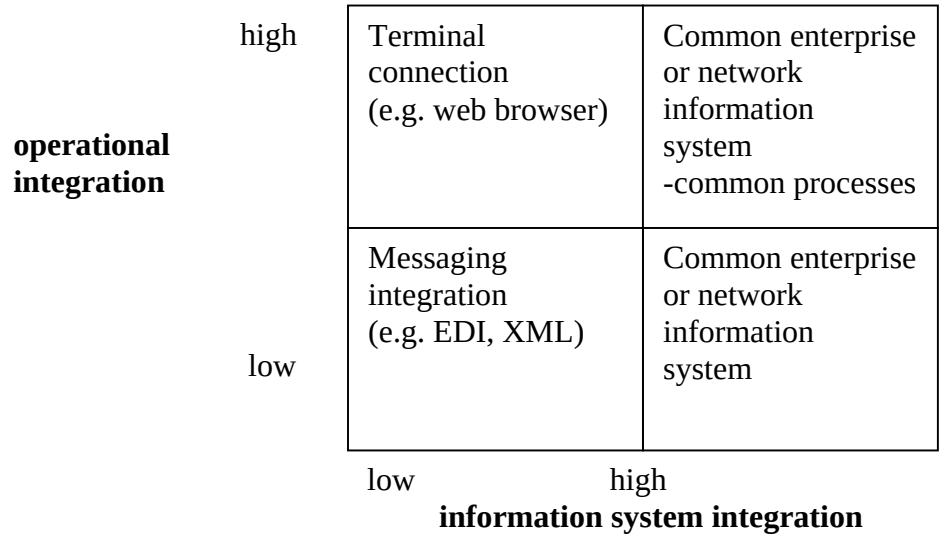

Figure 16. Operational integration-information system integration matrix. (Suonikko, 2003, adapted).

IT service provider, TietoEnator (Raunio, 2003) has studied different kind of business networks and suitable information system solutions for these network alternatives. Different types of networks are presented in table 5.

Table 5. Different types of network. (Raunio, 2003).

Furious network.	Characteristics of furious network are rapid delivery times and time-to-market, cost advantage as goal, and tight integration and contract culture.
Coordination network.	Characteristics of coordination network are outsourcing and supplier competition, and coordination and steering of different companies.
Cooperation network.	Characteristics of cooperation network are cooperation between companies, few partners, and outsourced activities (e.g. manufacturing and engineering).
System deliverer.	Characteristics of system deliverer are the role as first tier supplier, few customers, and customer needs define the structure and companies of network.

In figure 17, different network information system alternatives are matched with different network types.

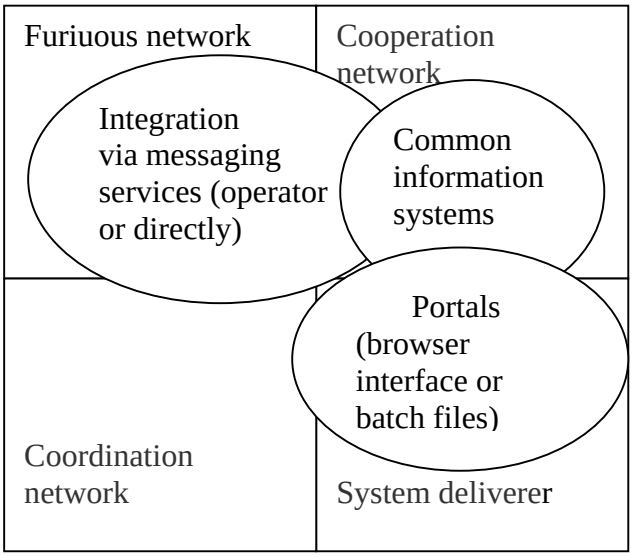

Figure 17. Network information systems in different types of network. (Raunio, 2003, adapted).

Haberland (2003) from StoraEnso catalogues the five major IT merger approaches in acquisitions and mergers (table 6).

Table 6. Major IT merger approaches in acquisitions and mergers. (Haberland, 2003).

Coexistence	Most systems of both companies are preserved. However, synergies may be sought from e.g. common infrastructure, procurement and contracts. Degree of standardization of resulting systems is low, and efforts to integrate existing systems are low (figure 18).
Absorption	One company´s systems, infrastructure and platforms are chosen as the base of newly merged organization. Degree of standardization of resulting systems is high, and efforts to integrate existing systems are low.
Transformation	The systems of both companies are retired in favour of new application suites. Degree of standardization of resulting systems is high, and efforts to integrate existing systems are low.
Best of breed.	The systems of both companies will be brought forward for review, with the best applications chosen based on business fit. Degree of standardization of resulting systems is high, and efforts to integrate existing systems are high.
Bridging	The existing systems of the companies are preserved. Bridges and interfaces are built to integrate the systems. Degree of standardization of resulting systems is low, and efforts to integrate existing systems are high.

Often, many approaches are used, but one is dominant. Same approaches can be applied for network companies.

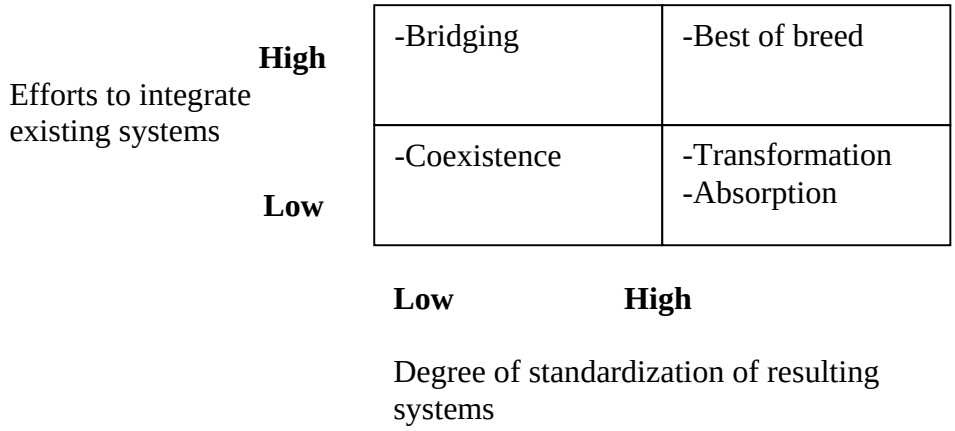

Figure 18. Efforts to integration-degree of standardization-matrix. (Haberland, 2003).

Flexibility of total network information systems will be achieved by utilising current systems of different participants and using information hubs, which integrate network processes and information flows between companies. Thus system architecture is modular. Modular architecture is not necessarily optimal from an IT management perspective, but it is flexible in changing environment, and companies or functions can utilize their own familiar internal systems in their processes.

Benefits from common systems of corporation or company network are (1) IT efficiency (less interfaces and systems, and economy of scale in developing and running the system); and (2) organisational effectiveness (best practice processes, common process development, similar processes, benchmarking capability) (Haberland, 2003).

4.6 Information hub in company network

Company network includes many to many relationships. Companies usually have multiple suppliers, while those suppliers themselves have multiple customers and suppliers. By creating single information hub between each of these organisations there is need for maintaining only one access point for every company. Every company has standard transaction processes to its information hub and task of information hub is to refine data for other participants. For example construction industry hub model is presented in figure 19. Figure 20 presents the difference between the traditional EDI model and information hub model.

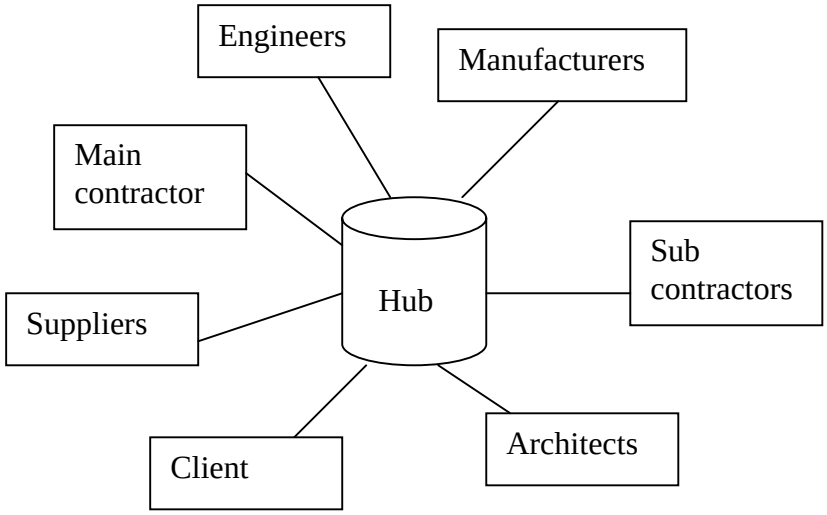

Figure 19. Construction industry hub model.

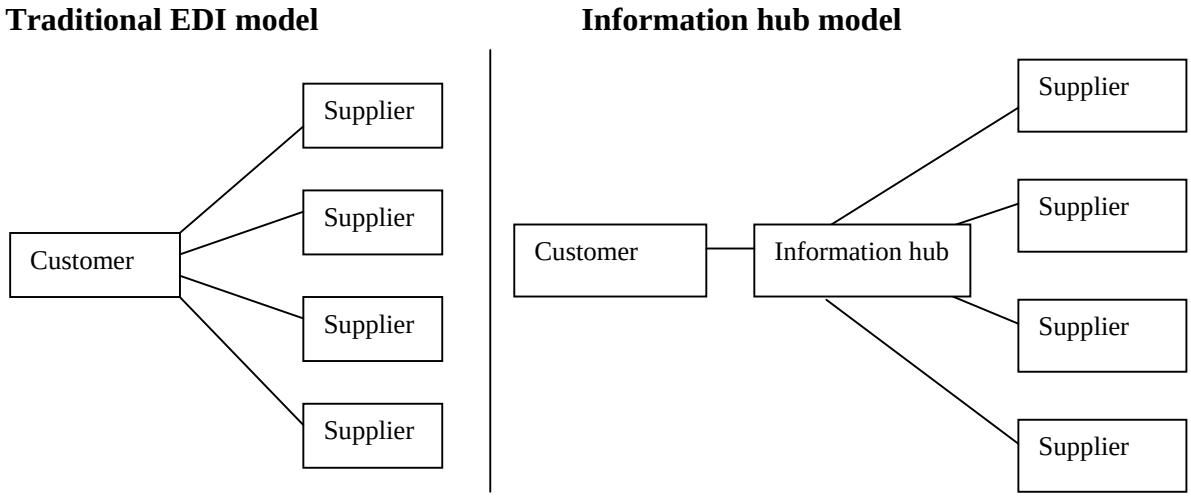

Figure 20. Traditional EDI model and information hub model.

Interactions between buyers and sellers occur in transaction process, in which goods, services and information are changed between customers and suppliers. This process may involve one or several intermediaries. Intermediary can create value for example by aggregating information, facilitating search, matching demand and supply and making transactions more efficient. Internet technologies have increased possibilities for making these transactions. Digital intermediaries or information hubs are utilised when they add value between trading participants.

The intermediation can be divided up to three phases. The phases are the intermediation phase, the disintermediation phase, and the reintermediation phase. Firms in the intermediation phase typically pursue pure electronic intermediation strategy. They identify a

product, service or information flow gap that traditional provider does not currently fills. In the disintermediation phase the digital intermediaries try to disintermediate traditional middlemen or to capture market share from them. Digital intermediaries can also disintermediate some parts of IT departments of companies. In the reintermediation phase traditional intermediaries fight back by creating their own digital services. (Chirchu & Kauffman, 2001).

The main goal of information hub is to gather data from decentralised and different systems of network companies, and share information to target participants (humans and systems) on right time on right quality on right format and on right price. Another important goal of information hub is to decrease transaction costs (e.g. orders, order confirmations, invoices) between companies. To fulfill information sharing and the decrease of the transaction costs goals, information hub must perform different operations like processing/refining data (e.g. conversion), transmitting and routing data, aggregating data, storing data, filtering data, creating intelligence (e.g. decision rules), securing data, and visualising data (e.g. layout of invoice or order).

By doing these operations hub adds information value just like operations for material add value for material. Information hub may also include common standardized processes for companies in network.

Information hub must provide a solution that is (1) open that company can fast and cost efficiently part and depart network; (2) flexible so that companies have different alternatives to get and entry information; (3) common so that for example some processes like content publishing of unstructured information can be common for many companies; (4) and integration ready; boundaries must be ready for different back end systems.

Benefits of information hub are:

- Information hub can manage transactions and therefore partners in supply chain or network do not need to concentrate on low value-added administrative tasks.
- Shorter lead times. For example less delays in decision making because of real time and synchronized data from network partners.
- Delivery accuracy increases when network partners utilize same demand data.

- One link for one company; this means standardized processes.
- More flexibility.
- Improvement of change management in network.
- Quick implementation because of some ready information system boundaries.

(Anilinker presentation material, 2003).

In figure 21 is an example, where a customer has standardised links and processes (one link for one process) towards information hub/operator. Information hub has different connection alternatives for suppliers (system integration, web user interface, fax, and traditional post). Suppliers make their own decisions in which form they want information, because ebusiness readiness, and transaction types and volumes varies between different companies. Decisions are based on for example cost savings compared to manual data entering and cost of technological choice. Integration messages can be transferred in different formats (e.g. xml, EDI, excel, in-house format). Information hub has gateways with other information hubs or operators, and therefore network participants can choose and utilize different operators.

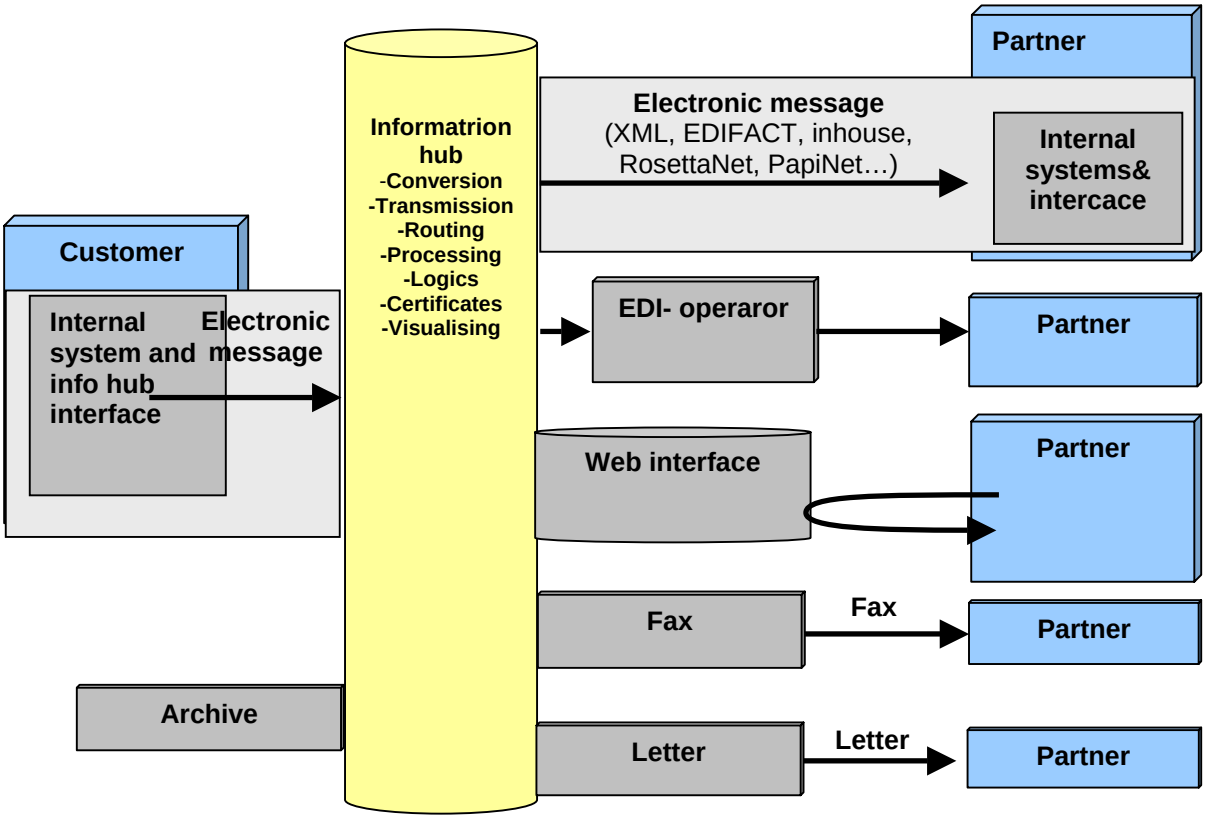

Figure 21. Information hub model between customer and its suppliers. (Anilinker presentation material, 2003).

The information hub can operate within some company (e.g. ERP portal or EDI service centre) or it can be outsourced to third party operator. The information hub can be owned by supplier, group of suppliers, customer, group of customers, group of customers and suppliers, or third party. In network, the network hub company usually develops and administrates information hub. Technological solution can also be outsourced for information operator. In many Finnish cases large customers have link to third party information hub and they provide cost freely some services for SME suppliers.

In the future industry specific standards are developing, when companies inside industry can change messages without heavy conversion. On the other hand different industries converge that means more conversion needs. Third party information operators, just like third party logistics service providers, response faster to environment and supply chain changes. At present situation using third party operators in conversion of messages is efficient model, especially in dynamic network.

The role of the IT management has changed in companies. Technologies are developing so fast that own resources of company rarely are sufficient. Outsourcing of IT services has been increased. This means that management of IT vendors is needed. For example service levels and response times of IT partner must be measured. SMEs outsource for example ecommerce applications and even their critical back end systems. Some application service providers provide ERP systems via Internet, but this has not yet broken through (Kettunen & Simons, 2001). Alternatives are application service providing (ASP) and outsourcing when third party is used. The essential difference between an ASP and an outsourcing is that an application service provider will manage application servers in a centrally controlled location of ASP, rather than on a customer´s site. Customers access applications for example via Internet through a standard web browser interface. (King et.al. 2002).

Leasing from ASPs is a particularly desirable option for SME businesses, for which in-house development and operation of ebusiness applications can be time-consuming and expensive. (King et.al. 2002). Co-procurement of network information system is a potential alternative for SMEs because of cost saving causes of individual companies.. ASP is suitable for standard processes in industry – not in customized processes. If company want to revolutionize than

evolve, ASP is not the best alternative. Advantages and disadvantages of ASP are presented in table 7.

Table 7. Advantages and disadvantages of ASP.

Advantages of ASP (Hemilä, 2002)	**Disadvantages odf ASP (King et.al., 2002)**
The newest software versions	Commitment to application service provider
The newest standards and message formats (e.g. EDI and XML) and so better integration readiness	Security issues and virus threat
Cost efficiency because of economies of scale of ASP; services and software are provided for broad customer base and so they are standardised or lightly customised	Customizing is not possible or it expensive
ASP´s customers do not need for own technological knowledge; ASP can provide full service, hardware, software, network and system integration, so customer can focus on its core business	Risk that information network is down
ASPs take responsibility of service levels and malfunctions	Critical information on service provider´s servers
Payment is based on usage of system and so costs are variable	Slow response times and Internet connection speed
Lower investment costs because there are not need procure licenses; customer does not need to invest hardware and software	
Proving ROI of ASP is easier than proving ROI for a software implementation and license fee	

5. RESEARCH RESULTS

5.1 As-is-state of ebusiness in supply chains and networks

The relationships between Finnish global companies and their SME partners are concentrating on comprehensive and collaborative tactical and strategic initiatives in addition to transaction based operational initiatives. This is also reflected gradually in ebusiness solutions, although transactional ebusiness processes are still much more common than collaborative processes. When SME suppliers develop from subcontractors to system deliverers, responsibilities in R&D increase. System deliverers need cooperative information and innovation management process with customers to respond to end customer needs. For example product development, demand and capacity information are shared in collaborative ebusiness solutions as well as purchasing orders, order confirmations and invoices. Collaborative solutions make it possible to optimise supplier and customer networks and match demand and supply in chains. However, many solutions are nowadays between two participants and real network optimisation is rare. In ebusiness solutions large companies communicate mainly with first tier customers and first tier suppliers. Some medium-sized companies have corresponding solutions. Only in some implementations and initiatives broader transparency in supply chain has been achieved. Also ebusiness systems of horizontal network and collaborative innovation management are quite rare in Finnish traditional industries. Many network information system possibilities are further lost, because companies are uncertain with data security and the will of sharing data openly. Traditional Finnish global companies consider ebusiness as enabler and driver to develop business models and to standardize processes locally or even globally with partners. However, all ebusiness models and eprocesses cannot be duplicated globally because of for example information network infrastructure, legislation (e.g. electronic invoicing), customer/supplier needs and culture differences.

Large customers are usually not interested in how their first tier suppliers manage their own sub-network. However, to achieve optimum in supply chain they should develop upstream supply network especially with long-term first-tier suppliers, and at least they should share their knowledge about operation and ebusiness models for suppliers. Some companies share openly also this kind of information. Common objectives and metrics should be used in network or chain to direct operations towards total optimum.

Network business model includes many risks and problems. Threats can be decreased or avoided with communication, collaboration and information system. Some threats of networked model are:

- Total price is too high because participants have safety margins in their prices. Solutions are that (1) participants know each other and each others´ cost structures and processes; and (2) processes and information systems are integrated.
- Information is not shared. Solution is that first confidence and common goals must be created among participants.
- Processes are not synchronised (e.g. lot sizes, planning cycles). Solution is that processes are planned, standardized and aligned in collaborative effort. Information systems support processes.
- Information systems, formats, standards and code practises differ among participants. Solution is that third party or other information hub solutions are used to align information.
- Production and decision responsibility are decentralized into many participants, and thus disturbance possibilities increase. For example every participant must deliver on right time in order to guarantee undisturbed operations in assembly line. Solution is that information must be shared among companies on right time and on right quality. Especially exceptions must be managed quickly. Alternative plans are also needed.
- Different companies have different cultures, values, goals, resources and processes. Solution is, that in partner selection process, potential partners are evaluated, and after that, in business relationship, continuous communication and learning philosophies are utilised.
- Technical threats (e.g. information system quality of service, data security, viruses).
- Human behaviour. This is often the most difficult issue in network projects. Solution is change management process.

5.2 Transparency, information value chain and eprocesses

Total transparency is not possible in supply chains and networks because of hygiene boundaries of companies. Companies in business network are defined as independent

companies, which have their own economical objectives. Furthermore, suppliers in network can have customers that compete against each other; and on the other hand network suppliers can compete against each other. This means great demands for data allocation and security. Trust is needed between participants, before information can be shared, because supplier can evolve as a competitor of customer, when knowledge is moved between companies.

Another perspective against total transparency is that every company or person in network wants only the information that it needs. Users must easily and quickly get needful information and especially exception information if everything is not going as planned. Because same information cannot always stream through the chain and network, value-adding operations like filtration and refinement of information are needed. Some information can however stream through the entire chain or at least part of the chain. Figure 22 presents transparency in communication between parties. Information can flow directly between parties or via contact person or system deliverer if they add information value. When contact person or hub do not add value, they however can see information flows and thus manage the entity.

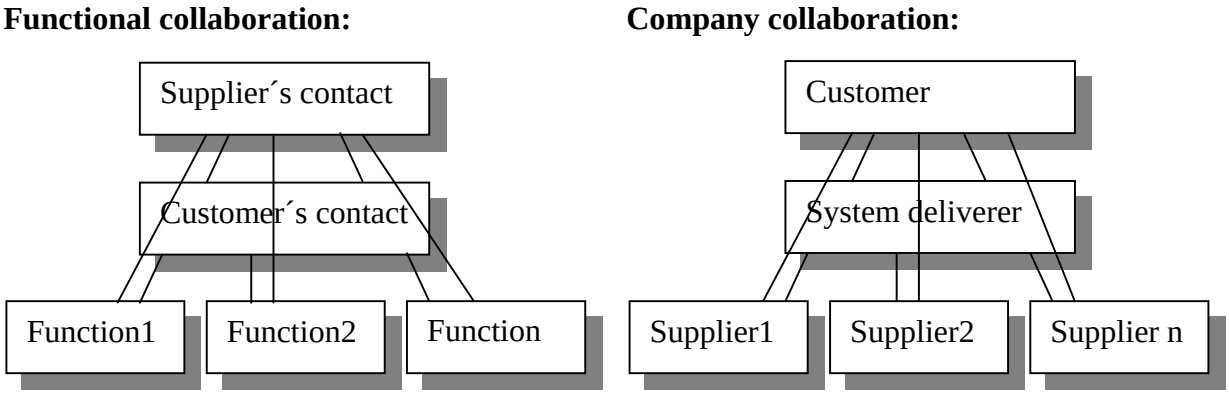

Figure 22. Transparency in collaboration.

Information stream in chain has an effect on material process lead time of chain. Because of that quick information filtration and refinement is critical for chains or networks. Delayed information often is due to single companies or persons do not understand total supply chain and thus the need to share information quickly for other participants. Furthermore delays in different steps of chain cumulate. Information process must however match material process, because quick information is not needed if material process is asynchronous with information. Early information can even be harmful in this kind of situation. Ideal situation in time critical supply chain is that participants´ internal processes produce real time information to external

processes. However, real time integration is not always necessary, but more important is to find business rhythm between network companies. All the data is not needed immediately everywhere. If the cost of delivering the information in real-time proves to be too high, compared to the received gains, it is unwise to do so. Moreover real time integration usually decreases flexibility in dynamic network. Furthermore, individual companies are not dependent on the availability of other companies´ systems, when systems are not integrated in real time.

Information has its value chain correspondingly to material value chain. Information can be bought, refined, delivered, stored and sold. Furthermore, there can be different support processes like help desk, invoicing and education. New companies and business models that are based on these value added services, have arisen. Information value adds when supply chain participants process information, and therefore information must also have price that depends on its position in the information value chain. Production of standard information is inexpensive because economies of scale, but customized information can be expensive to produce if badly managed. Modularisation of data can be utilized to produce mass customized information for user segments. XML provides a tool for information mass customisation. Communication channels in use like phone, web, email, meeting, and fax also have their prices. For example self-service information on web site can be even free for users, but user pays for data communication.

Information processing costs must be compared to benefits it brings to business processes; for example information accuracy and the costs to produce accurate enough information, or what are the benefits gained from earlier or more accurate information. Time when information is in business use for decision-making and information accuracy must be considered together for example in demand or capacity forecasts. In forecasts it is not reasonable to pursue 100 % accuracy, but possibility to share forecasts earlier for partners. Forecasts make possible to start some operations like engineering in advance. Risk management is part of forecasting, because some operations may have been started before order has been frozen. Risk can be better managed for example when there is knowledge of forecast accuracy tolerances, many customers/suppliers send forecasts earlier and standard modules are used for different products. Besides the information accuracy, users expect 100 per cent reliability, usability and availability of system. If users lose their confidence for system, they preferably use their earlier work procedures.

Ebusiness development is seen as an evolutionary path. Implementing of electronic processes is reasonable to perform in small projects, because then advantages can be quickly noticed and projects do not expand as unmanageable giants. Many ebusiness start-ups failed because of the attempts to electrify all processes and completely of different processes, and the human interaction was not provided even in complex and problematic service cases. Furthermore digitalized service operations like electronic shopping and invoicing were not aligned with physical operations like logistics and reverse logistics. Common roadmap in ebusiness solutions is: (1) identify processes that are useful to electrify; (2) implement these eprocesses between volume partners (usually transaction volumes between these partners are about 70-90 per cent of the total transaction volumes); and (3) consider other processes and partners. From other view of point partners first establish routine applications and later more complex applications. Simple applications help companies to learn communicating via the electronic channel. An adapted ebusiness roadmap of case company is presented in figure 23.

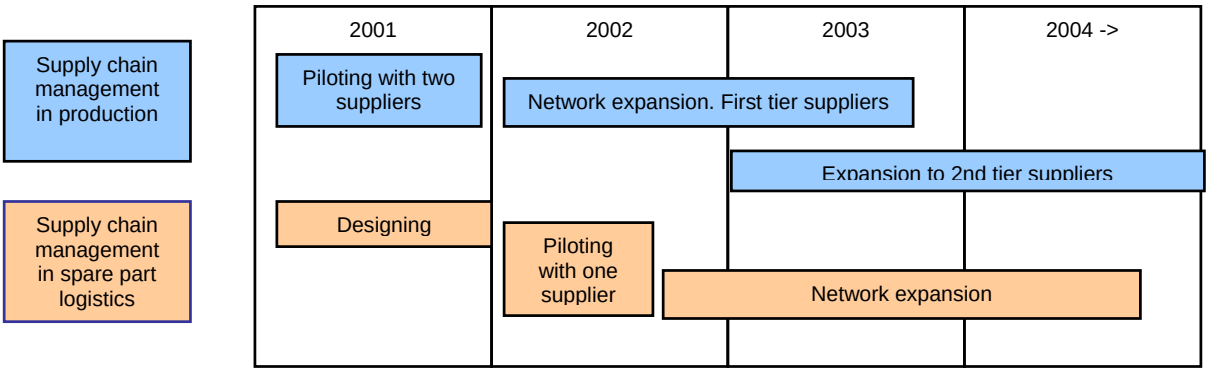

Figure 23. Ebusiness roadmap.

Before ebusiness processes can be implemented and fully utilised, (1) processes must be first streamlined by taking into account both opportunities of ICT, and needs and starting points of different participants in the chains or networks; and (2) internal processes and information systems of companies must be in order and integrated.

Business partners and processes for business partners should be segmented so that to avoid on the other hand one-size-fits-all processes and on the other hand customized partner processes. In one-size-fits-all operation excellent service of important partner and in customized operation efficiency of standard processes is lost. Segmentation approach is needed because there are different companies, business relationships, operation models, volumes and information systems in business networks.

Eprocesses, transparency and information value chain will be considered more specifically in the next research report of this project.

5.3 Network strategy and ebusiness strategy of network

Company network must be based on network business strategy and business model. Depending on network objectives, strategies and business models networks can differ considerably from each other. For example when supplier network has an objective to provide total service for their present customers by utilising core competencies of network companies, network must have e.g. network, customer, logistics, product and service strategies. Network objectives, strategies and models must be lax enough, because (1) network companies are separate business units and therefore they have their own business objectives and strategies (except that especially small companies seldom have strategic planning); and (2) companies can belong simultaneously to many different network. More important is that network companies believe in common vision and objectives and that network has some rules, which participants agree. Ebusiness strategy and ebusiness models of network should be based on business strategies and business models of network. Correspondingly to different business strategies and business models of each company, network companies can also have their own ebusiness strategies and ebusiness models (this is extremely rare in SMEs).

In customer centric business, objectives, strategies, and models (business and ebusiness) of customer network must be considered when strategies, objectives and models (business and ebusiness) of supplier network are constructed. In strategic partnerships companies have common vision, goals and strategies and the duration of the relationship is long-term, which requires also open information sharing and interacting. Network and its companies must make strategic decision to openly share information that support to accomplish network objectives. For example, information sharing for suppliers is the must in the situation where some operational function is partly or totally outsourced. When the management of function is also outsourced, supplier needs for information to plan and make decisions on behalf of customer.

According to this study, it seems that business strategies of networks have been developed, but ebusiness strategies are quite rare.

5.4 Network information systems and system architecture

The trend has been in large global companies that they do not pursue one information system for all business needs, but integrate different systems seamlessly. Some systems like financial and accounting can however be even globally standardized. Same phenomenon will be happen in network information systems, so that there will be many company and function specific systems and integration applications, which link those systems.

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Total network information system consists of existent internal systems of companies, information hubs/operators, portals and network information systems. Thus decentralized systems are coming more common and architecture is changing more complex. Total network information system must be flexible because information systems change or update frequently in network. Furthermore business environment changes rapidly. For example customers, customer needs, suppliers and roles change. Simultaneously information system users and IT staff wait for easier human-to-system and system-to-system interfaces. Furthermore, risks increase because data is aggregated from different sources and then systems and data network cannot be down for long periods.

One-size-fits-all solution is not enough for all inter-organizational communication needs. Some processes can be globally standardized for all business units and some other can locally customized (but for entire local supplier network standardized). Transaction volumes, data formats, the types of exchanged information, information criticality, type and duration of business relationship, internal information systems of partners, processes and operation models (e.g. different ordering models) differ among network companies, and furthermore companies are at different stages in networking and ebusiness readiness. Because of former factors, different customer-supplier combinations in network must utilise totally different ebusiness architectures, technologies, systems and standards (e.g. VANs, Internet, XML, EDI, RosettaNet, ebxml, web services, web browser) in their ebusiness solutions. Utilised standards and technologies are also selected case-by-case. Ebusiness solutions are based on different philosophy and standard combinations like CPFR and RosettaNet.

Different models exist when information is exchanged between partners:

1) Supply chain master allows or demands its trading partners to use its own internal system via e.g. portal or extranet. User interface is web browser or java client. Nowadays, information systems must be built as much for business partners as for itself, because partners use system if the gain benefits from it. The portal is usually implemented for human users of business partners in small transaction volumes, but it is not a good solution in exchange of high volume routine transactions with partners. Partners have noticed some weaknesses in this model. Portal provider company gains benefits, but the entire supply chain does not exchange information optimally. The most efficient link is system-to-system integration, but web browser based portals and extranets have been seen a good development and learning step towards integrated systems. On the other hand integration is always not even reasonable when transaction volumes are minor and/or manual routine work in transaction is minor. Operational cost saving effect is minor or even negative for SME supplier, when integration is not implemented. When partner has its own ERPs, it must double-entry information - into ERP portal and into own ERP. System-to-system integration is however possible in ERP portal solution, but data conversions and system interfaces must be done case by case. For example customer can share orders both in html format for human users and in batch file format (e.g. XML or Excel) for systems. When batch file format is used, partner or partner´s operator must have some conversion tool, which convert data into in-house format. Web browser based solution can however add value for customer and thus improve customer satisfaction. Anyway, use of fax and email will be decreased in the future because of their poor data management features. Portal model is common when supply chain master implements ebusiness solution for its SME network. Supplier has many portal or extranet user interfaces and authentications, if it has many customers which provide ebusiness services.

2) Trading partners use their own internal systems and these systems have direct integrations. Different companies mainly have their own processes in their ERPs and in other information systems. Supply chain partners, especially large companies with equal negotiation power, are not willing to use each others´ information systems. Thus there is need for information hub or direct integration between companies to integrate internal processes and external processes so that companies use only their own internal information systems.

3) Trading partners use their own internal systems and these systems have integrated via information hub, which can be provided by third party operator. Information hub gets data from different sources from information systems of network companies, and aggregate, filter, refine and share information for right participants. So information hub integrates internal processes of different participants. Third party operators are used to overcome problems of scattered standards. Some technologies and standards will mature as de facto in the future, and therefore complexity will decrease. One or more of the companies in the supply network, or third party operator, can own the information hub. Many third party operators failed in ebusiness hype because they had not enough the substance knowledge of the industry, or they did not add enough value. Lack of trust and inertia of change in IT outsourcing (Finnish companies have traditionally had strong internal IT department) were some other causes.

4) Supply chain master provides extranet solution via operator. This is same model like 1, but if every customer uses the same operator, then supplier has only one extranet user interface and authentication.

5) Integration between information hubs/operators. Operators have standardized boundaries with other operators. This means that supply chain or network partners can have their own operators, and operators exchange information. This model is applied in cases where buyer company has many supplier relationships and seller company has many customer relationships, and these partners use different operators because of for example commercial reasons.

6) Trading partners develop a common network information system, which they use collaboratively. Overlapping systems of partners cause ineffectiveness in supply chains Common network information system decreases that ineffectiveness by standardizing some processes in company network. To support these standardized processes it is possible to construct network wide common information system. Processes and applications in network can be: (1) company specific, (2) standardized for company group, (3) standardized between some company groups or (4) standardized for all companies (figure 24).

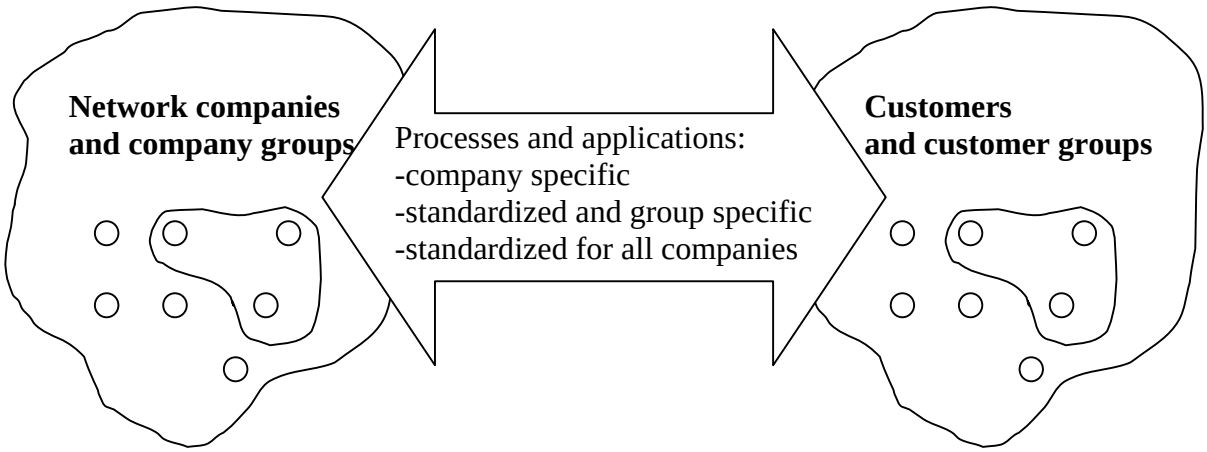

Figure 24. Processes and applications in network.

Network information system can also be utilised in dynamic virtual organization (e.g. construction projects), although participants varies between different projects. This is possible, when processes are standardized in every project. Flexibility is needed in user rights administration.

At present, SME networks and SME network information systems are contemporary. SME networks need for long run and flexible information systems, which are simultaneously inexpensive and easy to use. This sets up also new demands for software vendors and consultants. Many vendors and consultant have tried to approach SME sector, but they have mostly been unsuccessful because of their large customer centric models. The major differences between large company network and SME network system is that volumes are much smaller in SME case and processes cannot be so standardized than in large companies because of business flexibility demands.

In many cases more than one of former alternatives are used simultaneously. For example company can have ERP portal for some transactions and partners, and operator or EDI service centre (VAN) for some other transactions and partners. An example of total network information system is presented in figure 25.

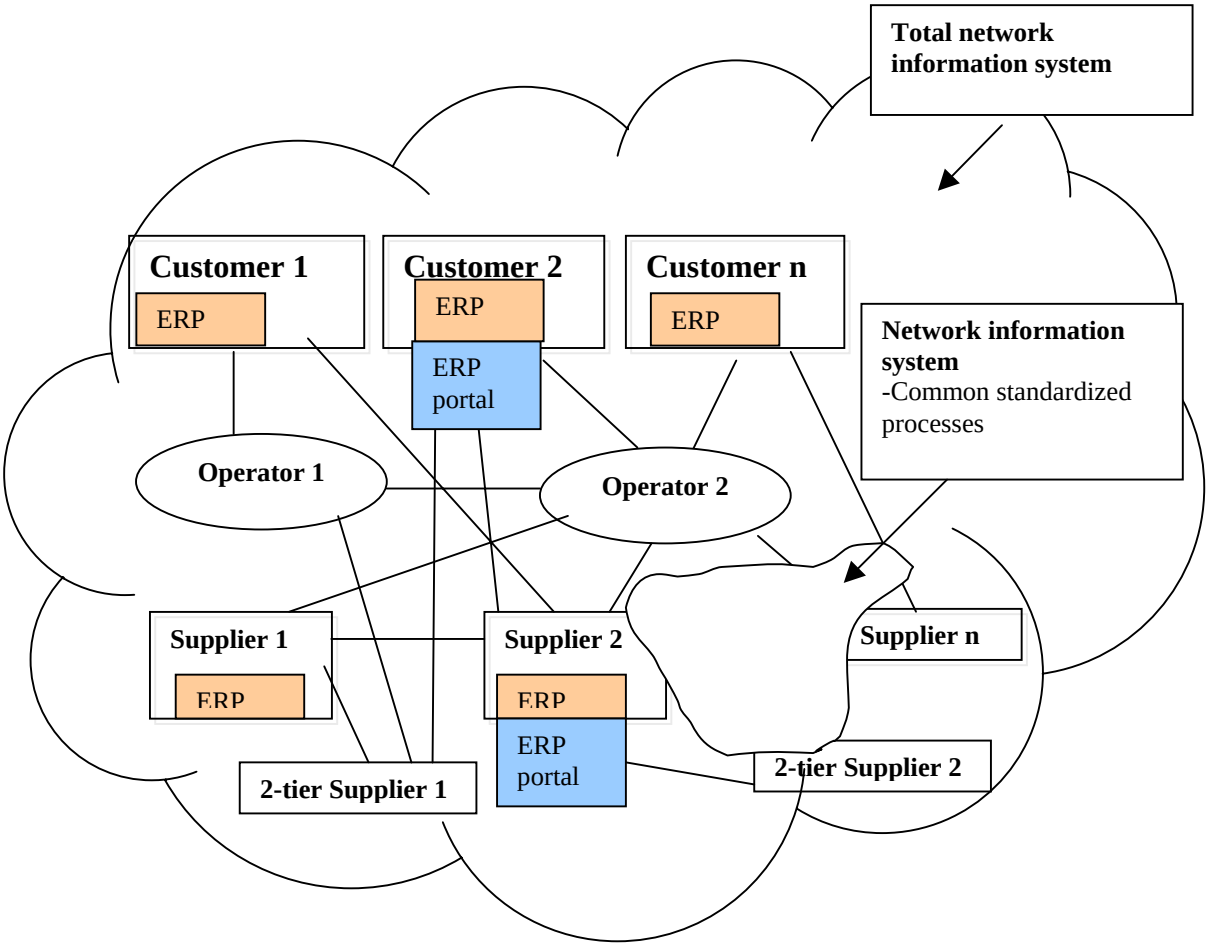

Figure 25. Total network information system.

Here are some links that are the most commonly utilised between participants:

- Large customer/supplier - operator: integration
- Large customer - large supplier: direct system-to-system integration or via operator
- Operator - SME supplier: fax, email, web browser and integration in high volumes
- Large customer/supplier - SME supplier/customer: portal or extranet that is constructed on the side of customer´s ERP.

Both EDI and web technologies are used in ebusiness solutions. Web based transactional processes have been implemented since the middle of 90´s, while EDI was used in volume transactions already in 80´s. Integrated traditional EDI solutions have been utilized in long term integrated business relationships and agile web solutions in shorter term agile relationships. Proprietary networks or VANs have been utilised in critical information exchange between partners. Traditional EDI solutions support mainly document exchange, but web technologies make it possible to develop complex ebusiness processes between

partners. Furthermore, web technologies make it possible to communicate electronically with smaller partners. Web solutions can be divided into (1) system-to-system integration solutions utilizing e.g. XML technology are utilised when volumes and amount of routine work are high; and (2) system-to-human and human-to-system solutions utilizing HTML and web browser are utilised when rapid initiation and termination of relationship and volumes are minor.

In different kind of business relationships is utilised different kind of ebusiness solutions. In **vertical integration** decision-making is centralized and integration has long-term influences on business. Thus ebusiness system can be a long-term integration solution between business units. In **partnership or company** network decision-making is decentralized for different companies. Companies in network must make both company specific and network specific decisions. Business relationships can be short and long-term. Ebusiness solution must be flexible and efficient, and it must support coordination of network resources and needs. Web based solutions (e.g. portals and extranets via third party operator) are utilised. Third party operator is a good alternative especially in dynamic shorter-term relationships (e.g. virtual organization). Also traditional EDI models are common in long-term partnerships. Integration degree of ebusiness solutions varies case-by-case. Ebusiness solutions are mainly transactional based. In **strategic partnerships** ebusiness solutions are something between solutions of vertical integration and partnership. Strategic partners exchange collaboratively tactical and strategic information; e.g. long-term forecasts and R&D information. In **competition model** products and services are bought from markets and price is often a determining selection criteria. Ebusiness system must be very flexible because of business relationships are short-term. Web based electronic auctions, reverse auctions and exchanges can be utilized, but in Finnish ebusiness culture they are quite rare. Traditional information channels like phone, fax and email are further common in competition model.

5.5 Development, implementation and roll out of network information system

Mutual strategies and trust of network companies are needed between partners before common information systems can be developed and implemented. Development of system must be performed in co-operation between partners in order to get network information system to work optimally. However the development and implementation of network information system is difficult and slow if there are many decision makers from different

companies. Furthermore, readiness of network companies varies much, and this often means delays in system development. Thus rapid implementation demands someone who has total responsibility and decision power. Principal or some other hub company of network should take the main responsibility for system planning, implementation and roll out. This is reasonable because the hub company usually gets also main benefits of network information system; mainly because they get one standard way to communicate with customer and supplier segments. However, surprisingly often network information system is delayed because of principal unreadiness. This is often caused of their internal information system challenges.

Two network information system development models can be distinguished:

1) Unequal companies. Big company, which has negotiation power, has development and implementation responsibility. SME network adapts to utilize system.
2) Equal companies. System is developed and implemented in close collaboration.

Hub company has the total picture of network information system. Development roadmap is definitely needed in complex and changing environment. Roadmap is introduced in chapter 5.2. Although some participant has main responsibility, the requirements of other network companies must be considered in system planning stage. Otherwise, there is danger that cost savings of hub company are covered by added costs of partners, and thus total optimum will be lost. Responsible participant must ensure in planning stage that the whole view of the system is understood. System is then implemented step by step. Gained benefits and value added in each network information system development step must be indicated and shared for network companies in order to keep positive development in running.

Hub company can allocate system costs related to gained benefits of each network company. In standard case the system use for network companies can be even cost free via web browser except information communication costs. Companies can make independently decisions in which format they want data. Customisation costs can be company specific or company group specific when group has some standard requirements.

5.6 Competitive advantage from continuous development, ICT management and change management

ICT investments do not purely bring competitive advantage, because systems are easy to replicate. However, aligning ICT strategies with business and supply chain strategies, innovation and business models can be the source for sustainable competitive advantage. The supply chain or network should be managed by focusing on seeking out new opportunities to create value. Pioneer companies, supply chains and networks do not just utilize ready and proven solutions, but innovate new business model, which can be developed by utilizing ICT. Most of case companies, networks or supply chains consider ICT a necessity to remain in competition than to achieve new competitive advantage and markets. So they have usually productivity growth goals from ICT projects, but new revenues goals are more unusual. Business cases of ICT projects are estimated more specific than in 90´s; costs, risks and benefits are compared. Measures are used to justify ICT investments, although measurement is usually considered as difficult task.

There is plenty of software for different business requirements in the market. However, utilising same software in the same way as competitor does not bring competitive advantage; it can even decrease competitive capabilities if software is not aligned with business goals and business model. On the other hand, standard software packages can be nowadays configured quite flexibly according to business processes. Pioneer company, supply chain or network can achieve intermittent advantage but it is lost when competitive companies or networks replicate business models and network information systems in a couple of months. Time and continuous development are the critical factors to maintain achieved competitive advantage with ICT. Continuous development, pioneering and rapid implementation of information system together make possible to be a step ahead competitors, especially in rapidly changing environment where business model, technology and product cycles have been shortened. Furthermore, the fast replication of competitor´s new business model is not self-evident, because of inertia related to e.g. resources, culture and structure. On the other hand, ICT management can bring competitive advantage. It is not self-evident that companies or networks have the best possible ICT portfolio for theirs business, because of supply of software and consultant companies is huge. When different ICT opportunities and alternatives are well recognized, also the innovation of new business models is much easier. Trade-off of

high development costs and risks of pioneer, and benefits from pioneering must be considered.

For example, the supply-demand chain strategy has been one of the major strategies and sources of competitive advantage of Nokia Corporation since the middle of the 1990´s. According to Rajaniemi (2003), systematic development of logistics of internal business operations, collaboration with the supply chain members, and development of intra-organizational and inter-organizational information systems has supported Nokia Mobile Phones in reaching its current market leader position in the business.

SME supplier or supplier network can gain competitive advantage against their potential competitors by developing ebusiness system together with its customer. Common information system development is about communication (e.g. goal setting, problem solution, process definition) between participants, and therefore it deepens the cooperation between companies in supply chains and networks. This raises also entry barriers for competitors.

Access to new knowledge and an ability to create new knowledge has become one of the major success factors of competitive advantage especially in high technology industries (Brännback & Carsrud, 2003). However traditional industries like car and forest industries use more and more high technology in their processes and products, and thus the meaning of information and knowledge increases all the time. For example traditional small car repair shops have not knowledge and tools to repair high technology parts.

The aim of change management is to deliver rapid and sustainable business benefits at minimum costs and risk. According a study, 52 per cent of all barriers to ERP system success come from change management and communication. Therefore, the success of information system project is about the people and their capacity to change (Saarikorpi, 2003). Information system project cause changes on (1) work (methods and procedures), (2) people (behaviour, skills, numbers), and (3) organization (structure, responsibilities). Success arises when personnel can utilize system routinely in their daily tasks and processes. Change management process is needed to quickly abandon old workflows and processes and replace them with new ones. Otherwise information system goals like productivity increase are lost. Time to entry data into new integrated system usually exceeds time to entry data into non-integrated systems, and this is often difficult to understand by personnel. Benefits are

however coming after data has been entered by e.g. decreased information search time, and faster and broader information availability. Change management process is needed especially to highlight total benefits that new network system brings to whole network. Via change management personnel and companies understand their own role in the supply chain or network entity. On the other hand, new information systems are used as a mean of change management, because information system project can provide a well-managed transition from existing processes to new ones. Change management is difficult even internally in company, but it is much more challenging in network of companies. Change resistance has decreased in new information system projects because personnel have usually already experience of earlier projects.

6. CONCLUSIONS AND FURTHER RESEARCH

This study concentrated on ebusiness systems between global companies and their SME network. Current state of Finnish pioneer ebusiness networks of different industries were studied in this first phase of SMILE research. In this report focus was on general trends of ebusiness in supply chains and networks of traditional industries; total ebusiness system architecture; ebusiness strategy; information value chain; different factors, which influence on ebusiness system of network; and the correlation between ebusiness and competitive advantage.

Ebusiness strategy and models of network must be based on business strategies and operation models of network. For example in strategic networks and partnerships, companies have common vision, goals and strategies. Therefore information sharing must be open, and the network must make strategic decision to openly share information that support to accomplish network objectives. Mutual strategies and trust are needed between partners before common information systems can be implemented.

Development of network information system should be performed in co-operation between partners in order to get entire network and information system work optimally. Although some participant has main responsibility, the requirements of other network companies must be considered already in system planning stage. Otherwise there is danger that cost savings of hub company are lost by added costs of network companies, and thus total optimum will be lost. However in practice, solutions are usually planned and implemented from perspective of supply chain master, and partners must adapt to those solutions.

In relationships, customers and their suppliers have over the past few years concentrated more on collaborative tactical and strategic initiatives besides transaction based operational initiatives. However, ebusiness systems are further mainly based on exchange of operational transactional data. Collaborative solutions are in planning or pilot phase. Furthermore, many ebusiness solutions are nowadays between two participants, but network and end-to-end supply chain information systems are quite rare. In ebusiness solutions big companies communicate mainly with first tier customers and first tier suppliers. Only in some supply chains and networks broader transparency has been achieved.

Total network information system must be flexible because business environment and network change rapidly. Because of environmental changes and lack of cooperation in information system development, there is much of overlapping on information systems among business partners in network. Decentralized systems are coming more common and system architecture is changing more complex. Total network information system consists of (1) own information systems of individual network companies; (2) portals and extranets; (3) information hubs, which provides information value adding services like information refinement; and (4) network information systems, which provide standardized processes for network companies.

Supply chain participants do not use with pleasure each others´ information systems. Thus there is need for information hubs between companies to integrate internal processes and external ebusiness processes. Companies use their own internal information systems and information hubs have responsibility to coordinate and integrate this information system network. Information hubs get data from different sources from information systems of network companies, and aggregate, filter, refine and share information for right participants. For example same information cannot always stream through the chains in network, and therefore value adding operations like efficient filtration and refinement of information are needed.

The most efficient link between companies is system integration, but web browser based portals or extranets have been seen a good development and learning step towards integrated systems, especially within SME suppliers. Web browser based solution is not necessarily efficient for its user but it can however add value for customer and thus improve customer satisfaction. On the other hand integration is always not even reasonable when transaction volumes are minor and/or manual routine work in transaction is minor.

In company network some processes can be standardized. To support these standardized processes it is possible to construct network wide common information system. Segmentation approach is needed because there are different companies, business relationships, operation models, volumes and information systems in business networks. Network information system must support to provide different information services and processes for different partner segments. The challenge of the network information system is that it must be simultaneously efficient and flexible.

The role of implementation and change management is critical to achieve business benefits from network information system. Change management process is needed especially to highlight total benefits that new network system brings to whole network. Via change management personnel understand their own role in the supply chain or network entity. Change management is difficult even internally in company, but it is much more challenging in network of companies.

Further research of SMILE will concentrate on ebusiness system architecture and electronic processes of case network, which consists of global forest companies and their local maintenance SME network. Reports will be publishes during 2004.

“Information is power but competitive advantage lies not in how you gather the data, but what you do with it once you have got it.” (ANI-Seminar 18.3.2002. Jari Tammisto. Chaiman Scandinavia. RosettaNet).

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