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VALUE ADDED LOGISTICS IN SUPPLY AND DEMAND CHAIN

SMILE

Part 2

EBUSINESS IN A SERVICE BUSINESS CASE: A MAINTENANCE AND OPERATIONS NETWORK IN FOREST INDUSTRY

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VALUE ADDED LOGISTICS IN SUPPLY AND DEMAND CHAIN (VALOSADE)
SMILE:
EBUSINESS IN A SERVICE BUSINESS
CASE:A MAINTENANCE AND OPERATIONS NETWORK IN FOREST INDUSTRY

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ABSTRACT

VALOSADE is a research project of professor Anita Lukka´s VALORE research team in the Lappeenranta University of Technology. The VALOSADE includes the ELO technology program of Tekes. SMILE is one of four subprojects of the VALOSADE. The SMILE study focuses on the case of the company network that is composed of small and micro-sized mechanical maintenance service providers and forest industry as large-scale customers. The basic principle of the SMILE study is the communication and ebusiness in supply and demand networks. The aim of the study is to develop ebusiness strategy, ebusiness model and e-processes among the SME local service providers, and on the other hand, between the local service provider network and the forest industry customers in a maintenance and operations service business. A literature review, interviews and benchmarking are used as research methods in this qualitative case study.

The first SMILE report, "Ebusiness between Global Company and Its Local SME Supplier Network", concentrated on creating background for the SMILE study by studying general trends of ebusiness in supply chains and networks of different industries. This second phase of the study concentrates on case network background, such as business relationships, information systems and business objectives; core processes in maintenance and operations service network; development needs in communication among the network participants; and ICT solutions to respond needs in changing environment. In the theory part of the report, different ebusiness models and frameworks are introduced. Those models and frameworks are compared to empirical case data. From that analysis of the empirical data, the recommendations for the development of the network information system are derived.

In process industry such as the forest industry, it is crucial to achieve a high level of operational efficiency and reliability, which sets up great requirements for maintenance and operations. Therefore, partnerships or strategic alliances are needed between the network participants. In partnerships and alliances, deep communication is important, and therefore the information systems in the network also are critical. Communication, coordination and collaboration will increase in the case network in the future, because network resources must be optimised to improve competitive capability of the forest industry customers and the efficiency of their service providers.

At present, ebusiness systems are not usual in this maintenance network. A network information system among the forest industry customers and their local service providers actually is the only genuine network information system in this total network. However, the utilisation of that system has been quite insignificant. The current system does not add value enough either to the customers or to the local service providers. At present, the network information system is the infomediary that share static information for the network partners. The network information system should be the transaction intermediary, which integrates internal processes of the network companies; the network information system, which provides common standardised processes for the local service providers; and the infomediary, which share static and dynamic information on right time, on right partner, on right costs, on right format and on right quality. This study provides recommendations how to develop this system in the future to add value to the network companies. Ebusiness scenarios, vision, objectives, strategies, application architecture, ebusiness model, core processes and development strategy must be considered when the network information system will be developed in the next development step. The core processes in the case network are demand/capacity management, customer/supplier relationship management, service delivery management, knowledge management and cash flow management. Most benefits from ebusiness solutions come from the electrifying of operational level processes, such as service delivery management and cash flow management.

Key words: ebusiness, networking, service business, SME, maintenance and operations

CONTENTS

ABBREVIATIONS

ASP. Application service providing.

CASE network. Maintenance and operations network that is studied in this research.

CASE Net. Network information system in the CASE network.

CBM. Condition based maintenance.

CPFR. Collaborative planning, forecasting and replenishment.

CRM. Customer relationship management.

EDI. Electronic data interchange.

EDYNET. Research project name "Ebusiness and Dynamic Networks in Alliances and Partnerships".

ELO. Technology program name "Ebusiness Logistics" of Tekes (Finnish Technology Agency).

ERP. Enterprise resource planning.

FTM. Fixed time maintenance.

ICT. Information and communication technology.

IT. Information technology.

LAN. Local area network.

MRO. Maintenance, repair and operations.

MRP. Material requirements planning.

NBM. Need based maintenance.

OTF. Operate to failure.

PC. Personal computer.

R&D. Research and development.

SME. Small and medium-sized enterprises.

SMILE. Research project name "SME sector, Internet applications and logistical efficiency".

SRM. Supplier relationship management.

VALORE. Name of the research group. "Value Added Logistics Research".

VALOSADE. Research project name. "Value Added Logistics of Supply and Demand Chains".

XML. Extensible markup language.

FIGURES

TABLES

1. INTRODUCTION

Generic mega trends such as localisation versus globalisation, information technology utilisation, total service offerings, demand uncertainty, outsourcing and networking are the drivers of change also in the forest industry and in the maintenance and operations service business.

The maintenance and operations services have been underestimated and seen only as a cost factor for a long time. However, the maintenance services are important in developing competitive advantage, especially in process industries such as the forest industry. In many industries, the production costs during the life cycle of production line correlate with maintenance and operation costs. Machinery shutdown is expensive and thus duration of shutdown should be minimized. (Laine, 1998).

At present, Finnish forest industry companies pursue efficiency after the growth, mergers and acquisitions. Companies concentrate on their core businesses to strengthen or maintain their competitive position. At moment many forest industry companies consider, is the maintenance and operations business one of their core competence or not. In the Finnish forest industry, there are no a total outsourcing of the maintenance and operations function. However, some spin-off cases exist. In spin-off cases, the maintenance personnel of a forest industry business unit have been moved to a new mill service company. The food industry has been a pioneer in outsourcing of maintenance and operations in Finland. Tough competition was the driver for outsourcing in the beginning of 1990´s. Some business units have totally outsourced maintenance services and the management of them. However, some outsourced operations have been in-sourced later because of cost and quality causes.

The forest industry is extremely capital intensive and investments are long-lived. Furthermore, forest industry companies require more and more total services from their suppliers and service providers. Therefore, the business logic of forest industry machinery suppliers and service providers has been changing towards a customer life cycle management philosophy, where after sales operations, such as maintenance and operations services play an important role. With total service concepts, service providers can build long-term customer relationships from machinery or estate delivery to after sales services. Both total maintenance service providers and machinery suppliers pursue market shares of the maintenance and

operations business, and they compete against each other in some segments. Machinery suppliers have an expertise of machinery they deliver, while the competences of total maintenance service providers are broader, including for example real estate maintenance operations. Local SME maintenance service providers have provided cost-efficient and high-quality services in some specific parts of maintenance markets. Maintenance and operations networks will be dynamic in forthcoming years and the future roles of the different participants are uncertain.

Up until the 1980´s, the service industries were considered inherently local. Unlike goods, the services can not be inventoried or transported. Therefore the production of services must take place close to a customer (Pärnistö & Salmela, 2003). Forest industry corporations operate globally and nowadays they expect that their service providers also provide a global business model and even globally standardised processes and transactions. Furthermore, the establishment of Internet services and service centres has challenged the role of the traditional local field services. The trend is to link locally customised services with the economies of scale that result from the global operations. In the maintenance and operations business, the services can be tangible, such as spare parts services and repair work, or intangible such as information services (e.g. remote diagnosis). The trend is that standard and high-expertise services are globally or nationally centralised, while customised services for customers are provided locally. Some services require both the local presence and the global expertise. For example the spare parts can be centrally managed but locally distributed and inventoried. Local maintenance service providers, which usually are micro, small or medium-sized enterprises (later in the text "SMEs"), offer mainly tangible repair services for customers. These services are usually consumed simultaneously as they are produced, or parts are tailor-made for customers. Local service providers necessarily have not their own products.

Networks and end-to-end supply chains are organisational structures that can add value for customers. Because of business criticality of maintenance and operations, partnerships or strategic alliances are needed among the network participants. In partnerships and alliances, deep communication is significant, and therefore the information systems in network are also critical. There will be enormous challenges with network information systems in company networks, because number of participants and different kinds of information systems in networks can be huge, company sizes in a network can range from micro-sized enterprises to global large-scale companies, and structures and roles in networks can continuously change.

Furthermore, participants can belong to many different networks. Process integration and information refinement services are needed to manage information flows between the different companies and different systems. On the other hand, the development in information and communication technology (later in the text “ICT) has made possible new business models such as remote services; for example the monitoring or even remote running of a paper machinery.

The service sector has been growing over the past three decades. However, there has been little research and models on services in supply chains and networks. Manufacturing best practices cannot be directly utilised in service business processes. New kinds of models and systems are needed to manage services in company networks and supply chains. Early forms of e-business systems have primarily supported the automation of manual processes such as ordering, order handling and invoicing. In recent years, business benefits have been pursued from coordination and collaboration in the supply chain. Furthermore, prior studies have mainly examined e-business benefits for network leaders. Benefits from ebusiness solutions are distributed unevenly, and supply chain or network leaders seem to benefit at the expense of SMEs by moving activities and costs to them. In this study, the perspective is SME network-centred. However, the total maintenance and operations network is considered, because all the network participants and their decisions effect on the future of the local SME service providers and the network information system.

2. RESEARCH GOALS AND METHODOLOGY

This report is a part of the SMILE (SME sector, Internet applications and logistical efficiency) study. The report concentrates on utilising information and communication technology (later in the text "ICT") in the processes of maintenance and operations business; especially on the ebusiness system (later in the text "CASE Net") among four local forest industry business units of global corporations and their 14 local SME mechanical maintenance service providers (later in the text "CASE network") in South Karelia of Finland. The special characteristic of the CASE network is that the customers are large-scale business units, and the local service providers are micro or small-sized enterprises, which mainly employ 1 to 30 employees. The aim of the study is to find ebusiness vision, ebusiness strategy, ebusiness model, core processes, and electronic processes among the SME local service providers; and on the other hand, between the local service provider network and the forest industry customers in the CASE network. In this chapter, the specific research issues concerning this second research report are discussed.

2.1 Research goals and questions

The current CASE Net system does not add value enough either to the customers or to the local service providers. The objective of this study is to find better solutions for practical business cases to add more value to the network companies. The research questions are (1) what are the business needs (customer expectations, and problems observed by customers and service providers) in the CASE network; (2) what are the value drivers for the local service providers; (3) what are the ebusiness scenarios, vision, objectives, strategies, architecture, ebusiness model in the CASE network (4) what are the core processes in the CASE network; and (5) in which processes ICT can add most value.

2.2 Research methodology and process

Research strategy is qualitative and applied case study. The qualitative case study was chosen to gain deep knowledge in the practices of maintenance and operations CASE network. The CASE network is also researched in parallel study project, EDYNET, which concentrates on network scenarios and strategies (Salo, 2004).

The study is mainly empirical because there is not much theory on the issue. Even though ebusiness as such has result much literature, theory with a practical application emphasis on this type of case environment is still missing. The significance and need for such application is evident. Furthermore, the CASE network needs practical information about issues considered in this study.

Study methods of this second research phase are a literature review, benchmarking and interviews. Interviews were conducted with software company consultants, maintenance and operations managers, business unit managers, maintenance and operations consultants, ICT operators and SME entrepreneurs. Totally 27 interviews were conducted. Theme interviews (appendix 1) were used in order to understand issue more profoundly. Furthermore, some group interviews and management meetings were arranged to find new idea and refine existent idea. Some interviews were conducted together with the EDYNET researcher, in order to achieve complementary opinions and reliability, and to forward the synergy of the two sub-projects, the SMILE and the EDYNET, in the VALOSADE.

The research process in this second phase of the SMILE study is as follows:

1. Understanding the principles of the maintenance and operations service business.
2. Finding theoretical frameworks and constructs, which can be utilised to analyse the CASE network and the CASE Net information system.
3. Analysing as-is-state of the CASE network (roles, business relationships and information systems). Results from the EDYNET research are also utilised.
4. Defining to-be-state of the CASE network (network scenarios, vision, strategy, roles and business relationships). These are derived from results of the EDYNET research.
5. Utilising theoretical frameworks and constructs in analysing the CASE Net.
6. Study results. Recommendations for the CASE Net system development.

2.3 Scopes of the SMILE study and this report

The study does not concentrate on physical material flows of spare parts, but the processes that plan and steer the work force in the supply network to fulfil the service level required by the customer, with minimum costs.

The total research framework of the SMILE study is presented in table 1.

Table 1. Research framework of the SMILE.

SMILE report 1: 1.General background - ebusiness in company networks
SMILE report 2 (the CASE network) : 2.Network scenarios, strategy and structure (inputs from EDYNET study) **3.Customer needs, business goals, observed problems, value drivers, operation models and core processes.** **4.Ebusiness scenarios** **5.Ebusiness vision** **6.Ebusiness objectives and strategy** **7.Ebusiness development strategy** **8.Ebusiness model** **9.Electronic processes** **10.Ebusiness architecture**

The first SMILE report concentrated on general ebusiness background in company networks among SMEs and large-scale companies. This second report concentrates on phases 3 to 10 at the framework. In customer-centred business, the customer needs and demand are the starting points for an ebusiness strategy process and an ebusiness model constructing. Network scenarios, strategy and structure are researched in the EDYNET study, and they are inputs into this SMILE report.

A process of ebusiness application development is presented in figure 1.

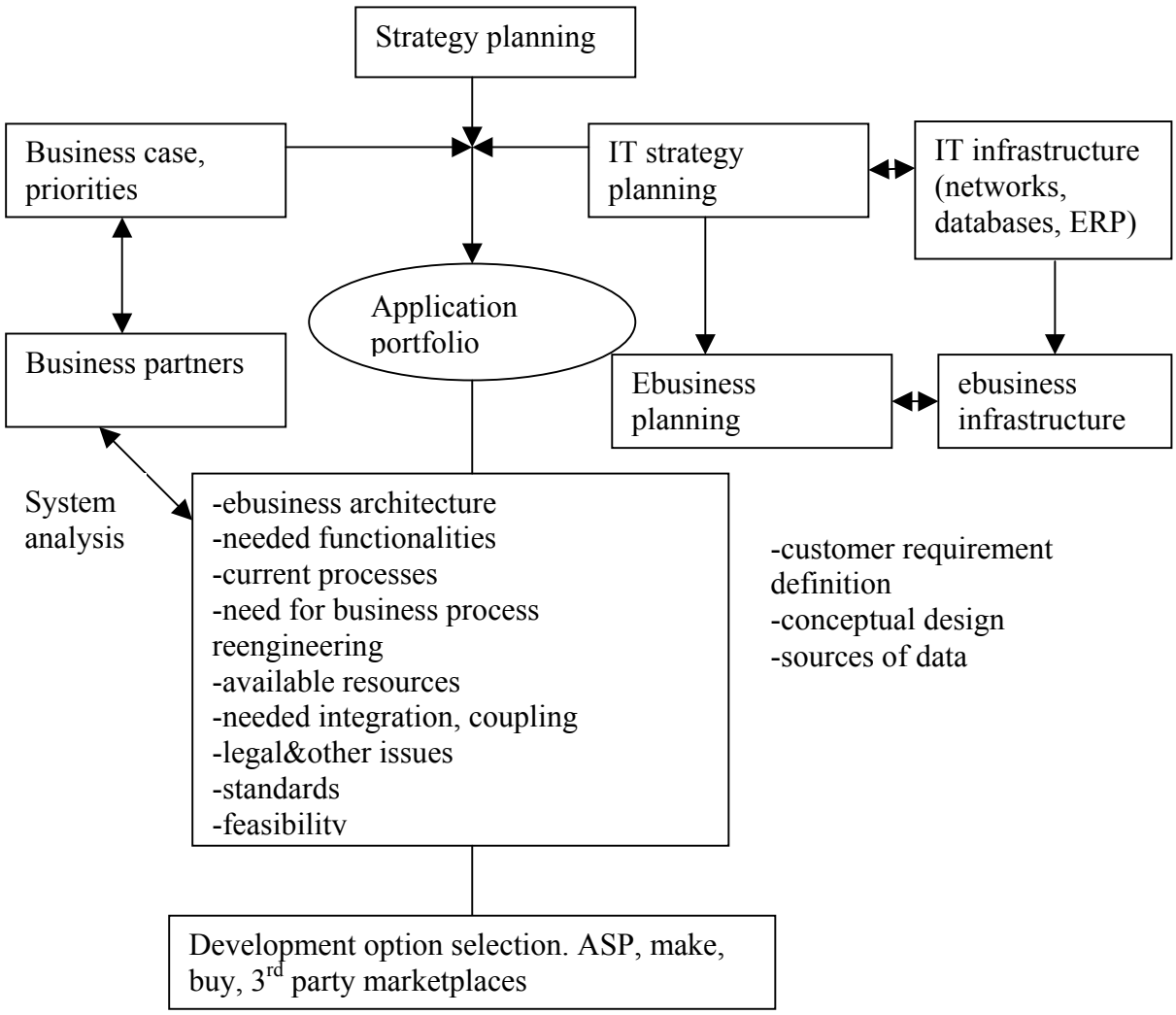


Figure 1. The process of ebusiness application development (King et al. 2002).

Ebusiness architecture is a conceptual framework for the organisation of the ebusiness infrastructure and applications. It is a plan for the structure and the integration of ebusiness resources and applications in the organisation. (King et al 2002).

The development of ebusiness architecture consists of the following steps:

1. defining business goals
2. defining the information architecture (information necessary to fulfil the objectives, information available, information that is digitised)
3. defining data architecture (where data locates; different companies and systems)

4. defining application architecture (components or modules of the application that will interface with the required data defined in step 3; the conceptual framework of the application, but not the infrastructure that will support it)
5. defining technical architecture (examination of the specific hardware and software, which are required to support ebusiness architecture)
6. defining the organisation architecture (legal, administrative, skill and financial constraints)

(King et al 2002)

The SMILE study mainly concentrates on the steps 1 to 4 presented above. The SMILE study does not concentrate on technology choices such as software, security solutions and programming paradigms and languages.

2.4 Concepts

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

Application is an alignment of a business need and technological opportunities (e.g. information systems).

Architecture is a model about mutual relationships of different operations/processes and information system that support those relationships. Architecture can include e.g. databases, information systems, applications, components, interfaces and messages. Architecture can be divided into system, application and data architecture.

Ebusiness is integration of business partners, business processes and information systems by utilising Internet technologies. Figure 2 describes the scope of ebusiness.

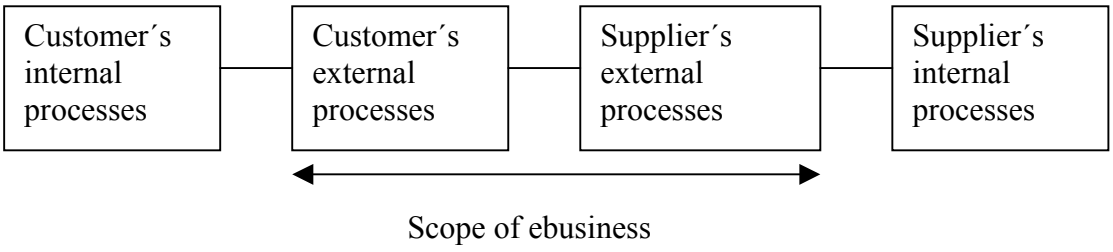


Figure 2. Scope of ebusiness.

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

Ebusiness roadmap includes milestones, how ebusiness strategy will be implemented.

Ebusiness strategy includes means how information systems and information networks can be utilised to attain and maintain competitive advantage for a company or a company network.

Integration makes different systems or processes work together as if they were one system or process.

Maintenance and operations. Maintenance concept refers to repair activities when machinery has broken down, while maintenance and operations concept is to stand for all the functions through which machinery is planned, constructed and purchased to manufacture products without failure or defect; throughout machinery life cycle.

MRO (maintenance, repair and operations) is the business of indirect materials and services. In **maintenance**, items (parts, materials and services) are non-time-critical and they are typically purchased as part of a scheduled maintenance event. In **repair**, items (parts, materials and services) are time-critical and they are often inventoried on site for rapid replenishment and access for unplanned or emergency repairs. In **operations,** items (other indirect material) are non-time-critical and they are typically purchased to support business operations, particularly in an office environment. (Aberdeen Group, 1999). In this report MRO is replaced concepts such as "**maintenance**" and "**maintenance and operations**" and those are used to describe maintenance service of machinery and devices in factories.

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

Network information system provides standardised processes for company group in company network.

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

Scenarios are descriptive narratives of plausible alternative projections of a specific part of the future.

Service is not a distinct output of a separate production phase but rather constitutes an integrated process, in which the customer enters into a relationship with the service firm. Generally, services are intangible, non-storable and customer-specific. Furthermore, the service process overlaps production and consumption. (Kemppainen & Vepsäläinen, 2003).

SME. SME definition in the Finnish scale is that a company employs less than 250 employees and its 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. (Yrittäjät web site, 2003).

Supply chain management for services means the management of information, capacity, service performance and funds from the earliest supplier to the ultimate customer
(Ellram, 2004).

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, 1998).

Vision is an ideal and shared long-term state of will.

3. MAINTENANCE AND OPERATIONS BUSINESS

3.1 Background of service business

Services have become a fundamental means of competitive advantage and profit for firms. Services are an inherent part of goods manufactured and can occur before manufacturing, during manufacturing, as part of selling, during usage, and after usage (Brännback & Carsrud, 2003). Characteristics for services are that they are intangible, non-storable and customer-specific, and the service process overlaps production and consumption. Service as a concept refers to a wide variety of processes and interactions. For example the after-sale services may include maintenance, training, warranty and financing (Kemppainen & Vepsäläinen, 2003). Services can be bundled or unbundled with product. When services are unbundled and made as products, customer has the chance to customise total package from the service and product modules. Physical products are usually easier to standardize than services. However, the standardization of services has increased over the past years. Some companies, such as the insurance service and consultant companies provide only services, with no tangible products attached.

Information plays a particularly prominent role in the delivery, coordination and quality assurance of services. Services are dependent on the people in the service process but also include technology-based systems, which require both management and integration. The service process can be partly automated but human interaction is also needed (Brännback & Carsrud, 2003).

Understanding the customer needs and expectations is a fundamental source to business success and also a basic element of the service marketing (Brännback & Carsrud, 2003). Huovinen & Hawk (2003) argue that a supplier manages its relationships most effectively by simply serving the decision makers in targeted customer organizations better than any of its competitors can. A trend appears to be the transition towards larger service organizations. The new service model is characterized by the service units that are capable of responding to customer needs by a wide array of products and services. Rather than serving only local customers, the units are prepared to make global contracts with global customers. A prerequisite for the new model appears to be that the service processes and information systems are standardized on a global level (Salmela & Jahnukainen, 2003).

3.2 Maintenance and operations service business

The traditional maintenance concept has extended into the maintenance and operations concept. The maintenance and operations concept stands for all the functions through which machinery is planned, constructed and purchased to manufacture products without failure or defect (Laine, 1998). The characteristic of the maintenance and operations is that a part of the maintenance work is performed while machinery is running. For example observation and lubrication are these kinds of activities. The maintenance and operations is continuous when the traditional maintenance is more project and repair oriented. Actually the maintenance and operations is also project-oriented but project sustains the whole life cycle of machinery.

Maintenance and operations activities are extremely critical for business, especially in process industry such as the forest industry. Every shutdown is expensive and therefore duration of shutdown must be minimized. Maintenance and operations activities should be treated as profit factors instead of cost factors. Companies should not try to reduce maintenance efforts to increase profitability, but the target should be to optimise maintenance activities (Laine, 1998).

In the 1950s´ and 1960s´, OTF (operate to failure) was the ruling maintenance level, that is using machinery until breakdown occurs. Shutdowns became long and repair costs were high. In the 1960s´ and 1970s´ FTM (fixed time maintenance) level became popular. This meant regular maintenance, heavily planned in advance. This model was very expensive. In the 1970s´, 1980s´ and 1990s´ maintenance thinking was based on the condition of the devices (CBM, Condition Based Maintenance). The device is inspected regularly or the condition of the parts is followed up by continuous measurement. The goal was to eliminate maintenance problems in advance by planning. Failure reports of components (failure frequency), failure analysis and the ability to design better alternatives to replace broken components provided the basis for this activity. CBM level action aimed to reduce OTF actions to reasonable levels where breakdowns and shutdown are under control. Since the 1980s´ and 1990s´, cooperation between operations and maintenance has tightened and we can talk about NBM level activity (Need Based Maintenance) maintenance based on need. Anticipated changes in usage were taken into consideration by modernising the components to the required usage level beforehand, thereby avoiding unforeseen breakdowns. Service work could also be dimensioned or changed to meet requirements according to changes in usage. In NBM, the

OTF, FTM and CBM levels are used in maintenance according to needs, possibilities and strategies. (Laine, 1998).

In the 2000s´, a direction in the maintenance and operations services has been more and more towards proactive activities and remote monitoring services. The goal is to get rid of shutdowns or at least unplanned shutdowns, because they are difficult to manage and expensive. Maintenance and operation planning is important to avoid over and under quality in services. Teamwork has further increased in the maintenance and operations business. Production line personnel, internal maintenance department, machinery suppliers, spare part suppliers and service providers co-operate and share information to keep machinery running. Production line personnel perform daily maintenance and operations work and therefore, they need more and more knowledge about machinery. Maintenance contracts are created with usability guarantee, and customers can track in real time, that the service actually meets the level guaranteed (Salmela & Jahnukainen, 2003).

Maintenance and operations processes and guiding factors are presented in figure 3. These processes will be considered in more detail in the next research report.

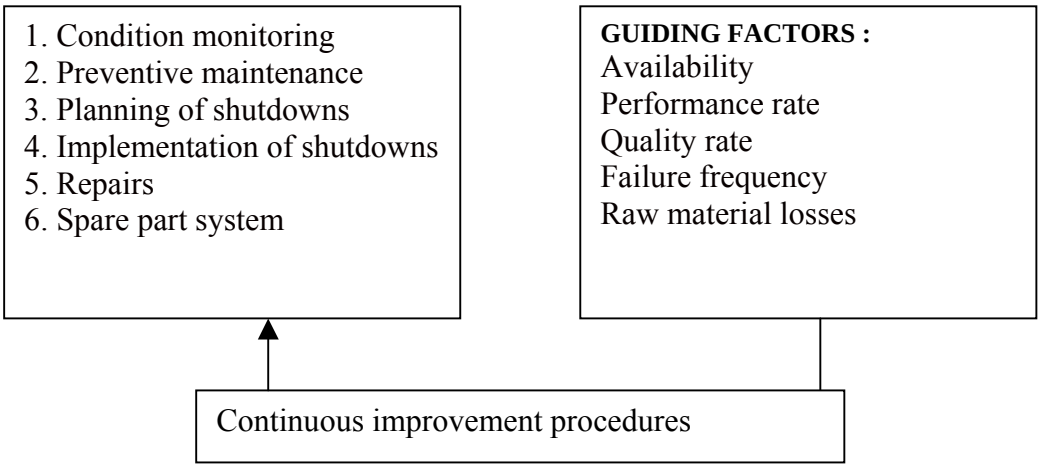


Figure 3. Maintenance and operations processes (Management Systems Oy web site, 2004).

According to Laine (2001), the development is needed on maintenance and operations areas, such as continuous electronic control of machinery, electronic history data, preventive maintenance activities, interactive shutdown planning and control, electronic management of material and spare parts, and electronic links to service providers.

Service centrality, globalisation and increasing business from the services are the mega trends in the maintenance and operations business. For example the KONE corporation, which manufactures elevators and escalators and provides services for these products, splits its business process into three main parts: the supply line, the front line, and the brand and risk management. The supply line includes product development, engineering, sourcing, manufacturing and logistics. The front line includes marketing, sales, installation and after sales services such as maintenance and operations. The supply line creates close to 40 per cent of the added value, the front line close to 60 per cent, and the brand and risk management about 3 per cent of the added value. This varies between the different lines of business. The Kone case indicates that customer service process (front line) adds value more than material process. The globalisation and process standardisation at Kone has proceeded in following steps: (1) the brand and risk management, (2) the supply line, and (3) the front line. Information system standardisation is aligned with process standardization. Kone competes against local service providers in the after sales business. Competitive advantage is pursued via preventive maintenance services. The service products include diagnostic features and therefore, remote problem solving is possible. Furthermore, KONE provides centralized service centre for its customers. In problem situations, customer can get all the information, such as service history that is related to the product. (Perttula, 2003). Service centres can also manage the capacity of service network, and send service orders for free service staff on the field (Kemppainen & Vepsäläinen, 2003).

3.3 Maintenance and operations information systems

According to the case study of Salmela & Jahnukainen (2003) (the case companies were Kone, Nokia Mobile Phones, Metso Automation, Fujitsu Invia, ABB Group IS and Outokumpu Copper Products), the service model and information system development often is a trial and error process. The study found 6 key lessons in developing global service processes and ICT solutions:

1) The scope of business harmonisation needs to be defined by business – not by technology. Standardisation of business processes and operative information and moving to a single integrated information system should be used with great care. Perhaps the biggest risk is to involve too many organisational units and underestimate the organisational inertia associated

with enforcing change. Factors must be found and analysed to make decision when a process is worth globally standardise and when locally customised.

2) Implementing a new customer service model is a long development project. Replacing legacy service processes and information systems with new ones is slow process. Even when scope of harmonisation and integration is right, changes are difficult to implement. Creating something new appears to be much faster than changing something that already exists.

3) One process does not serve all. For most businesses, customers are different and thus they need to be served differently. For example the Kone Corporation has distinguished A, B and C processes. A process includes standard, completely pre-engineered products which means short lead times and low price; B process includes standard components but the product configuration is unique, and C process includes customised products. The A/B/C process concept also applies to service business for example in help desk services. The standard customer requests are solved in a remote service centre. More complex problems, the responsibility of handling the case are transferred to specialists. Customised problems are solved by local service persons. For service organisations, finding the right balance between local responsiveness and global efficiency seems to have become one of the key issues in designing service processes. Information system should flexibly support different processes.

4) Use technology to drive changes. Investments in IT should be based on business strategies, but also the business strategies should incorporate options generated by technology. In general, the need to integrate IS strategy and business strategy has been well recognised. When implementing new service concepts and processes, the case companies often benefited from the simultaneous implementation and change process of new information systems.

5) Invest in capabilities to integrate systems. The ERP vendors point out the benefits of connecting all business units within an enterprise into a single database and thus integrating both the operations and management of these units. Most case companies have selected different approach to managing their applications portfolio. The cases clearly support a view that sufficient business integration can be achieved with a modular approach. The modular architecture makes it easier to synchronise the timing of business changes, e.g. the implementation of new service models. In general, each module can be better designed according to needs of its immediate users. Meticulous architectural planning, the ability to set

and enforce policies and standards, an adherence to open application interfaces, minimal dependencies between modules and good technical skills in different platform technologies are prerequisites for a well-functioning module architecture. However, according to Market-Visio study, a majority of 168 interviewees believe that by 2006 total packet software will be much more general than function-specific software (Tietoviikko, 2003).

6) Think twice before going into real time customer information system. A common argument when implementing web-based solutions to customer service is that all delays are removed from the service process, and customers can use real time information to make decisions. The experiences in the cases do not necessarily support the view that real time information automatically benefits customers. More important is that both customers and own employees know the schedule or the rhythm with which systems are updated. Besides the existing applications and IT infrastructure may not be suitable for real time services, and that the transformation to real time operations makes the system architecture inflexible and vulnerable to system risks. The need for real time system is case-specific.

Although above introduced key lessons are deduced from the study of the large-scale service companies, those lessons can also be applied in SME service provider network.

Maintenance and operations information system supports services and material flows in maintenance activities. Maintenance staff of a customer or a service provider is the primary user of the maintenance information system, but business partners can also use system locally at a mill or remotely for example via Internet. Maintenance service providers can use their own maintenance information systems, their customer´s information systems or both according their customers´ request. The basic parts of the maintenance information system are maintenance files (machinery files, location files, spare parts files, hierarchies, drawings), logs (observed defects, repaired defects, performed services), workflow (e.g. order and invoice processing), work control (defect control, project management, and work planning such as shutdown and resource planning), material management (inventory system, purchasing system), cost accounting (cost control, cost allocation, afterward accounting), sales and invoicing (sales orders, invoicing); system administrator interface (e.g. user rights), and different kinds of reports (kunnossapito nettikirja web site, 2004).

Maintenance information systems have not developed very much since the end of the 1980s´, but the Internet and mobile technologies have enabled more efficient information sharing between partners. For example some maintenance data, such as machinery files can also be stored in systems of business partners (e.g. machinery suppliers) and this data is linked to customer´s and/or maintenance service provider´s information system. Material management systems have developed more than maintenance systems during the last 15 years. Maintenance information systems are also provided as ASP service, but the demand for ASP has been modest because of data security prejudices, the traditional way of thinking and IT politics of companies.

4. EBUSINESS CONSTRUCTS AND FRAMEWORKS

Theoretical models, constructs and frameworks, which are utilised in this report, are introduced in this chapter.

4.1 The successful business of the 2000´s

The successful businesses require new kinds of tactics, business models and tools. Effective business design and execution can depend on how technology is used to deliver services faster, cheaper, and with better quality than competitors.

Kalakota & Robinson (2001) present the following basic requirements for business success: (a) Be customer focused. Create customer central processes. (b) Value creation is a continuous process. Even the best business designs can have short life spans. (c) Transform business processes into digital form. Digital information is more efficient to create, search, refine, maintain and share. (d) Decentralise management but centralise co-ordination. Integration efforts to co-ordinate 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. (e) Create ebusiness application architecture. The architecture addresses three critical elements such as interface for customers and suppliers, integration of processes and information systems and innovation of more advanced applications that improve business. (f) Integrate, but plan for continuous growth and change. The value from technology investment should be maximised in changing environment.

4.2 Competitive strategies, networks and ebusiness

According to Porter (1985), generic competitive strategies are differentiation, cost leadership and focusing. In the differentiation strategy, a firm seeks to be unique in its industry along some dimensions that are widely valued by buyers. In the cost leadership strategy, a firm sets out to become the low-cost producer in its industry. In the focusing strategy, a firm selects a segment in the industry and tailors its strategy to serving them to the exclusion of others. In this study, the competitive strategy is dealt with network perspective. A single company can not efficiently utilise all the strategies, but in a company network by utilising ICT it can be

possible. In a company network, individual companies can concentrate on their core businesses, when each company in network can, on the other hand, concentrate on differentiating its services and products, and on the other hand achieve cost efficiency because of economies of scales. Cost advantage can also be achieved when transactions are efficiently managed and automated by ICT among companies in network. Naturally excellence human expertise is also needed to coordinate and manage network. The focusing can mean for example personalised information services, which are supported by ICT. This can achieved for example by mass customisation of information with the help of XML. Services and information bundled with product is seen as a source of competitive advantage per se. Diversification can be achieved when networked companies combine their core businesses, and thus network can provide for its customers diversified total service offerings.

4.3 Value drivers in ebusiness

Customer needs, business goals and supply chain or supply network goals define, how ebusiness is utilised in a supply chain or network. According to Means et al (2000), ebusiness enables new markets, customer responsiveness (e.g. rapid introduction of new products, gathering of customer needs, better customer relationship), holistic service for customers, disintermediation of non-value-added processes that reduces costs and also allows direct link to end customer, reduced costs (e.g. reduction in working capital and lead time), possibility to move into new business, possibility to rapidly reconfigure business models and processes as market conditions change, and more efficient usability of capacity and resources.

4.4 Organisation of value-added networks

According to Means et al (2000), there are following alternative models to organise ebusiness system of value-added networks: (a) all suppliers are linked with buyer and, where applicable, each other, (b) groups of buyers with common needs/interests align to gain leverage, (c) community forms around common exchange of buyers and sellers (no dominant party necessarily), (d) supplier group focus on a common group of buyers, and (e) neutral party builds platform for e-business within vertical market.

4.5 Ebusiness systems in different kinds of business relationships

According to March (1991), actions in organisations can be categorised as either exploitation or exploration. In exploitation, the goal is to improve operational efficiencies (e.g. through reduced manual intervention, increased standardisation and tighter process controls) by streamlining. In exploration, the goal is to learn about the environment and discover novel ways of creating value or solving problems by innovating. Suppliers must understand market trends and customer preferences and use that knowledge in various ways in exploration. Exploitation is about a process management and exploration is about a knowledge management. According to Subramani (2004), competitive performance is coming together from operational and strategic benefits. However, knowledge specificity is more potent than business-process specificity as a basis for deriving strategic advantage.

In different kinds of business relationships, different kinds of ebusiness solutions are utilised. In **vertical integration,** the decision-making is centralised and the process integration has long-term influences on business. Therefore ebusiness system often is a long-term system-to-system integration solution between business units. In **partnerships**, the business relationships can be middle or long-term. Business partners mainly exchange operational and tactical information. Ebusiness solutions are mainly transactional based. Information system integration degree between business partners varies case-by-case. Traditional EDI solutions have been common in long-term partnerships, while web-based solutions have recently been utilised in middle-term relationships. In **strategic partnerships,** ebusiness solutions are something between solutions of vertical integration and partnership. Strategic partners exchange collaboratively operational, tactical and strategic information; e.g. long-term forecasts and R&D information. In **company networks**, the decision-making is decentralized for different companies. Companies make both the company specific and the network specific decisions. Ebusiness solution must be flexible, especially in a dynamic company network, and it must support the coordination of network resources and needs. Web based solutions such as extranets are utilised. When the process integration degree between partners is high or processes are similar among the network partners, the partners may need shared network information system, which support the standardised processes. In **competition model,** products and services are bought from markets and price is often a determining supplier selection criteria. Ebusiness system must be very flexible, because business relationships are short-term. Deep system integration can be a risk, because investments in integration can be

unprofitable. Web based e-commerce catalogues, electronic auctions, reverse auctions and exchanges can be utilised. (Salmela, 2004).

Some business relationship types, and related ordering and replenishment models are presented in figure 4. According to the figure, order and replenishment models and utilised media (internet or extranet) differ in different kinds of relationships.

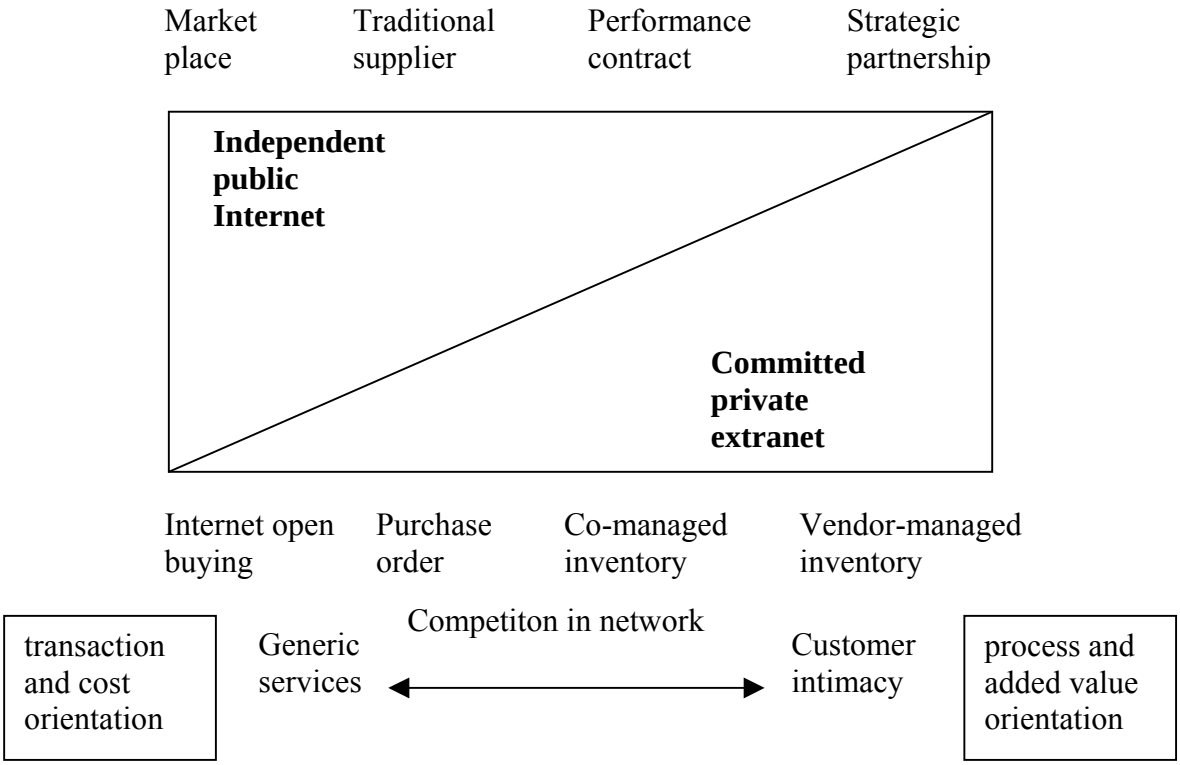


Figure 4. Different ordering and replenishment models in different kinds of business relationships. (Poteri, 2003).

IT service provider, TietoEnator (Raunio, 2003) has studied different kinds of business networks and the suitable network information system solutions for those network alternatives. Different types of networks are presented in table 2.

Table 2. Different types of networks (Raunio, 2003).

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

Different network information system alternatives are matched with different network types in figure 5.

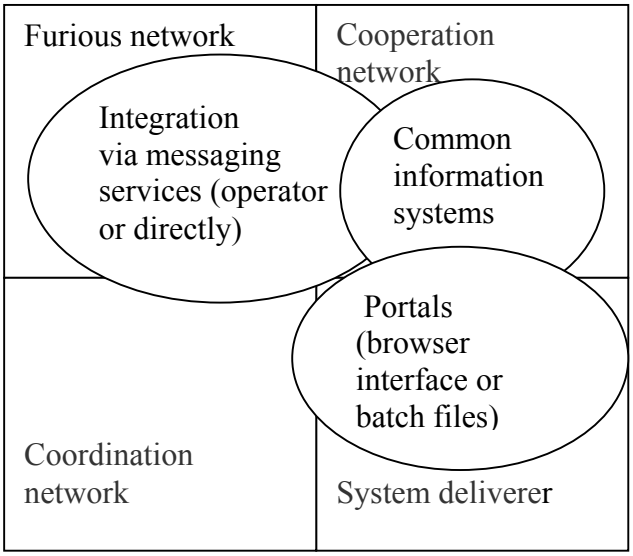


Figure 5. Network information systems in different types of networks. (Raunio, 2003, adapted).

4.6 Ebusiness strategy, design and architecture

Kalakota & Robinson (2001) have created the process of ebusiness planning that includes a translation of ebusiness strategy to action. This process is presented as adapted for company network in figure 6.

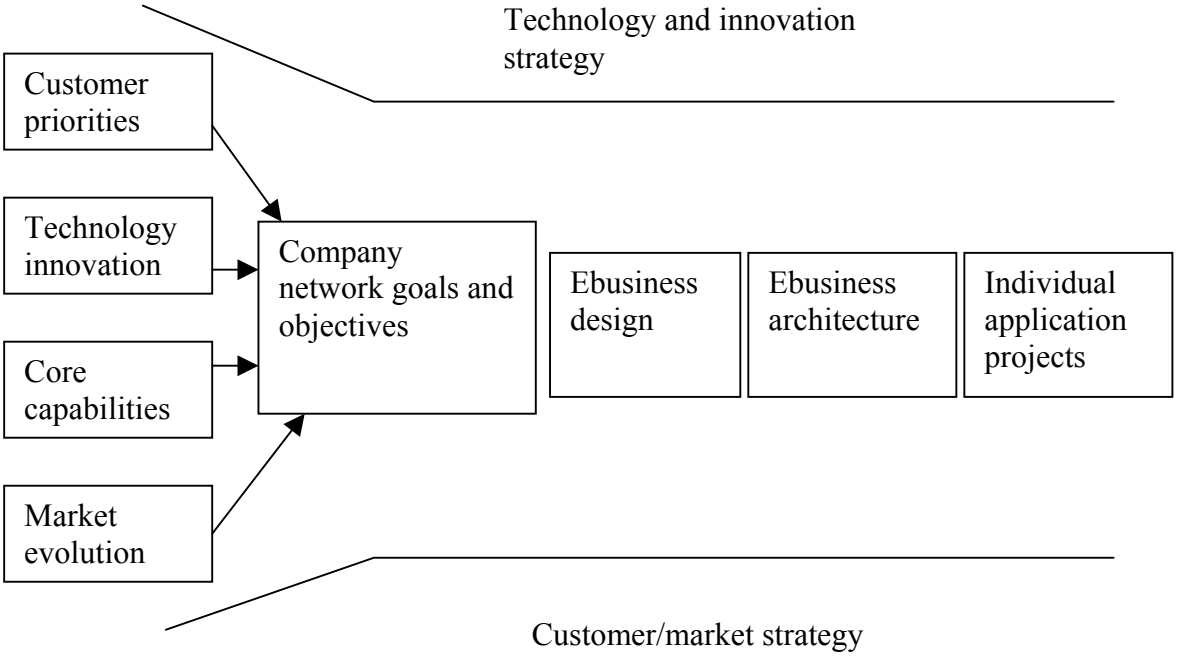


Figure 6. Translating ebusiness strategy to action.

This research report concentrates on ebusiness strategy, design and architecture of the CASE network. The CASE network goals and objectives are dealt with EDYNET research report "Vision for SME Sector in MRO Business Field" (Salo, 2004). Applications and processes will be dealt in the next SMILE research report.

4.6.1 Ebusiness scenario, vision and strategy

Ebusiness scenarios, visions and strategies must be linked to traditional business scenarios, visions and strategies of a company or a company network. Business is same, but it is based on electronic channel. (Korper & Ellis, 2001). The landscape of ebusiness strategy is presented in table 3

Table 3. The landscape of ebusiness strategy (King et.al., 2002)

Strategy initiation	Industry, company, network and competition analysis. Scenarios. Vision. First mover or follower? Global or local? ICT - enabler or driver? Role of ebusiness.
Strategy formulation	Critical success factors, objectives, strategies, ebusiness opportunities, architecture, cost-benefit and risk analysis.
Strategy implementation	Organisation of development teams, implementation plans, project management, pilot projects and resource management.
Strategy assessment	Metrics. Failures and successes.

A scenario working is the starting point for the development of vision, strategies and roadmaps. Scenarios are descriptive narratives of plausible alternative projections of a specific part of the future. Scenarios serve two purposes: first, scenarios foster preparedness so that managers can anticipate a range of potential futures and get ready. Secondly, scenarios afford managers a forum, in which to consider and determine what they should do to materialise each future (Fahey, 2003). A vision is the desired future.

Ebusiness strategy includes means, how information systems and information networks can be utilised to attain and maintain a competitive advantage of a company or a company network. Ebusiness strategy is about the uncertain future and therefore it is based on assumptions and beliefs about customer priorities, technology evolution, competition, and the core competencies that will be needed in competition. In a customer central business, ebusiness objectives, ebusiness strategies, and ebusiness models of customers must be considered when ebusiness strategies, objectives and models of a service provider 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 companies must make strategic decision to openly share information that support to accomplish network objectives. For example, information sharing for suppliers is crucial in the situation, where some operational function is partly or totally outsourced for suppliers. When the management of function is also outsourced, service providers need information to plan and make decisions on behalf of customer.

Top-down analytic planning, bottom-up tactical planning, and continuous planning and feedback are alternative ebusiness strategy planning processes. The goal of the top-down planning is to find the most likely outcome and create a strategy that is based on it. Managers

discuss alternative scenarios and test how sensitive their predictions are to changes in key variables. The top-down planning is only marginally helpful when business environment is uncertain. In the changing environment, the insights of those on the front line, such as sales people are important. Then bottom-up planning can be utilised. In the bottom-up planning, individual projects succeed well, but there are no integrated plans that link individual projects into a cohesive whole. (Kalakota & Robinson, 2000).

According to Mitchell & Coles (2004), the source of sustainable competitive advantage is coming from continuous business model innovation. In continuous planning, strategy formulation and implementation blur, and the continuous planning process includes features of both the bottom-up and top-down planning processes. Planning cycles are short and organic, and the success of continuous planning depends on feedback. An ebusiness strategy must evolve as innovative technology or business models emerge and new customer needs are observed. Continuous planning is perceived suitable in ebusiness planning. (Kalakota & Robinson, 2000).

According to Kalakota & Robinson (2000) ebusiness strategy formulation includes **knowledge building**, which helps a company in understanding customer values and where the industry is going; **capability evolution**, which defines the existing business and identifies what capabilities it has today and what capabilities it needs to have tomorrow; and **ebusiness design**, which asks what the value proposition a business must provide to take advantage of digital capabilities, and how is this value going to be packaged into products and services.

Ware et al (1998) proposed a seven-step framework for developing ebusiness:
1) Create a map of scenarios for aligning business strategy and Internet initiatives in the future.
2) Communicate a vision from top management to drive Internet initiatives
3) Identify and transform key value constellations, specifically, what business core practices and processes could Internet technologies affect most.
4) Develop the portfolio of ebusiness initiatives
5) Develop year-by-year objectives and plans for the chosen initiatives, including measures of effectiveness and their effect on the business

6) Implement the change. The project participants must undergo the changes in attitudes and behaviour required by such a system.
7) Monitor the overall plan, learn lessons, adjust, and improve.
(King et al. 2002)

4.6.2 Constructing ebusiness design

Ebusiness design is the development of the coherent design that responses the new customer needs. The ebusiness design is the foundation that helps the company network get where it needs to go. For example if a customer wants self-service solutions, then the ebusiness design must facilitate that need. Ebusiness model is an outcome of ebusiness design. Ebusiness model is a method of doing business in Internet by which a company can generate revenue, or a method that support business and help to gain or sustain competitive advantage. Different ebusiness models are for example channel reconfiguration, transaction intermediary and infomediary.

The idea of creating value is not novel, but new is how innovative business designs are delivering value. According to Kalakota & Robinson (2000), the process of constructing an ebusiness design is the following:

1. Self-Diagnosis. Is the company or company network ready for new kind of business model?
2. Reverse the value chain. The greatest challenge in ebusiness is linking emerging technology to new business designs to respond customer needs.
   Traditional business design includes:

in-house core competencies → rigid infrastructure/processes → product/services → channels → customers

   New business design includes:

customer needs → integrated channels → product/services → flexible infrastructure/processes → outsourced/in-house core competencies

3. Choose a narrow focus.
   Market leaders use three types of e-business designs to narrow their focus and retain leadership, because they know that few organisations can do many things well. Market leaders thrive because they provide intrinsic, narrowly focused value that their

customers care about. Successful firms choose among **service excellence** (delivering what customers want with hassle-free service and superior value), **operational excellence** (delivering high-quality products quickly, error free, and for a reasonable price) and **continuous innovation excellence** (delivering products and services that push performance boundaries and delight customers.

4.6.3 Ebusiness architecture

As businesses apply technology to address new opportunities, the relationship between the business model and its application architecture grows closer. The application architecture defines how well information is managed in supply chain or network. ICT infrastructure and business processes must be shaped so that they meet the demands of customers and build lasting value by connecting business strategy with operational reality. Ebusiness architecture is about how to integrate an intricate set of applications so they work together to manage, organise, route, and transform information.

Ebusiness architecture is a conceptual framework for the organisation of the ebusiness infrastructure and applications. It is a plan for the structure and the integration of ebusiness resources and applications in the organisation (King et al 2002). Ebusiness applications are needed to implement strategy to make supply chains and networks more competitive. Company network includes many different existent applications of different companies. Generally, applications have first been integrated internally in companies and after that also with business partners. Only by focusing to end-to-end processes and business applications, organisations can achieve the levels of performance that the global competition demands. A clear roadmap of the various cross-functional and cross-organisational applications and how they integrate to backbone of the enterprise or supply chain becomes essential. Figure 7 shows from the value chain perspective, how different application clusters are integrated to form a ebusiness model of the organisation. Furthermore, each cluster can include many different sub-applications.

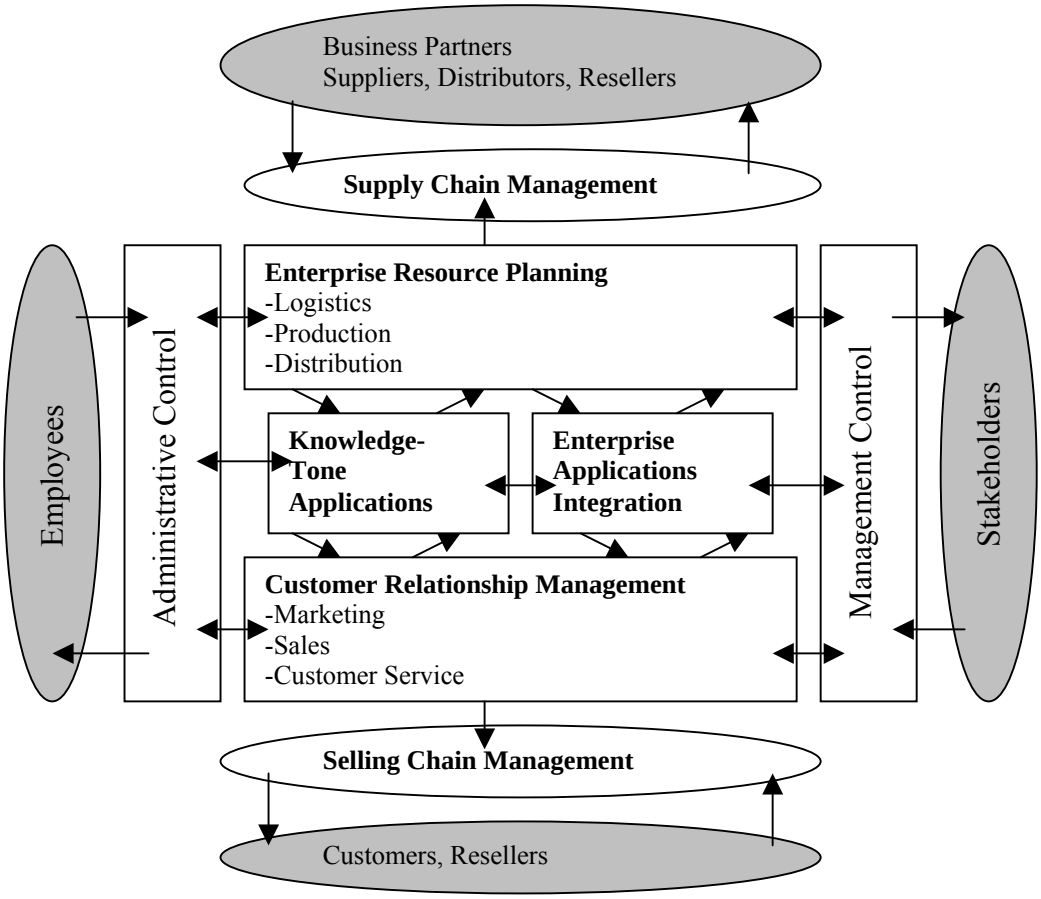


Figure 7. Ebusiness application architecture (Kalakota & Robinson, 2001).

Constructing the ebusiness architecture is the issue of top business and information managers. The architecture constructing responsibility is not clear in supply chains and networks, which consist of many companies. However, the supply chain or network manager companies usually have also the total architecture management responsibility.

4.7 ERP-/ebusiness matrix

An ERP-/ebusiness matrix (figure 8) describes, how company is positioned in ERP and ebusiness map. In the matrix, the internal ERP evolution locates on the vertical axis and the external ebusiness evolution locates on the horizontal axis. The matrix is developed for global companies, but it can also be applied in SMEs and company networks. Companies in a company network are analogues with business units in global corporations. Explanations of the ERP-/ebusiness matrix are presented in table 4.

	eBusiness				
ERP	No ebusiness capabilities	Channel enhancement	Value chain integration	Industry transformation	Convergence
Greenfield					
Non-integrated systems					
Limited/single function ERP					
Integrated business unit ERP					
Integrated enterprise ERP					

Figure 8. ERP-/ebusiness matrix (Norris et al 2000).

Table 4. Explanation of the ERP-/ebusiness matrix.

ERP in the matrix includes:	**Ebusiness in the matrix includes:**
Greenfield. No ERP system.	No ebusiness capabilities. Company has not ebusiness solutions.
Non-integrated systems. Company or business unit has non-integrated legacy systems and applications.	Channel enhancement. Internet is a business enabler and company has some eprocesses with its supply chain partners. However, back end systems runs independently. This includes information sharing (e.g. supplier manual) via web browser and interacting with web forms.
Limited/single function ERP. Company or business unit has one or more ERP modules (e.g. financial and accounting, MRP, logistics).	Value chain integration. Company has integrated processes with its supply chain partners. Some partners´ back end systems are integrated with company´s own systems and transactions are automated.
Integrated business unit ERP. Business unit has ERP system that integrates different functions.	Industry transformation. Internet is business driver and strategic. Value chain includes fully integrated processes and back end systems. Processes are dynamic (e.g. real time capacity management) and collaborative (e.g. co-forecasting, co-engineering).
Integrated enterprise ERP. Enterprise has globally integrated ERP. This means globally standardised processes.	Convergence. Different industries co-operate to add value for customers (e.g. virtual market places of different industries).

During the 1980s´ and early 1990s´, process models focused on incremental process engineering in large-scale companies. Non-value-added activities were removed or replaced with more value-adding activities. For many sectors this involved the development of just-in-time processes, in which demand signals trigger quick and flexible responses to manufacture and ship part or services to the next step in the process chain. Time-based approach in process design improved working capital efficiency in supply chain inside of company. During this phase of process improvement, EDI was used to better connect elements of the supply chain. During the 1990s´, companies continued to evolve their business process models in the direction of synchronised supply chains (sourcing, manufacturing, distribution, sales and after sales). The key to success was to share market and demand information smoothly throughout the supply chain within the four walls. This practice reduced end-to-end cycle time and made customer responsiveness better. ERP systems provided best practice models for companies. Ebusiness requirements of the 2000´s come from inter-organisational processes that must be managed in company network or in extended supply chain. This business model must serve multiple channels along the supply chain from the brand-owning company to end customers; provide sufficient flexibility and transparency so that customers, business partners, and employees can actively affect performance and activities; perform as a synchronised supply chain; and allow demand, capacity, and price to be optimised in the supply chain (Means et al 2000).

Dell Inc. is a good example of the company that has moved to right bottom corner in the ERP-/ebusiness matrix, when it began to sell other consumer electronics besides the computer devices. Well-known brand, such as Dell, owns customer relationships and can diversify its product mix by converging with other industries.

4.8 Communication matrix

A communication matrix is presented in figure 9. In the matrix, data source is on the vertical axis and data user on the horizontal axis. Human-to-human interaction is needed for example in non-routine complex decisions and in sharing of tacit information. Human-to-computer and computer-to-human interactions are suitable for example in small volume transactions, in which routine manual work is insignificant. Computer-to-computer interaction can be used in high volume routine transactions, which require much manual work. Different communication alternatives are positioned into communication matrix in figure 10.

From: \ **To:**	Human	Computer
Human		
Computer		

Figure 9. Communication matrix.

From: \ **To:**	Human	Computer
Human	-meetings -phone -email -fax	-data from interactive extranet user interface (web forms) -data for example to ERP
Computer	-data for example from ERP -data to web browser, proprietary client or fax	-direct system-to-system integration or integration via information hub -real time or batch file

Figure 10. Different communication alternatives in the communication matrix.

5. CASE NETWORK

5.1 Case background

Maintenance and operations market shares in forest industry of South Karelia are divided into in-house of the customers (ca. 60%), the local contract service providers (ca.10 %), and total maintenance service providers, machinery suppliers and local non-contract service providers (ca. 30 %). Total volume of maintenance and operations business in the network will not change significantly in forthcoming five years but outsourcing will increase from 40 % to 60 %. (Pöllänen, 2003). The total organisation of the maintenance and operations network in forest industry is presented in figure 11.

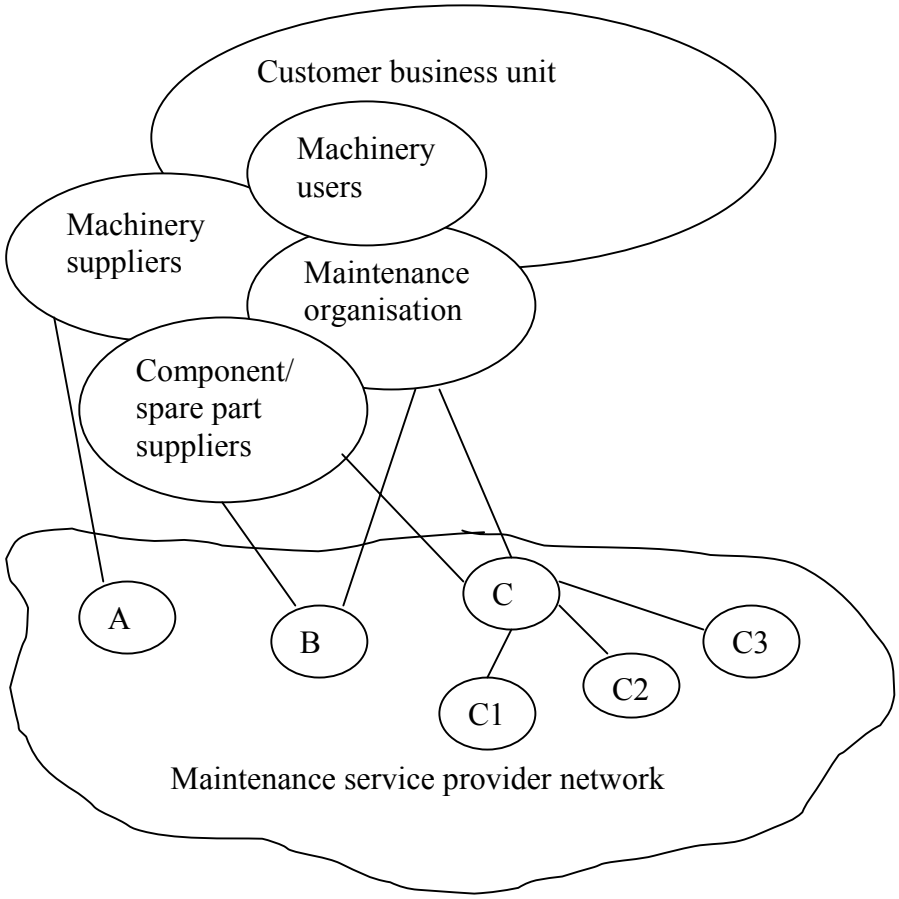


Figure 11. Organisation of maintenance and operations network in forest industry (Pöllänen. 2003).

This study concentrates on business relationships and ebusiness between the forest industry customers/maintenance organisations and their local maintenance service providers.

5.1.1 CASE network

The CASE network is the co-operative network among four forest industry business units and their 14 local mechanical maintenance contract service providers in South Karelia of Finland. The CASE network started in 1996 from the initiative of the forest industry customers and it is one of the network pioneers in Finland. The CASE network has extended to a network of 60 local service providers from different areas of maintenance and operations business (e.g. automation, electricity, hydraulic) during 2004.

The customers are global forest industry corporations, which have their local business units in South Karelia. The local service providers are mainly small or micro-sized companies, which employ 10 to 30 people. The local service providers perform physical maintenance work activities for the customers, and they have no wide management responsibilities. A considerable portion of local service providers´ turnover is coming from maintenance business for the forest industry customers. Maintenance markets assisted the local service providers to survive over the recession in the beginning of the 1990´s.

When the CASE network was founded, the objectives were new business creation, SME sector development and vacancies retention. In the CASE network the main development areas have been the common contract models among the participants, fulfilling of quality requirement of the customers, and education of the service providers. The network also has common quality system. As a result, the cooperation among the companies has deepen and increased in the network. Continuous improvement philosophy is used in the development of the network. The steering group of the network makes decisions related to network development initiatives. The CASE network is not a juridical unit.

SWOT analysis was made for the CASE network in EDYNET study. This analysis is presented in table 5.

Table 5. SWOT analysis of the CASE network (Salo, 2004).

Strengths	**Weaknesses**
-independent entrepreneurship -reasonable investments -basic competence -good relationships with partners -good relations with the customers -locally well-know -loose networking with the partners -experienced personnel -so far equable and even employment -a lot of industry around -good price/quality ratio -financial stability -good reputation	-no active and outspoken long term planning -poor negotiating power -aged personnel and management -micro and small sized companies -no development resources -no enough development capabilities -no ambitiousness -no continuation of entrepreneur -poor possibilities to get access to high technology -no enough collaboration with partners -no active marketing or business elsewhere -partly outdated processes and IT systems -no leader in the network -no coordination in collaboration with the partners -poor recognition of change -no specialisation
Opportunities	**Threats**
-focused marketing and lobbying -long term planning with business partners -predictive alertness in changes -outsourcing in forest industry increasing -new power in negotiations by networking -new partners available -activity in training and investments -activity in specialisation -coordination and management of networks -support and respect from government and authorities -on going development projects -privileged status as a local company -price competitiveness -excellence in performance (quality) -local education -existing customer relationships	-hard competition with new competitors -foreign underpaid employees -lack of understanding of business -lack of understanding of entrepreneurship in the customer interface -no commitment from current customers -short term planning in general -too tempting offers from business buyers -no collaboration locally -envy -lack of development -corporate level decisions of the customers -centralisation of operations in customer companies -fluctuation of customer demand -overwhelming demands and expectations from customers -forest industry will not invest in Finland anymore -aged and retiring personnel -lack of qualified employees -down markets within the region

5.1.2 Total maintenance service providers, machinery suppliers and internal mill services

National and global maintenance service providers provide global total maintenance services for the forest industry customers. Global machinery suppliers pursue also more after sales activities. This is obvious because even more than half of life cycle costs of paper machinery comes from after sales activities. Some customers in the CASE network have their own mill service companies, which have the responsibility of the management of maintenance and operations. Other customers in the CASE network have their own internal maintenance departments.

5.2 Business relationships in the CASE network. As-is-state.

The CASE network is the vertical network between the local service providers and the customers, and the horizontal network among the local service providers. The CASE network service providers mainly consider each other as partners - but in some cases also as competitors. According to Pöllänen (2003), there is no significant cooperation in production among the service providers, because competencies of the service providers are very similar. Some cooperation exists between the CASE service providers and local non-CASE network service providers. In the CASE network, inter-organisational trust is in order, and so elements for wider cooperation and reorganisation exist. However, according to Karhu (2002), from the perspective of the customers the type of relationship is seen as cooperation, while from the perspective of the service providers, the relationship is considered more as competition.

Global large-scale service providers can provide total service and development activities for their customers. Machinery suppliers and local service providers have particular specialities, but not the total service. Global maintenance service providers, machinery suppliers and the mill service companies of the customers are simultaneously opportunity and threat for the local service providers, because they can be either competitors or customers for the local service providers in the future. The customers have much new machinery, when the service need is little and machinery suppliers manage warranty services. Machinery suppliers have know-how of their own machinery, but the local service providers can perform better and more cost efficiently the physical maintenance operations. Therefore machinery suppliers utilise the local service providers in some maintenance operations of the machinery they have delivered.

Competitive advantages of the local service providers are close location, responsiveness, cost efficiency and good knowledge of machinery, factories, processes and personnel of the customers. At present the service providers can manage separated jobs or small aggregated jobs, but they cannot compete against large-scale service providers or mill services in wide job entities or in investment projects. Management and R&D can be performed remotely in maintenance business, but labor intensively physical maintenance work is however bought from the local providers or performed in-house because of cost factors.

Different customers have different sourcing strategies and maintenance organizations, which sets great challenges in standardizing operation models and processes in the CASE network. Customers have centralised global corporation contracts and decentralised business unit specific local contracts with their suppliers and service providers. Local contracts are mainly used in services and in some material. Global contracts are used in common raw materials and in large-scale purchases. Different customers use different mixes of local service providers. Customers select optimal combination of service providers that maximises potential profit and minimises potential risks in shutdowns. Low labour costs are insignificant in maintenance operations, if quality is poor and deliveries are late. Therefore, the total costs of maintenance work is an important factor in selection of service providers.

The management of the maintenance service provider network is one of the key matters for the customers, because processes must be undisturbed in process industry. At present the CASE network is mainly managed by maintenance organisations of the customers. The customers know their local SME service providers profoundly because of long relationships with them. In shutdowns there can be hundreds of maintenance men from tens or even hundreds of companies performing their duties. Accurate orchestrating, that is accurate scheduling and allocation of work, of this network is necessary because one weak link in the network can late the start-up of the machinery. The customers use services of many local service providers, but the CASE network service providers however are preferential because of contracts. However, supplier selection for separate shutdowns is also based on human-to-human relationships. About half of the local maintenance service work is performed outside the contracts. Business relationships in the CASE network are based on three-year bilateral contracts between a customer and a local service provider. Prices are negotiated annually. Total maintenance business volume has not recently increased but purchases from the CASE service providers have been increased because of network development activities.

The customers mainly fulfil first their own maintenance capacity and if it is not sufficient, further resources are purchased from service providers. Some customers have outsourced special tasks for their service providers, and those tasks are always acquired from them. In that case, the customers have not at all their own capacity for those tasks. Maintenance service outsourcing rate differs among the customers and it ranges from 35 to 65 per cent. Seasonal variation is a considerable problem in the CASE network. Furthermore, service intervals have lengthened because of new machinery. Those causes mean uneven load for the service providers during the year. The service providers cannot adjust their service capacity according to big shutdowns, and therefore additional resources are needed especially in Christmas and Midsummer shutdowns. Non-CASE network and non-local service providers are utilised in demand peaks.

The customers have tools to select new service providers and to audit performance of their existent service providers. Those tools include different criteria and performance indicators for service providers. The tools are developed continuously; for example ebusiness readiness of a service provider will probably be added to criteria in the future. The service providers have to adapt to criteria, which the customers define and thus keep up with the development of their customers. Different customers have different criteria although standardising work has been done.

Business relationships are not restricted only the cooperation among the local service providers, machinery suppliers and the customers, but cooperation is also undertaken among the customers. This study does not concentrate on cooperation among the customers.

5.3 Information systems in the CASE network. As-is-state.

5.3.1 Communication in the CASE network. As-is-state.

Figure 12 presents the current business relationships and communication methods at rough level in the CASE network. The figure also includes machinery suppliers and total maintenance service providers. Although they are not part of the CASE network, they are an essential part of the total maintenance network.

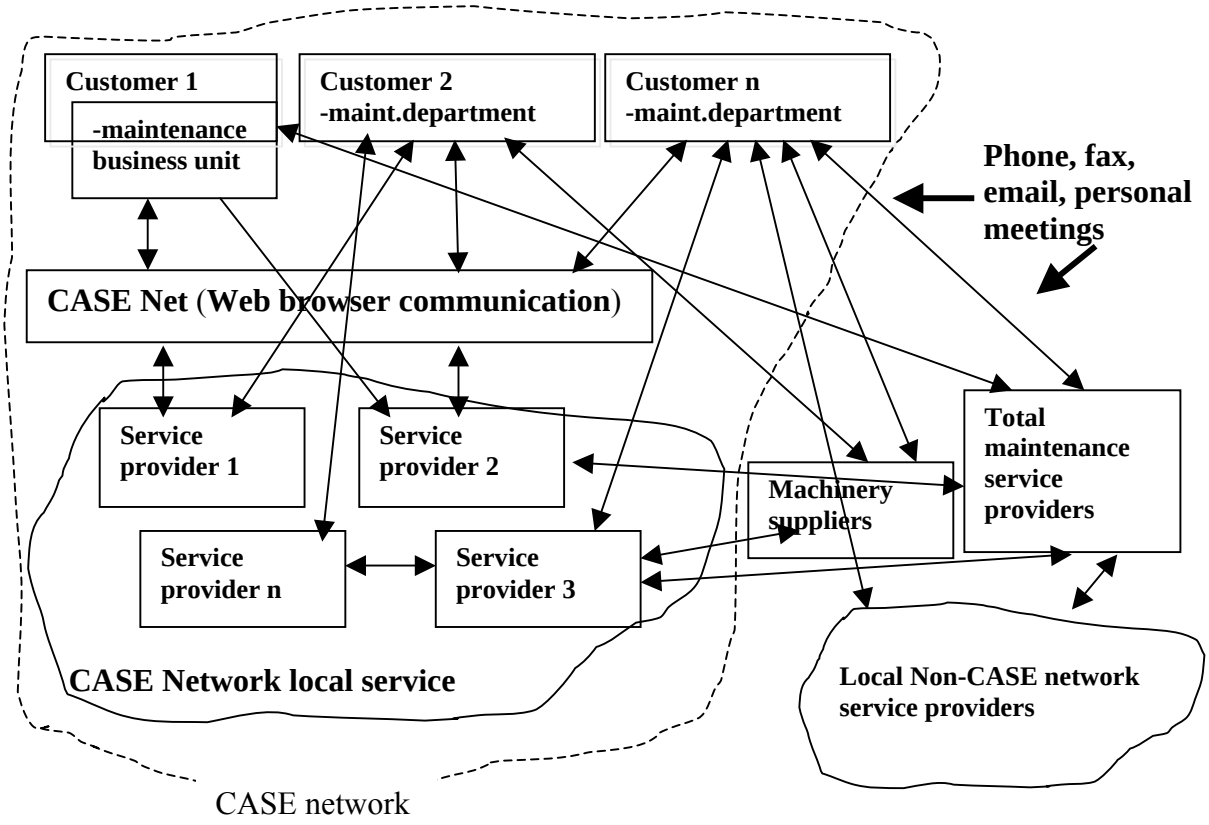


Figure 12. Communication in the total network. As-is-state.

The forest industry customers have their own maintenance departments or business units and maintenance information systems. At present, the customers have mainly concentrated on their internal processes or global corporation processes in their ERP and maintenance system projects, and those projects are in progress. The customers have only some electronic links with their partners; for example some remote connections and extranets have been opened for engineering agencies to manage documentation in large-scale investment projects. Furthermore, some local service providers enter data into maintenance information systems of customers with terminals in LAN of customers. Ebusiness solutions also are not usual with machinery suppliers and total maintenance service providers. Machinery suppliers and total maintenance service providers have provided their own maintenance systems for the customers, but the customers have not been interested in using those systems. At present, the web-based network information system, the CASE Net, is one of few network ebusiness systems that are in use in this total network. The CASE Net has been implemented for the maintenance departments of the customers and the local service providers in the CASE network. Phone, email, fax and personal meetings are the most important communication methods in the CASE network and in the total network.

5.3.2 Information systems of the local service providers

40 % of studied SMEs in South Karelia of Finland have information system. 70 % of the SMEs have interested in developing systems. The SMEs assess that they need half to one year to respond customer requirements in information technology development. (Pöllänen, 2003)

Information systems readiness is good among the service providers that belong to the CASE network. Naturally, the CASE network service providers have different information systems. Every service provider has some financial or invoicing software. Some service providers also have operations management modules. However, there is much development potential to utilise better their current systems. Information systems are not integrated with systems of partners and customers. At present some service providers consider a new information system implementation or updating of existing one. However, the decisions to implement new system are not easy, because systems often are too complex and expensive especially for micro-sized service providers. The service providers in the CASE network mainly utilise email to receive drawings and request for quotes from the customers, and to report work for the customers.

5.3.3 Information systems of the customers

At present the customers have their ERP and maintenance systems projects in progress. Business process reengineering, utilising best practices, globally common reports and metrics, and integrated, standardised and transparent processes are the goals in their global ERP projects. Some processes such as finance and accounting will be globally standardised, while some other processes will be locally customised in their ERP systems.

New ERPs of the customers bring transparency between different business units inside the global corporations, and efficiency in procurement, purchasing and inventory control (Pöllänen, 2003). However, the next goal is to improve effectiveness in external processes with partners in supply chain. The common goal is that the customers decrease a number of their suppliers, because they pursue savings in management and transactional costs. Integrated and automated processes with partners are means to decrease those costs. In the near future, the customers require information system integration and usage readiness from their local service providers.

At present, the maintenance departments or the business units of the customers have the main responsibility to manage the maintenance and operations network and information systems. Maintenance information systems include the management of both internal and external resources. Maintenance systems are partly global and partly business unit specific. Until now the maintenance functions and systems of the customers have been quite separate from other functions and systems, but the new ERP projects integrate the maintenance processes to other business processes. Different maintenance information systems integration alternatives are as follows: (1) a maintenance system is one module in an ERP system, (2) a separate maintenance software is integrated with an ERP system. Furthermore, separate and specific value-adding modules of different maintenance software vendors can be utilised to improve the performance of a maintenance information system and to integrate an ERP and a maintenance information system.

The customers have different maintenance and operations strategies, models and processes. Even different business units inside one corporation can have different models. Furthermore, different customers have different data coding practices. Therefore, one common maintenance information system among the customers is not realistic, but some common external ebusiness processes with their service providers are possible. There is need for the development of ebusiness solutions to support processes between the customers and the local service providers, and on the other hand for processes among the service providers and for processes among the customers. For example common inventory systems have been developed for management of spare parts. Furthermore, customers have communicated quite openly with each others about their ERP projects and some benchmarking of systems have been performed. The processes among the customers are out of scope in this study.

5.3.4 CASE Net information system

One initiative of the CASE network was the design and implementation of web based network information system, the CASE Net. The goal of the CASE Net was to create the system that supports electronic communication in mechanical maintenance service business among the CASE network companies (EKAMK. Täydennyskoulutus- ja yrityspalvelut, 2002). The CASE Net is based on common standardised processes between the CASE network customers and their local service providers. The CASE Net was designed and implemented in 1996-1998

and it was a pioneer network information system in the mid 1990s´ in Finland. After that some system development has been done.

The CASE Net includes the marketing system, which consists of public web sites of the service providers and short description of the customers; and the maintenance information system (intranet/extranet solution), which consists of work orders, resource reservations, phone books, group emails, education material, factory layouts, links, shutdown calendars, memos, forms and work hour reporting. The benefits of the CASE Net have been studied after the implementation. Interviewees considered it necessary or extremely necessary (EKAMK. Täydennyskoulutus- ja yrityspalvelut. 2002). According to the SMILE study, the current CASE Net does not add very much value for the companies. Information in system is mainly static and features of work process management have not been implemented or utilised. A couple of service providers utilise electronic work hour reporting with a customer. Electronic invoicing is not in use. Cause and effect analyses, why the CASE Net implementation and roll out were not perfectly succeeded, are introduced in chapter 6.1.10.

The greatest benefits of the current CASE Net for the service providers are shutdown calendar, contact information, factory layouts and public websites. The greatest benefit for the customers is the contact information of the service providers. The customers do not use public websites of the service providers, because they know the service providers anyway. Preferably, the public web sites could be utilised as a marketing channel for total maintenance service providers and machinery suppliers.

5.4 Development needs

Some observed problems and development needs in the CASE network are introduced in this chapter. The observed problems and development needs are based on research interviews, the experience of the researcher and the reports of other researchers and consultants.

The CASE network considerations, which are based on interviews of the service providers and their customers, include: original idea of the CASE network is missed – the customers have not outsourced as planned; well-defined vision and direction of the CASE network absent; the customers should share more openly information; lack of continuation because of personnel changes; lack of continuation in development work; more education is needed;

purchasers of the customers do not always adhere contracts especially in emergency circumstances; demand is unstable and uncertain; the customers have too many contact points, operation models and different processes towards the service provider network; work supervision is not always performed properly; much administrative work with hour reporting and invoicing; short shutdowns cause much preparation work compared to physical work activities; and the service providers should be more customer central (e.g. communication, marketing, cooperative innovation).

According to Karhu (2002), from the perspective of the customers, the biggest problems and obstacles in the cooperation include that the capacity of the service providers is not enough for big maintenance deliveries - at least not quickly enough; the trade union resists outsourcing; the service providers have not appropriate technology or competence; and the customers want to preserve some basic competences and own maintenance organisation.

According to Karhu (2002), from the perspective of the service providers, the biggest problems and obstacles in the cooperation include that the service providers get orders and shutdown information too late from their customers, and it causes scheduling problems in service production; lack of co-planning between the customers and the service providers causes problems in performing activities cost efficiently; there is no capacity enough for big deliveries; and work load is in imbalance, because shutdowns are kept simultaneously among the customers.

According to Pöllänen (2003), the customers expect from their service providers productized and bundled total services; continuous development of products and services; spare parts services; networking of the service providers, total service offerings; remote diagnostic services; and readiness to electronic data transfer and documentation, system interfaces, and to use electronic systems and input data into systems.

The development needs for the communication in the CASE network and the CASE Net information system include earlier and more accurate shutdown information for the service providers; earlier orders and capacity reservations for the service providers; service product catalogues, work orders, work feedback, work hour reporting and invoicing in electronic format; unbroken electronic workflow from orders to invoicing; the system user interface development; and the change of relational database server software.

5.5 Business relationships in the CASE network. To-be-state.

This study report presents some considerations about to-be-state of the CASE network. The EDYNET study (Salo, 2004), concentrates in more detail on to-be-state alternative strategies, scenarios and business models of the CASE network.

According to Turban et al (2000), the major goals of virtual corporations managed by for example hub company are excellence; each partner brings its core competence, so an all-star winning team is created; utilisation; resources of the business partners are frequently under-utilised, but a virtual company can utilise them more profitably; and opportunism; a virtual company can find and meet market opportunity better than an individual company.

The customers in the network will make their strategic sourcing decisions more and more globally, when they seek the best maintenance solution for them. Those sourcing decisions influence on the network structure and the role of the local service provider network in the future.

Maintenance and operations should not be separated into areas such as mechanical, electrical and hydraulic maintenance, but somebody should manage entities and different specialities can be obtained from the network. For the customers the best solution from the management point of view would be one-stop-shop, where one maintenance service provider provides total service for whole life cycle of machinery or group of machinery or even for the whole factory. Total maintenance service providers and machinery suppliers will come nearer to customer to provide wider after sales services. They pursue extended management responsibilities of maintenance and operations.

Local service providers have so far been competitive in their service supply segment. Total maintenance service providers and machinery suppliers will network with local SME providers or even buy them, because local providers are cost efficient and they have deep knowledge of their customers. Local providers should anyhow provide more extensive deliveries for their customers from planning to execution of work. Machinery and tool knowledge is anymore not enough, but process and industry knowledge is also needed (Pöllänen, 2003). When local service providers network with global players, they also have possibility to get new maintenance markets and networks.

The local CASE network service providers must construct their sub-networks, although their customers may change from the maintenance departments or business units of the forest industry companies to external total service providers or machinery suppliers. Forest industry customer or total maintenance service provider want to interact with fewer partners and thus SME network needs its networked hub model. Some SMEs must develop as hub service providers. 65 per cent of maintenance service volumes of the CASE network are nowadays coming from mechanical maintenance services and therefore it is reasonable that hub companies will develop from some current mechanical service providers. To become a hub service provider, a local service provider must be customer central; have internationalisation and growth will; and have network creation and management, risk taking and development capabilities. Hub companies will have to re-organise its own business and its sub-network business and thus define network company roles, competences and responsibilities. The SME network should include both complementary and supplementary competences to provide extended services and to maintain competitiveness.

Hub companies can provide system deliveries for example for specific machinery, processes or functions of the customers. Value-add for the customers is coming on the other hand from rationalised management, which decreases administrative costs, and on the other hand from improved service quality because of more innovative maintenance solutions when service providers can concentrate on their core businesses. Value-add of the hub model must not only be indicated by qualitative but also quantitative metrics are needed; for example savings in maintenance and operations costs per pulp ton when hub model is used compared to traditional model. Because there is one more knot in the chain in the networked hub model, information and transaction management must be efficient. The hub and contract model between a hub company and its sub-network have been developed in the CASE network during 2004 and 2005. However, networked structures of service providers could work better in large-scale investment projects than in separate maintenance activities. Investment projects are an opportunity for the local service providers and networking is on method to realize it.

One possible future state of the total maintenance and operations network and its partner relationship types and contract terms are presented in figure 13.

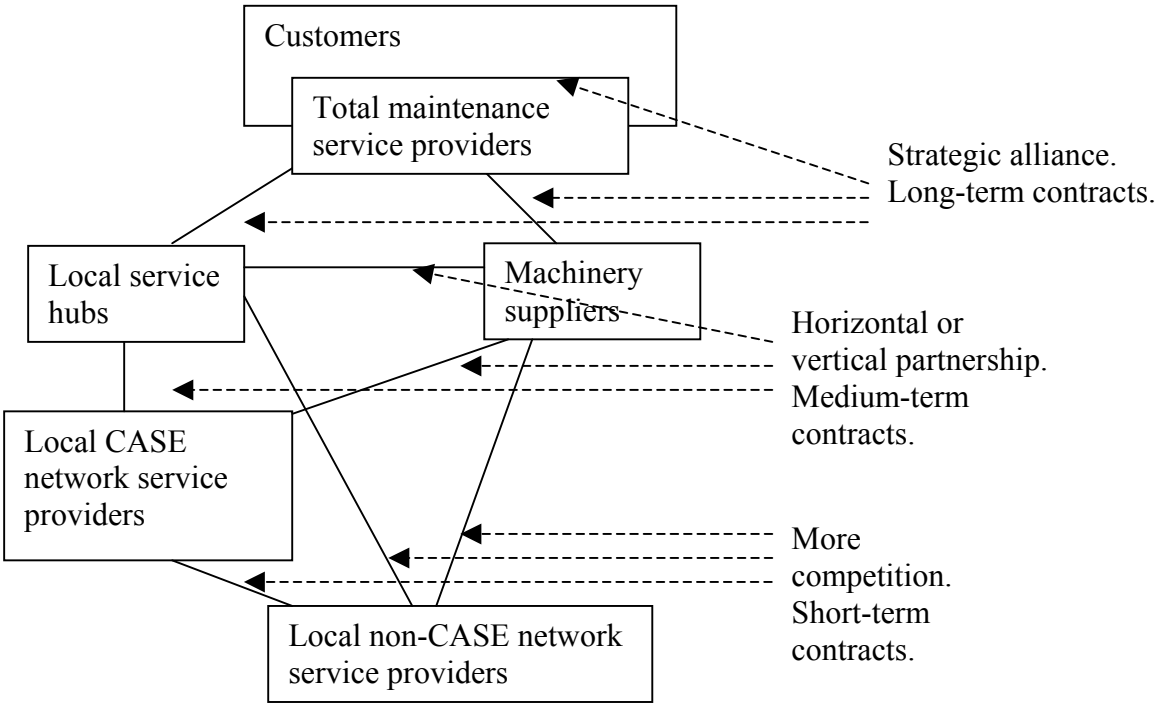


Figure 13. Relationships in total network.

EDYNET research (Salo, 2004), catalogued three scenarios for the CASE network:

1) The first scenario is based on idea that the local maintenance and operations business environment should be regarded as a system of the customers from forest industry and the local service providers, and they have partly common strategies and goals concerning maintenance and operations business issues.
2) The second scenario supports the idea that the forest industry customers and local service providers are collaborative partners but do not state common interests of future. This scenario is a continuity for as-is-state of network
3) The third scenario is based on idea that local service providers do not get enough support and commitment from the customers, and eventually end up working for competitors (e.g. machinery suppliers and total maintenance service providers), and maybe loose independency as entrepreneurs.

Scenarios are discussed in more detail from the perspective of ebusiness system in chapter 6.2.1.

5.6 Network information system architectures. To-be-state alternatives.

In the near future, knowledge and information sharing requirements will increase in the total maintenance network and in the CASE network. This sets new kinds of demands for communication solutions between network partners. Network model and strategy, and outsourcing decisions of the customers are the starting points for the network information system development. During 2004 and 2005 those themes will progress in the CASE network. This chapter previews some alternatives for network ebusiness architecture in the future.

Companies utilise information that is scattered in different manual and computer systems in the company network. For example the local service providers need machinery life cycle information from machinery suppliers and the customers. A local service provider may have some information in its own system, but mainly information will be obtained from for example machinery files of the customers and machinery suppliers. Duplicate maintaining of data should be avoided in the network companies.

5.6.1 To-be-state alternatives of ebusiness architecture

This chapter introduces ebusiness architectures for the total maintenance network at the rough level. Although the SMILE study concentrates on the CASE network, total maintenance service providers and machinery suppliers are also considered in to-be-state ebusiness architecture alternatives.

To-be-state alternative 1. Extended ERP (extranet) model and direct system-to-system integrations.

Alternative 1 is presented in figure 14. In this alternative, the customers extend their ERP systems to ebusiness extranets after their internal information systems have been implemented. The service providers enter data to and get data from the customers´ systems via web user interface. Interactivity for human users is constructed with web forms. The customers can also share batch files (e.g. orders) in different formats, such as excel or xml, and the service providers can have conversion solutions to enter data semi-automatically into their information systems. Processes and services are standardized for different service provider segments in this model. From the viewpoint of the SME service providers, this is not

an optimal solution, because every customer has its own extranet interface towards the service providers, and processes among the customers can differ considerably. In this case, a size of a customer segment is one. The need for real time system-to-system integration is considered separately with each company-to-company combination. Furthermore, machinery suppliers and total maintenance service providers can have their own extended ERPs for the local service providers and the customers. Third party operators are not used in this alternative.

In the alternative 1, the probable links of operational transactions between partners are:

- customer ↔ total maintenance service provider/machinery supplier:
  -interactive extranet web interface, batch file integration or direct real time system-to-system integration
  -processes and services are specific for company or company segment
- customer/total maintenance service provider/machinery supplier ↔ CASE service providers and other local providers:
  -interactive extranet web interface or batch file integration
  -processes and services are specific for company segment

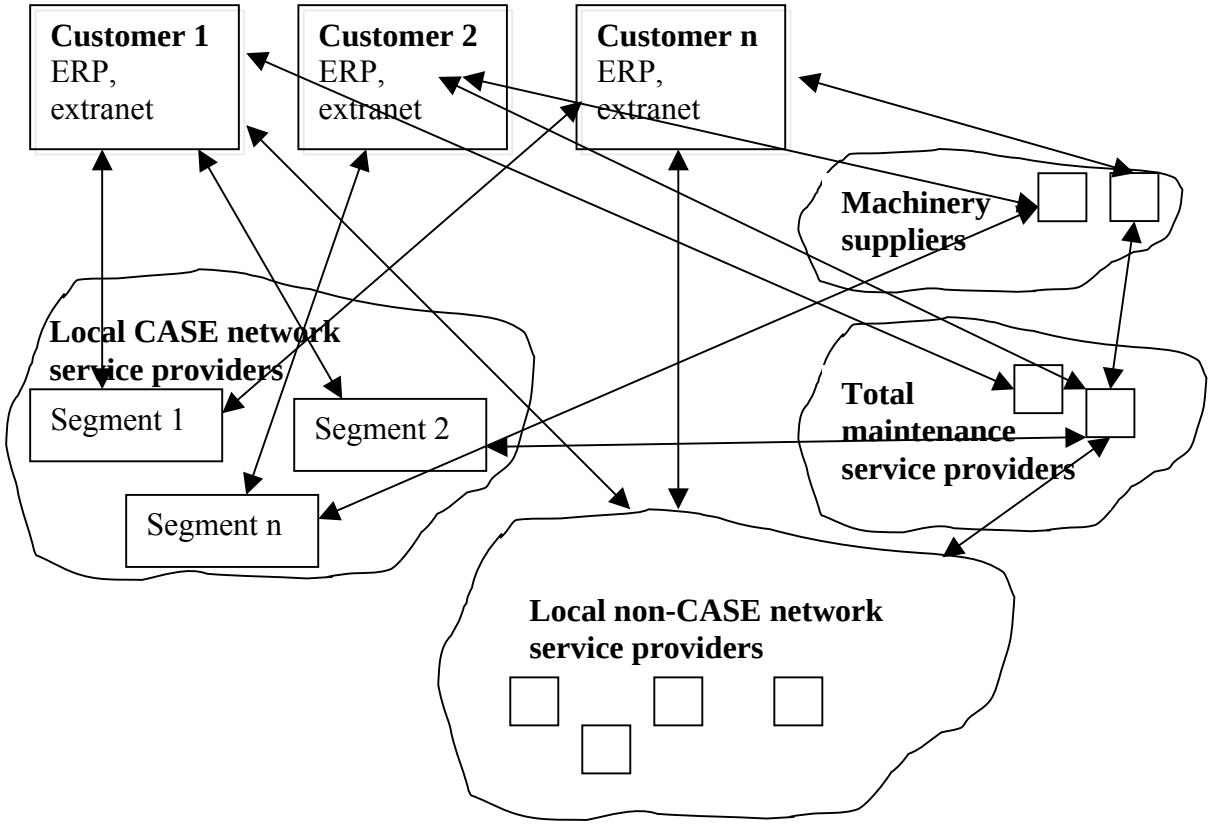


Figure 14. Extended ERP (extranet) model and direct system-to-system integrations.

To-be-state alternative 2. Information hub model.

In this alternative, information hubs are utilised between partners. The customers do not extend their ERPs to extranet solutions, but information hubs take extranet solution responsibilities and tasks. Service providers and suppliers use the services of information hubs to enter and get data via web user interface. Information hubs can also provide some network applications such document management and two-direction conversion services between systems. Each company can agree on real time or batch file system-to-system integration with information hub when it is reasonable. There can be different information hubs in the company network. The CASE Net information system can be one information hub. Figure 15 presents information hubs, which links different participants and systems. To-be-state alternative 2 is presented in figure 16.

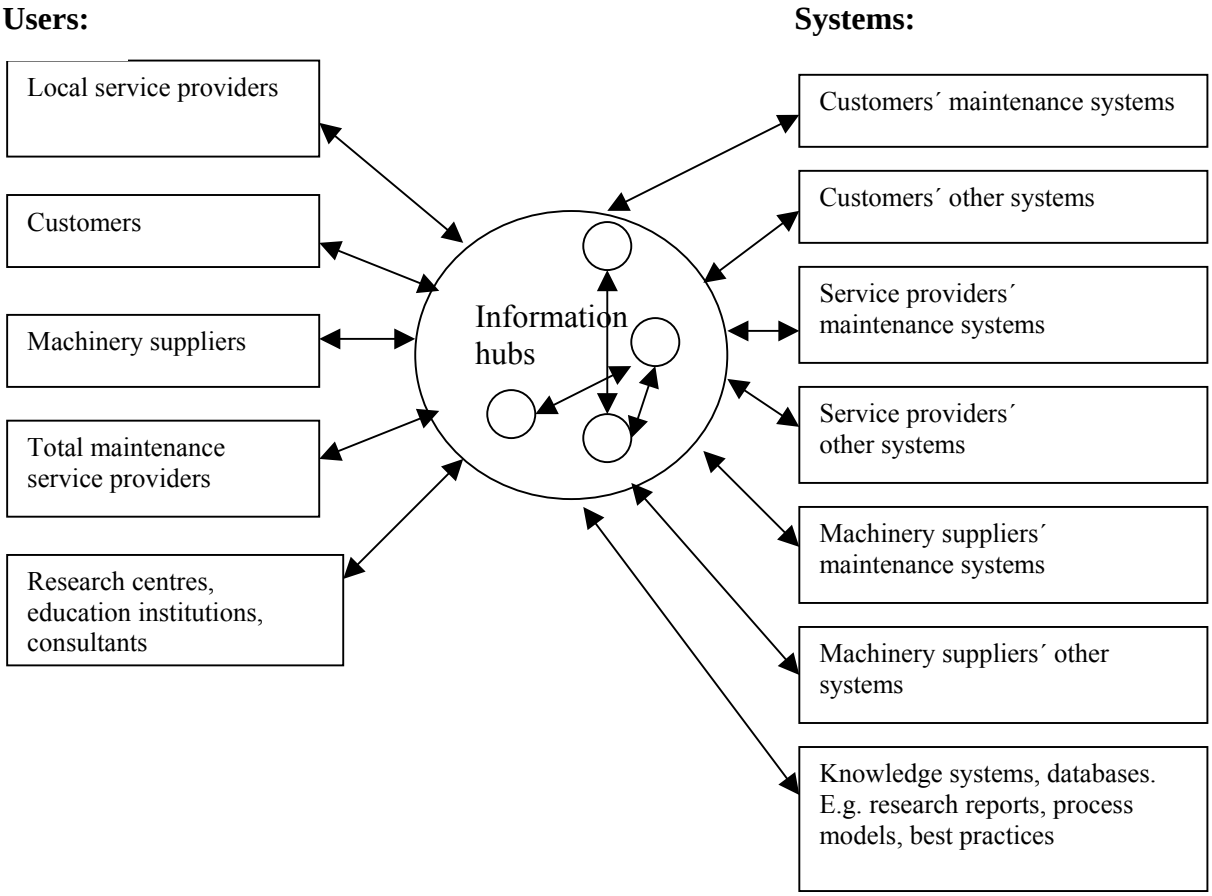


Figure 15. Information hubs link different participants and systems.

In the alternative 2, the probable links of operational transactions between partners are:

- customer ↔ information hub:
  -real time or batch file integration
- information hub ↔ total maintenance service provider/machinery supplier
  -real time or batch file integration, or interactive extranet services for human user
  -processes and services are specific for company or company segment
- information hub ↔ CASE service providers and other local providers
  -extranet, batch file integration, phone, fax, email
  -processes and services are specific for company segment

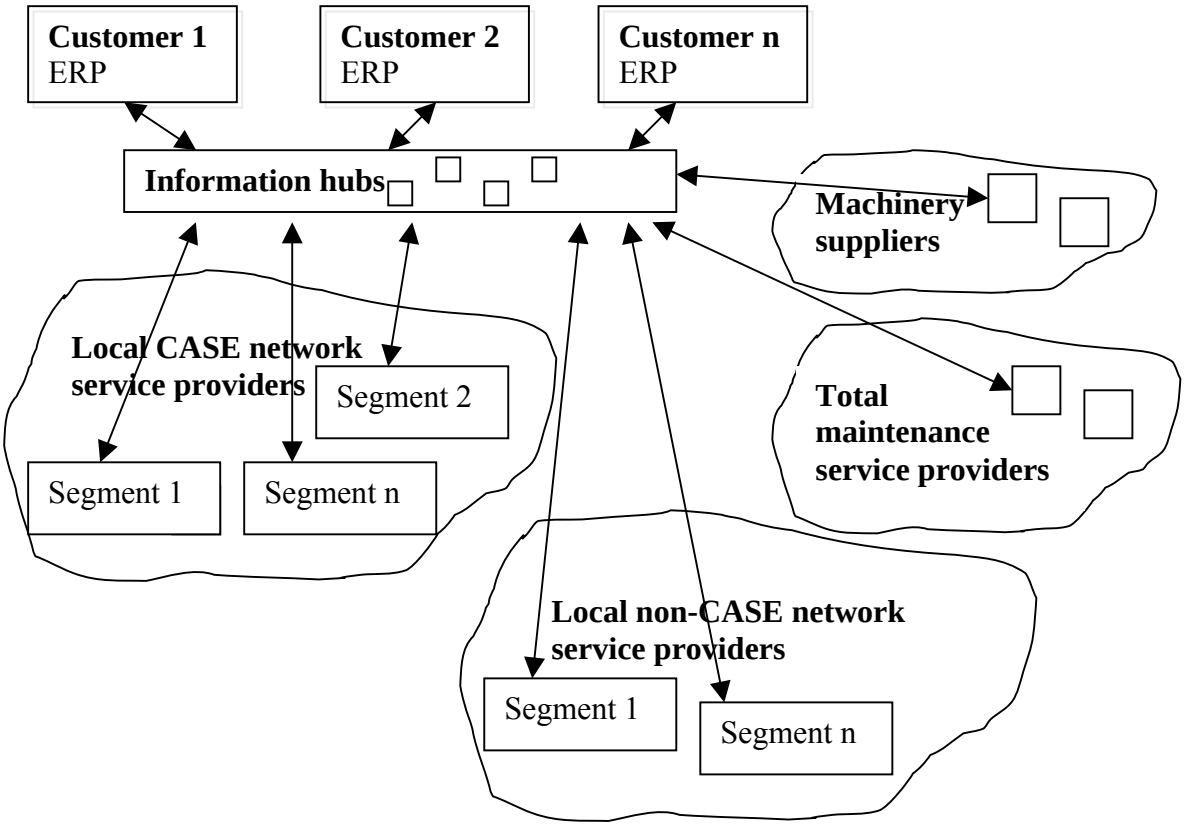


Figure 16. Information hub model.

To-be-state alternative 3. Hybrid model.

Alternative 3 is presented in figure 17. In hybrid model, company extranets, batch file integrations, direct system-to-system integrations and information hubs are utilised between network partners. For example there can be direct system-to-system integrations between volume partners, and extranet interfaces can be used in communication between the customers and small service providers. The model evolves step by step when needs, network structure and readiness of partners change. Furthermore, new kinds of technologies (e.g. web services) are utilized when they mature.

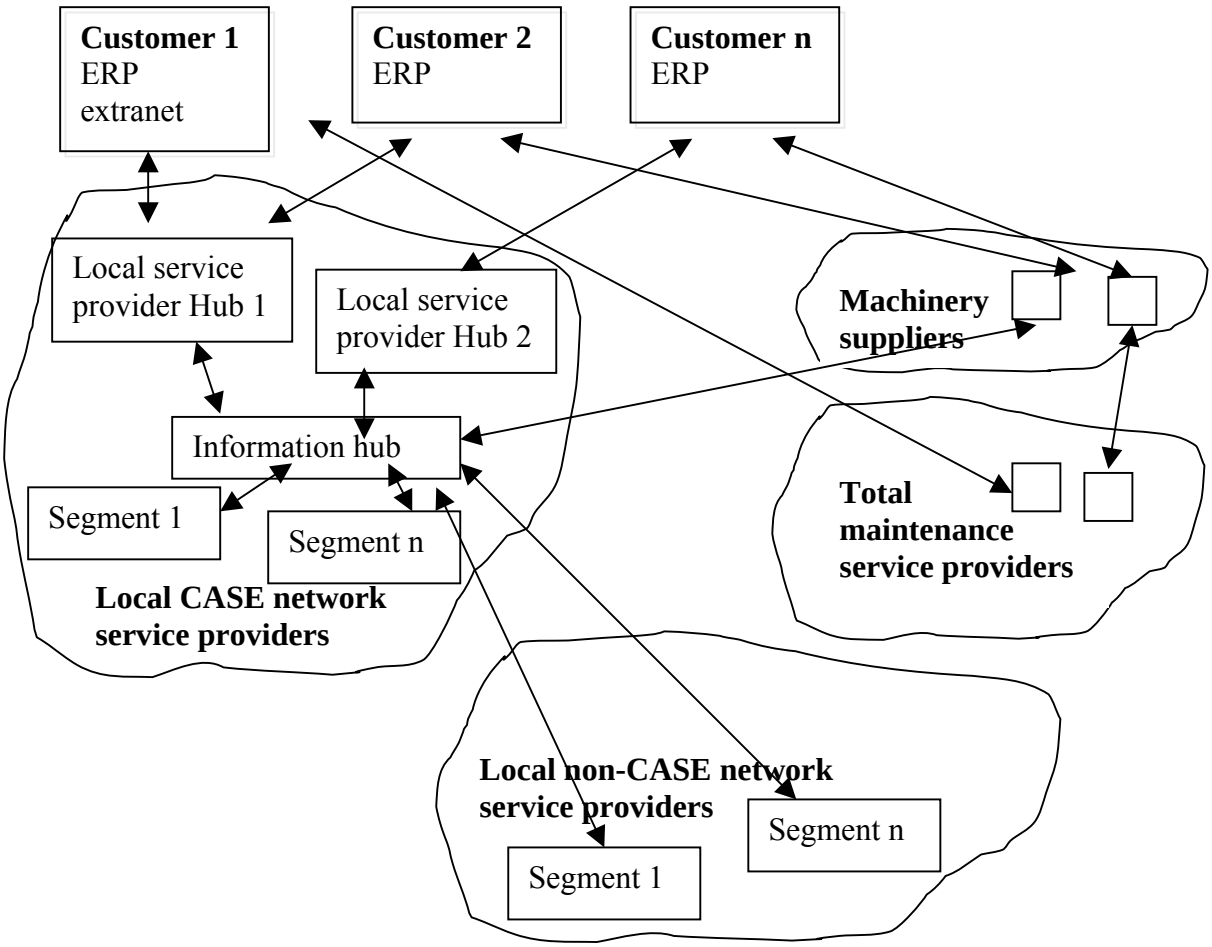


Figure 17. Hybrid model.

To-be-state alternative 4. Customers outsource the management of maintenance and maintenance information systems.

Alternative 4 is presented in figure 18. When maintenance is mainly outsourced, also maintenance information system can be outsourced for total maintenance service provider. Total service provider´s maintenance information system and customer´s ERP are integrated. Information hub or maintenance information system extranet can be implemented between total maintenance service providers and local service providers.

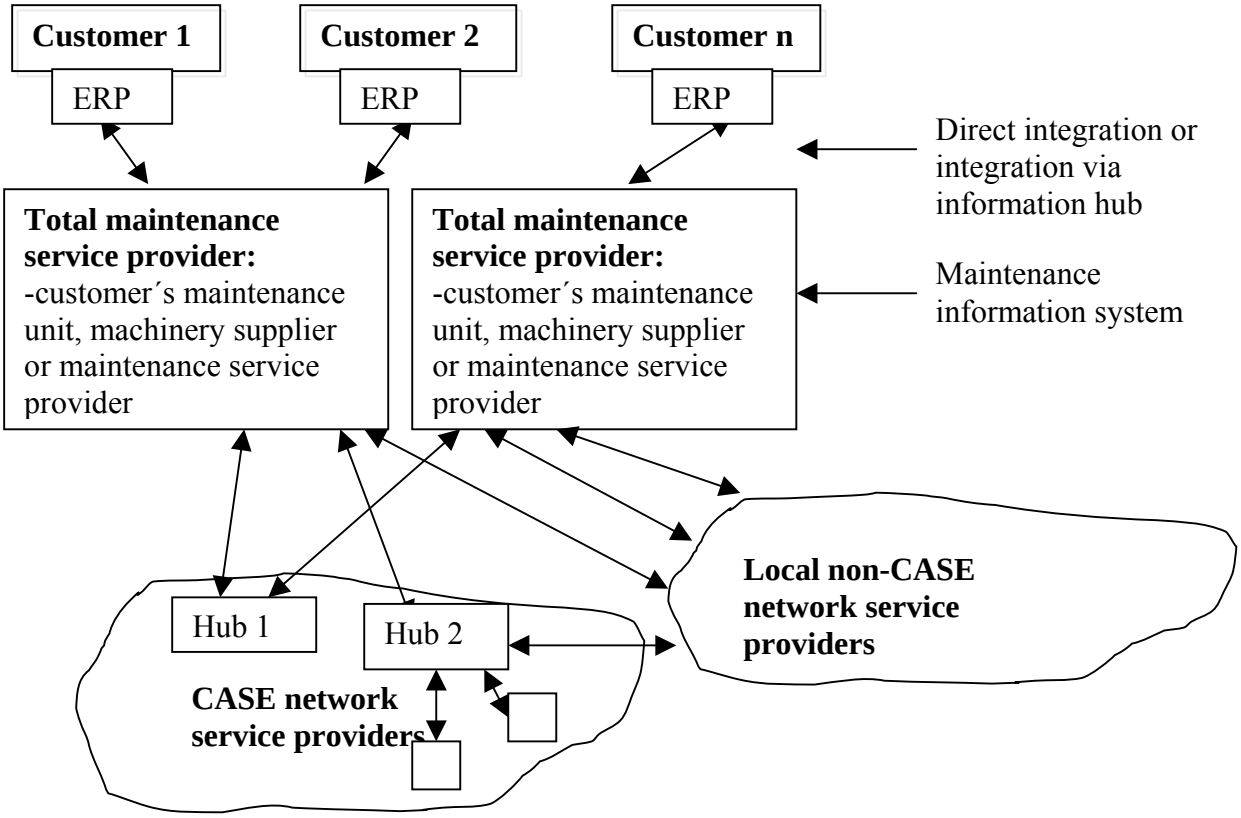


Figure 18. Model in which customers have outsourced maintenance management and maintenance information systems.

5.6.2 Ebusiness solution considerations. Pros and cons.

Considerations for different to-be-state ebusiness solution alternatives for the CASE network are presented in table 6.

Table 6. Considerations for different to-be-state ebusiness solution alternatives for CASE network.

	Pros	**Cons**
1.ERP vendor´s extended ERP (extranet):	+price +knowledge of ERP +good for low volume transactions	-price -slow implementation -ERP vendors are not concentrated on external processes. -can require many different processes and data interface towards service provider network
2.Common maintenance information system for service provider network (network information system). Current CASE Net has features about this.	+standardised maintenance processes for network companies; best practices +customized solution for maintenance business	-different suppliers have different processes and business models -too many decision makers -slow implementation -no solutions on market → customisation is expensive
3. Commercial third party operator	+experience of system integration +technological knowledge; e.g. different standards +knowledge about best practices; benchmarking +quick implementation +external processes is their core business +project management competency in network information systems	-transaction and process fees -commitment to operator -no implementations for maintenance service business
4. Non-commercial third party operator (current CASE Net system)	+price +local development +neutral party +good industry and local knowledge	-slow implementation -no integration, automation and conversion services -lack of future development -poor implementation, roll-out and change management process -data security
5. Many operators. Current CASE Net and commercial operator(s).	+external view; information about best practice solutions +mix of best solutions	-many systems to manage

6. RESEARCH RESULTS

6.1 Departures for the CASE network ebusiness solution

In this chapter, the groundwork and basis for the next development step of the CASE Net system is introduced.

6.1.1 Management of maintenance and operations in the CASE network

In process manufacturing of forest industry, it is crucial to achieve high level of operational efficiency and reliability, which sets up great requirements for maintenance and operations of devices and machinery. Therefore long or medium term partnerships or strategic alliances are needed between the customers and their suppliers and service providers. Continuous inter-organizational communication is crucial, and therefore network information systems also are important.

In the total network, the network participants are the local forest industry companies as the customers; the maintenance departments or the mill service units of the customers as the total maintenance service providers; machinery suppliers and spare part suppliers as the suppliers; and the local CASE network SME service providers and local non-CASE network SME service providers as the service providers. Some machinery suppliers are founding their own resource centres to provide the total service offerings for their customers, and thus they are ready to take some maintenance responsibilities from their customers. Furthermore, some SME hub companies will have sub-management responsibilities, and they match the sub-network supply with the demand of total maintenance service providers or customers. The management of maintenance and operations does not include only the management of network companies but also resources and competences (personnel and machinery) and capacities in the network companies (figure 19). In the future, some resources can be even co-owned among some network companies, such as resource 5 in the figure 19. Some companies (e.g. company 3 in the figure 19) can participate in different company networks. This means that different networks and different network information systems must communicate with each other.

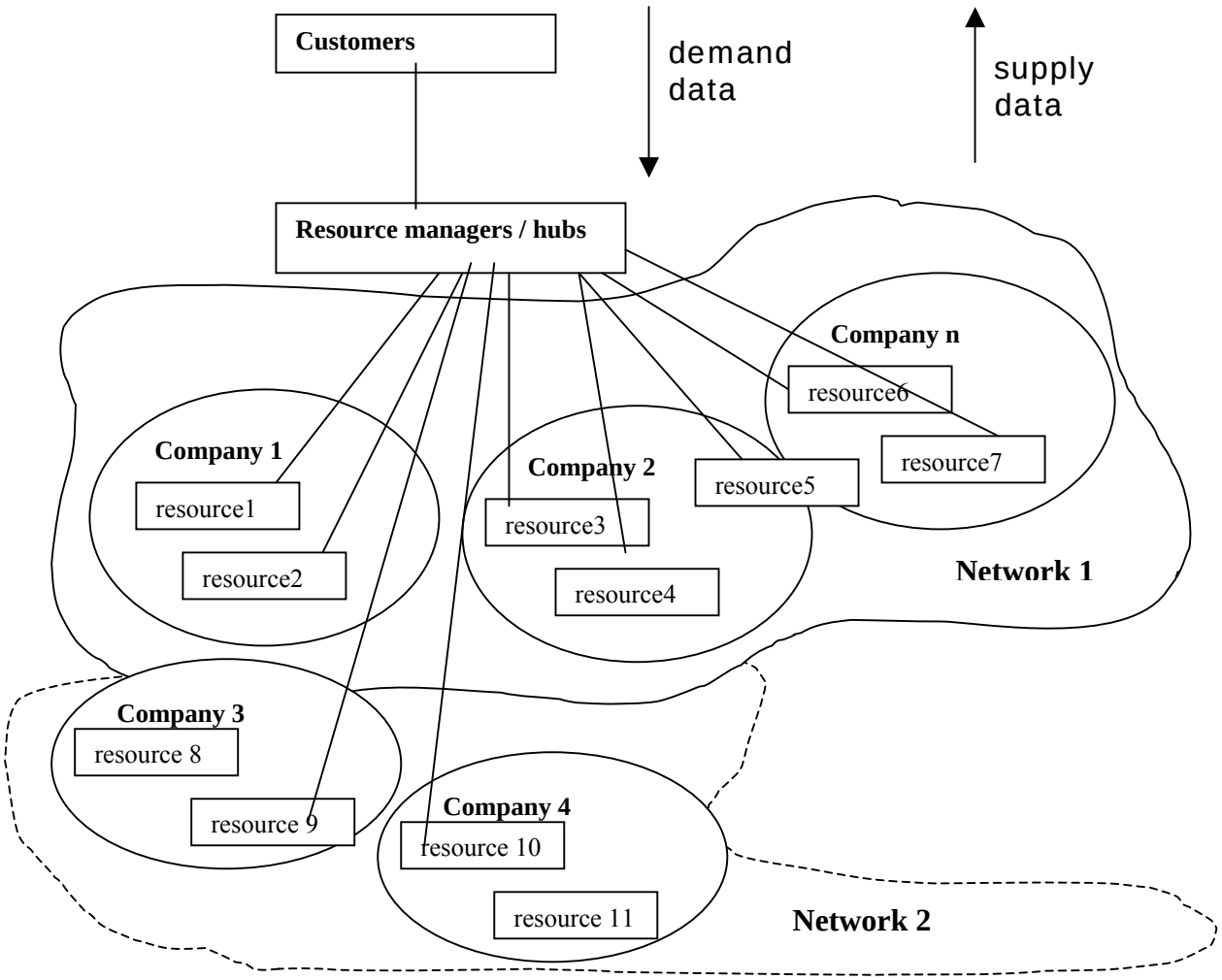


Figure 19. Resource management process in company network.

At present, the majority of the information in the total network is stored in the ERPs and maintenance information systems of the customers. If the outsourcing will increase in the network, the maintenance management and the maintenance information system will also be partly or completely outsourced for some service providers (figure 20).

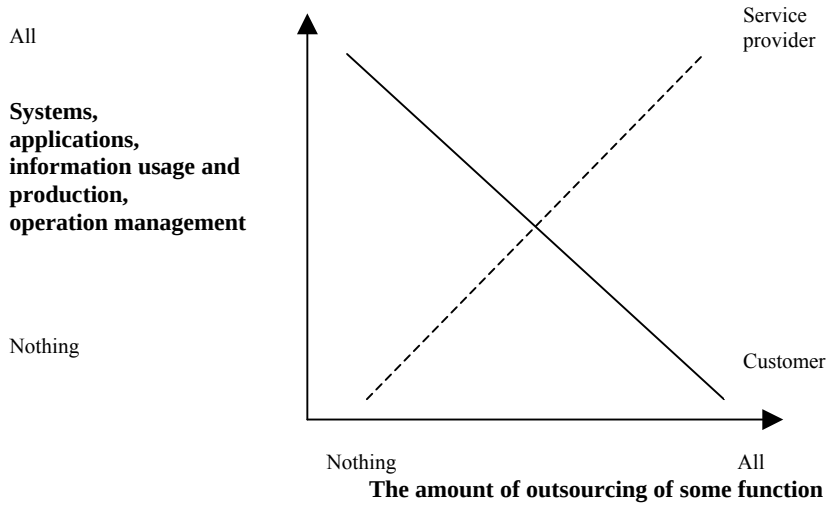


Figure 20. Outsourcing-management function.

Large-scale companies have utilised a hub model toward their suppliers in many industries. According to the study of Michaelides et al (2003), service level increased from about 93 per cent in the traditional model to around 98 per cent in the hub model. The hub model also brought a reduction in the overall costs. SMEs can also utilise the hub model, especially when they have many volume customers. In the current model of the CASE network, transactions in maintenance and operations relationships between partners are partner-specific (figure 21), while in a hub model, companies have only one common process toward a hub company or an information hub (figure 22). Some tasks that are common for all the customers, can be moved from the maintenance and operations departments of the customers to the hubs to gain economies of scale in operation volumes. The hubs can also offer wider service packages for the customers. This decreases the prices of services, because the maintenance work can be planned and supervised in wider entities. The hubs can utilise wide resource network and can provide solutions that respond to the customer needs about costs, service level (e.g. free capacity and delivery times), quality and knowledge. Furthermore, the task of the hubs is to manage efficiently transactions (e.g. purchase orders and invoicing) in the company network, and that is possible because of economies of scale in transaction volumes. The hubs aggregate, refine and share demand and supply data to improve competitive capability of network.

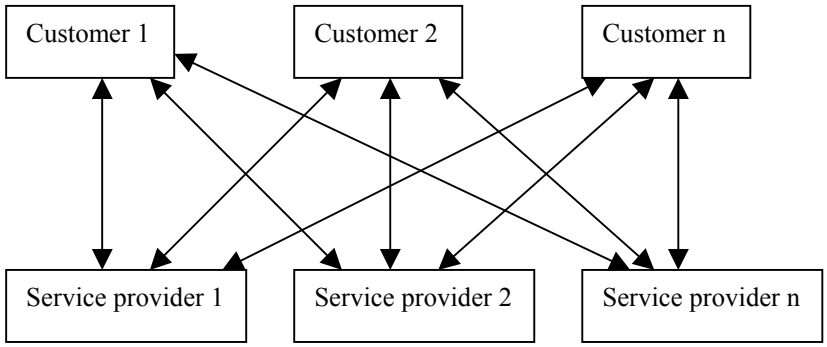


Figure 21. Traditional model in partner interactions.

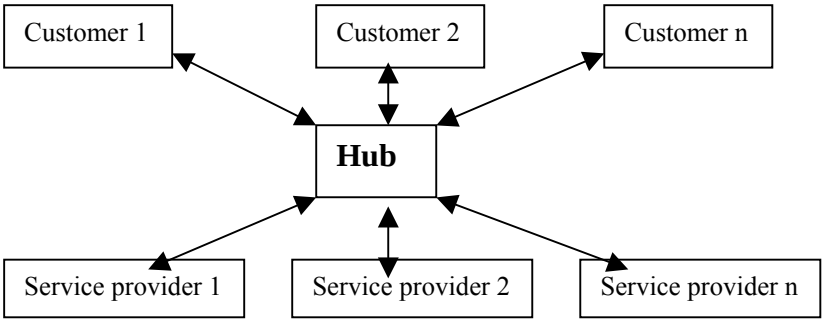


Figure 22. Hub model in partner interactions.

In the future, intangible services such as monitoring, the preventive maintenance, help desk and resource reservations will be performed more and more by centralized service centres, while tangible services such as physical maintenance work is reasonable ahead to perform locally. Especially when customer needs are globally similar, services can be standardized and provided from centralized service centres. For example spare parts information management can be centralized but physical inventories can be decentralized in market areas. Globally common and high expertise services will be centralized for total maintenance service providers and local specific services for local service providers.

Global machinery suppliers and total maintenance service providers pursue competitive advantage against the local SME service providers with the total service offerings and the ICT utilisation. In the total service offerings, machinery suppliers can manage the total maintenance process of their delivered machinery, and thus improve the customer asset productivity. The ultimate goal of machinery suppliers in new machinery deliveries is the remote condition monitoring and even the running of machinery without the need of a physical visit to machinery. Agents and sensors will be utilised to gather data from the production process, to refine data and to send data to monitoring centre. Simultaneously

machinery suppliers can provide this data transparently for their customers to justify maintenance operations and costs. Service centres can produce information for the customers to help them make decisions to time shutdowns optimally at the right moment based on total costs. Remote monitoring and preventive maintenance decreases machinery breakdowns and therefore the need for the physical repairs. Machinery suppliers can focus on **proactive preventive maintenance operations** at centralized service centres instead of travelling physically near to machinery. However, all the machinery and processes cannot be monitored and serviced remotely, and therefore the **responsive local service** staff is needed. This means that networking and communication are needed between machinery suppliers and the local service providers. Information, such as resource reservations and working instructions must be shared for the local service providers.

The strength of machinery suppliers is that they can provide strategic knowledge management services for their customers by gathering data from machinery. On the other hand, the local service providers know the factories and the factory layouts of the forest industry customers better than machinery suppliers. Furthermore, local service providers can however compete with efficient operational processes.

6.1.2 Basic requirements for business success in the CASE network

The local service provider network is customer focused. The new customer expectations, which were introduced in the chapter 5.4, must be considered when the CASE Net information system will be developed. The hub model development is in progress to create new value for the customers. Part of the network business processes are in digital form, and the forthcoming development project of the CASE Net must concentrate on electrifying the processes that add most value for the network companies. Naturally, the management of the companies´ internal information systems is decentralized for the individual companies, but the CASE Net could have the centralised role in network coordination. However, the processes between different companies have not been integrated, and therefore the need for the network information system has been insignificant. Ebusiness application architecture lacks, but it is needed in the future when the applications and the business processes will be integrated. The CASE Net is based on web technologies and thus it is flexible and scalable to respond changes in business environment.

6.1.3 Competitive advantage of the CASE network service providers

Competitive advantage of the local service providers has been based on responsiveness, cost efficiency and quality. However, this is not enough in the competition in the future. The local service provider network should take more responsibility of the maintenance processes of the customers and provide wider service packages and the management of them. The individual local service providers should concentrate on more specified competencies and decrease overlapping services in the network. One threat for the local Finnish service providers are Russian service providers, which can provide low labour cost services. At present total costs of Russian service providers are however higher than the local Finnish service providers because of their high costs of quality and transactions. Cost advantage towards Russian service providers can be maintained by managing and automating transactions with ICT, by still increasing knowledge about the customers, and by concentrating on core competencies to gain economies of scale. Quality advantage has been achieved by learning, working and communicating in long-term relationships with the customers. To maintain competitive advantage, the local service providers must develop services against total maintenance service providers or machinery suppliers, and cut total costs against Russian service providers. On the other hand, those competitors can also be an opportunity to cooperation for the local service providers.

6.1.4 Value drivers for the CASE network service providers

The customer expectations concerning the local service providers are services in modularized product form, total service offerings, continuous development of products and services, spare parts services, networking of service providers, remote diagnostic services, and readiness to integrate and use ebusiness systems. In the CASE network, the local service providers and the customers have observed problems such as the customers should share more openly information; purchasers of the customers do not always comply contracts, especially in some emergency circumstances; the customers have too many contact point and different processes towards the service provider network; the service providers get orders too late (shutdown information comes late and thus the service providers have scheduling problems in service production); and much manual work with invoicing and hour reporting.

Considering the total combination of the customers needs, observed problems and the SWOT analysis (introduced in chapter 5.1.1), the value drivers for the CASE network local service providers are holistic service for the customers, more efficient usability of capacity and resources, total costs minimisation, reduced administration and transaction costs, increased market share, and new markets.

6.1.5 Organisation of the CASE Net development

The original impulse for the CASE network was that the CASE network customers had common demands towards the local service providers. The CASE Net information system focused on this quite a static network and it was developed collaboratively with the customers and the local service providers. However, the business environment has changed and the CASE Net must be aligned with this change. Globalisation, network expansion and network dynamics are the main drivers of change. In the future, the CASE Net will be one part of the total maintenance network information system. The CASE Net will furthermore concentrate on long-term relationships, but also on more dynamic processes and shorter-term relationships. The CASE Net should be furthermore developed in collaboration between the customers and the local service providers although it is mainly the tool for the local service providers.

6.1.6 Ebusiness systems in the CASE network

Cooperation in the CASE network is based on bilateral contract between a customer and a service provider, but strategic partnerships do not exist in the network. Communication could be performed between the customers and the contract service providers in the CASE Net, but at present the most utilised communication methods are phone, fax and email. The customers also buy services sometimes from markets outside the contracts. The CASE network is positioned on relationship model in figure 23.

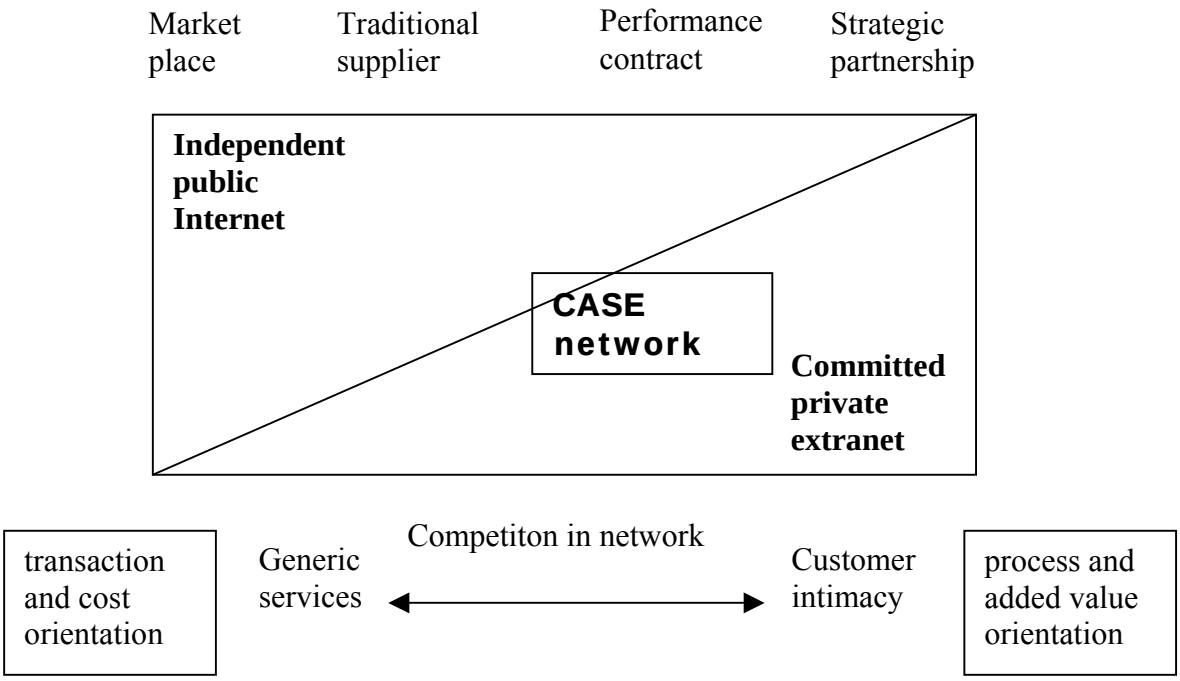


Figure 23. Different ordering and replenishment models in different business relationships in the CASE network.

The CASE network is mainly a network, in which individual SME service providers have very same kinds of processes. Furthermore, the service providers have cooperation for example in quality and education issues, and in the future more and more also in production. Therefore a common network information system such as the CASE Net is convenient for the CASE network service providers (figure 24). In the future, the SME hub service providers, which act as system deliverers, will be the main users of the CASE Net. The CASE Net will also be the extranet or even ERP solution for the other local service providers, which belong to the sub-network of the hub companies. Integration solutions will be needed between information systems of the customers and the CASE Net in some high-volume information flows.

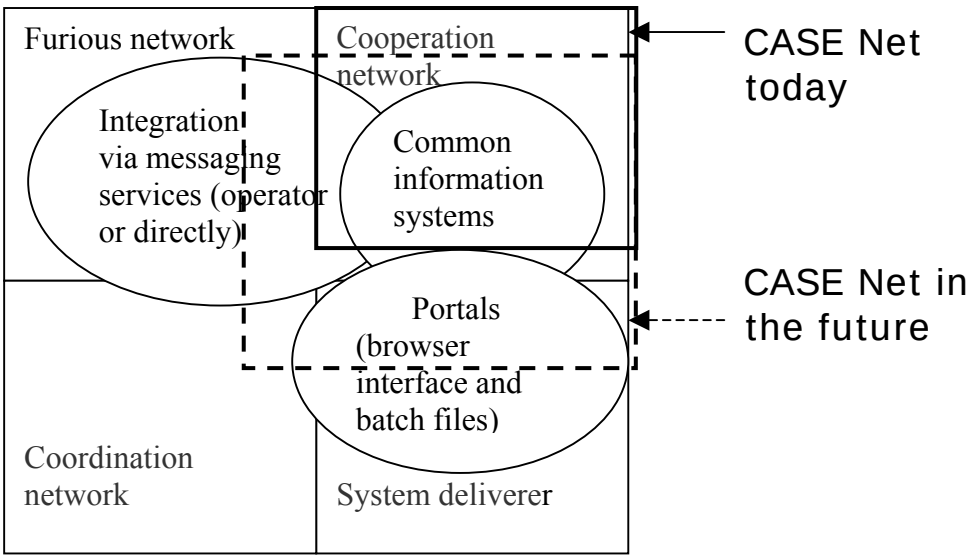


Figure 24. Network information systems in different types of networks and the position of the CASE Net.

In the common information system model, the local service providers have the common operation and process model towards their all customers. If every customer would provide their own ERP extranet for the service providers, then the service providers should log on different extranets and use different kinds of electronic workflows and user interfaces. In that case, the customers would gain the benefits, but the amount of administrative work for the service providers would increase.

6.1.7 Ebusiness strategy, design and architecture in the CASE network

Ebusiness strategy and information system architecture have not been defined for the CASE network or the total maintenance network. Some network information systems, such as the CASE Net, have been piloted in the total maintenance network, but the utilisation of them has not been perfectly succeeded. There are no direct system-to-system integrations among the CASE network companies.

The self-diagnosis for ebusiness has not been performed exactly in the network. Business design of the network is oriented on customers and it is on going. The business focus of the local service providers is operational excellence by delivering high-quality products quickly, error free, and cost efficiently. The goal of the CASE Net was to create the system that supports electronic communication in mechanical maintenance business among the CASE network companies. The CASE Net operates as a network information system that filled the information flow gap that no existent information systems of the business partners solved. At

present, the ebusiness model of the CASE Net is an infomediary, which share static information for the CASE network companies.

The development of the CASE Net information system aligns quite well with the ebusiness development model that was introduced in chapter 4.6.1. However, the most problems in the CASE Net development were a lack of support of top management and ICT management of the customers, inadequate change management, a lack of continuous development of system, and a lack of measures to indicate business benefits. The bottom-up planning has been utilised in the CASE Net development, when the viewpoint is the total maintenance and operations network that includes the customers, machinery suppliers, the spare parts suppliers and the local service providers. The CASE Net was developed as an individual system project, and there were no integrated plans that link the CASE Net into cohesive total network information system architecture. On the other hand, the top-down planning has been utilised in the CASE Net development when the viewpoint is the CASE network that includes only the local service providers.

6.1.8 ERP-/ebusiness matrix in the CASE network

Current states and future directions of the individual CASE network companies are positioned on ERP-/ebusiness matrix in figure 25. Machinery suppliers and total maintenance service providers are slightly more advanced in ebusiness capabilities and they have more furious ebusiness strategies than the local SMEs and the forest industry customers in the network. The current state and the direction of the local service provider network is positioned on ERP- / ebusiness matrix in figure 26

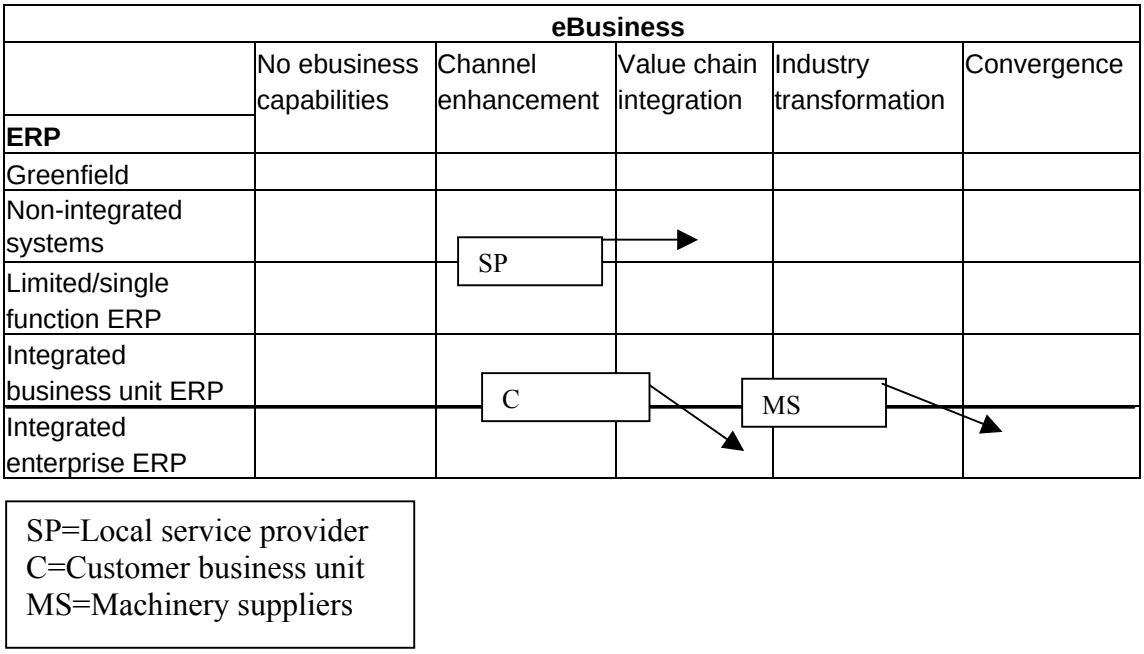


Figure 25. Positions of the CASE network companies on ERP-/ebusiness matrix.

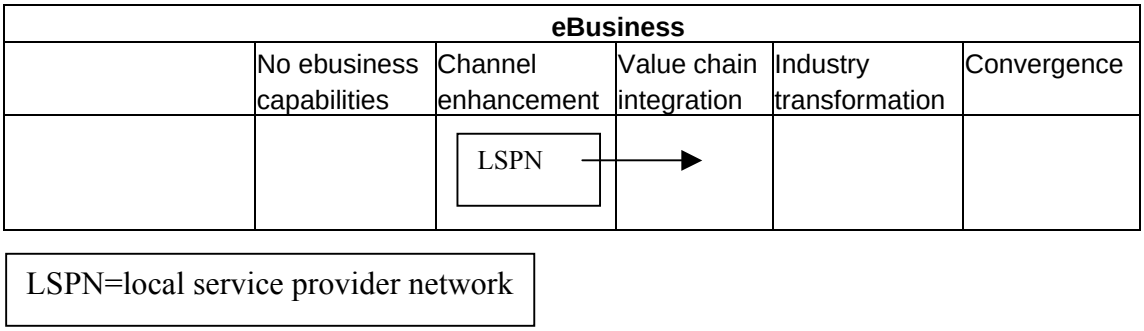


Figure 26. Position of the service provider network on ERP-/ebusiness matrix.

6.1.9 Communication in the CASE network

Communication in the CASE network between the local service provides and the customers at as-is-state is positioned on matrix in figure 27.

	To: Human	Computer
From: Human	-negotiations -development meetings -reservations, orders etc.	-data entry into the CASE Net or customers´ maintenance system
Computer	-data reading from the CASE Net system via web browser *	-no integration

** Contents and services of the current CASE Net system were presented in the chapter 5.3.4.*

Figure 27. Communication in the CASE network.

At as-is-state, the most utilised communication methods among the CASE network companies are personal meetings, phone, fax and email. Generally, ERP systems are rare in micro-size enterprises, which employ fewer than ten employees; this is also valid in the CASE network. Correspondingly network information systems usually are rare in small networks consisting of a few companies. Invoicing and accounting applications are common for the local service providers, but for example service delivery management applications are rare. Micro-size maintenance service providers seldom have data in structured format in their information systems, but rather the information is personally acquired and held. When information is not structured and documented, it cannot be very reliable. On the other hand, managers and supervisors in micro enterprises know quite well for example their resources without information systems. Furthermore, micro and small-size enterprises can respond flexible even when resources have been wrong-estimated.

6.1.10 Change management in the CASE network

The CASE Net implementation and roll out did not completely succeed in the end of 1990s´. Causes can be divided into technical, organizational, change management, content producing, business and information system definition causes. Causes are introduced in more detail in table 7. Some causes have already been corrected. The cause-effect tree is presented in appendix 2.

Table 7. Causes why the CASE Net does not add value and it has not been utilised as planned.

Technical causes	• SME service providers took just first steps utilising ICT when the CASE Net was implemented. However the SMEs adapted quickly. • The SMEs had slow modem Internet connections that were based on time price. This decreased motivation to use system. • No internet access for all service providers. • Data security. • Total transparency was not possible because of data structures. The customers could not authorize their service providers to enter into their inventory databases, because there was price data. This is also a business cause.
Organizational causes	• Real users (for example the supervisors of the service providers) of the system were not educated to use system at first. • Organisational causes within the customers. Responsibilities were not clear. One reason for implementation problems was the different organisation structures and cultures of the different the customers. Some similar problems were within the SMEs. Especially personnel changes caused problems. • All users of the customers have not authorised to access Internet and thus the use of the CASE Net was not possible.
Change management causes	• System benefits were not be demonstrated. • Lack of system marketing. • Decision makers, system developers and system users had different perspectives and requirements. • Traditional work flows were preserved. • Lack of continuous development of system. • Lack of support from top management and ICT management of the customers.
Content producing causes	• Source data was inaccurate and thus it was not reasonable to publish. • No system integration. The CASE Net was not integrated with the ERPs and the maintenance information systems of the customers. For example the shutdown calendar could come directly from the customers´ system. On the other hand there was no integration with the service providers´ information systems.
Business causes	• Business secret causes prevented information sharing (e.g. price data in inventory system). • The CASE Net system has not a proper business case and it has have pilot reputation.
System definition causes	• Value-add analysis of eprocesses was not performed exact enough. For example the CASE network companies know each other well, and thus there was no need for this kind of information system with only static internal marketing information. • Routine transactions were not automated.

6.2 From the customer needs to eprocesses

In this chapter, network scenarios, ebusiness scenarios, ebusiness vision, ebusiness strategies and objectives, ebusiness model, ebusiness architectures, core processes, electronic processes and ebusiness development strategy are introduced. The total framework from the customer needs to eprocesses is presented in figure 28.

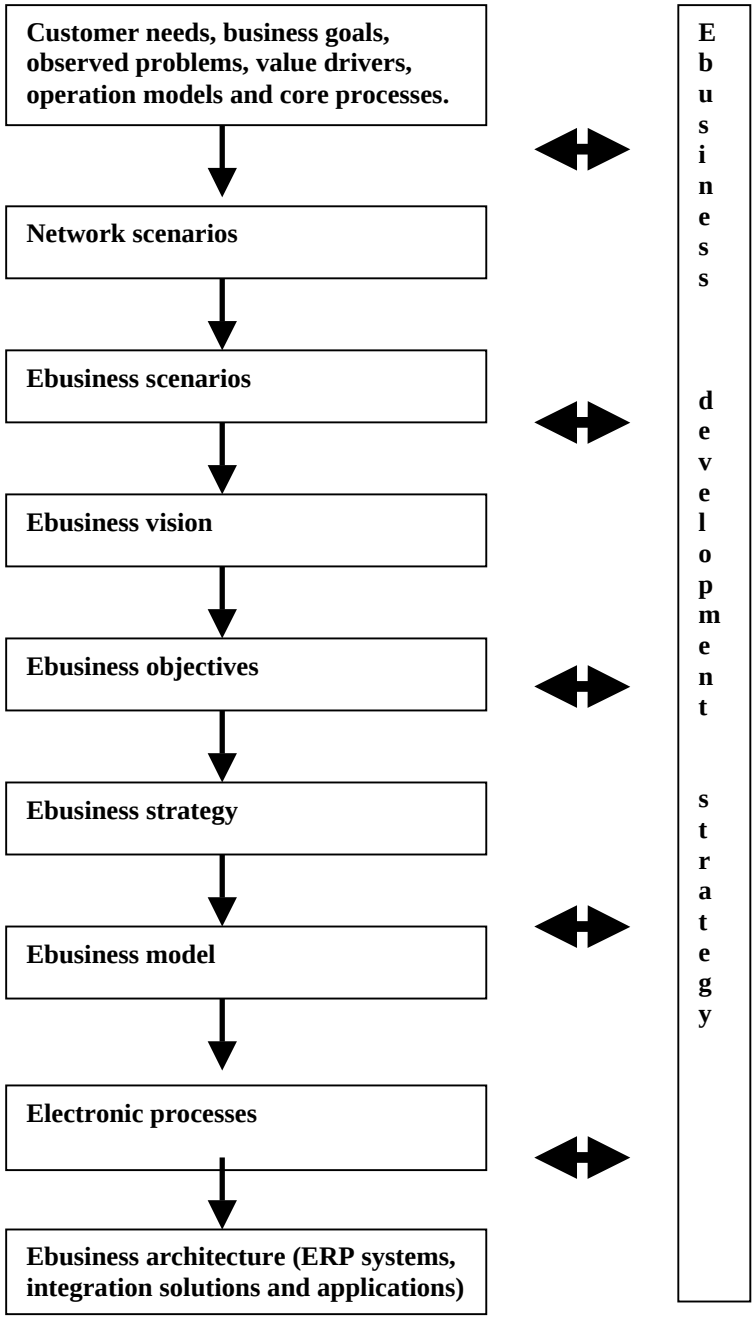


Figure 28. Framework from the customer needs to ebusiness architecture.

6.2.1 Network and ebusiness scenarios

Salo (2004) catalogued three scenarios for the CASE network. Now in this SMILE research, one additional scenario is introduced. In the following, the four network scenarios are introduced, and network ebusiness scenarios are derived from those network scenarios.

The first scenario is based on idea that the local maintenance and operations business environment should be regarded as a system of the customers from forest industry and the local service providers, and they have partly common strategies and goals concerning maintenance and operations business issues (Salo, 2004). In ebusiness scenario, the CASE Net or corresponding network information system is developed in cooperation among the customers and the local service providers. The current CASE Net system must be developed to respond changes in business and technological environment, but it is developed separately from other information system projects in the total maintenance network. However, the system must provide application interfaces to other systems; especially to internal information systems of the forest industry customers and the local service providers. Sub-network (the CASE network), value analysis is needed to find the most value adding network processes, which are reasonable to electrify. In this scenario, possible extended ERP solutions (extranets) of the customers must also be considered.

The second scenario supports the idea that the forest industry companies and the service providers are collaborative partners but do not state common interests of future. This scenario is a continuation for as-is-state of the network. (Salo, 2004). In ebusiness scenario, it is accepted that the CASE Net cannot add value either to the customers or to the local service providers. The current CASE Net will not be developed or it will be developed in small steps. In the future, different customers may order their local service providers to use their extended ERP or third party information hub solutions. In this scenario, there is no vision about ebusiness among the customers and the local service providers, but each participant will develop their own systems separately without common objectives, strategies, architecture and roadmap. This means that internal systems and external systems such as the CASE Net and extranets are separate solutions. Company or pair of companies value analysis is used in this scenario to find the most value adding company processes, which are reasonable to electrify.

The third scenario is based on idea that the local service providers do not get enough support and commitment from the customers, and eventually end up working for competitors (e.g. machinery suppliers and total maintenance service providers), and maybe loose independency as entrepreneurs (Salo, 2004). Competitors may buy local service providers or make cooperation contracts with them. The local service providers will lose their direct customer relationships. New customers may order local service providers to use their information systems. In ebusiness scenario, the role of the CASE Net can change, because new customers do not necessarily accept it. On the other hand, the CASE Net should have preparedness to interfaces to information systems of new customers. However, the CASE Net may continue as separate network information system of the local service provider network.

In fourth scenario, the total maintenance and operations network, including also machinery suppliers, total maintenance service providers and spare parts suppliers, should be regarded as a total system, and it has partly common strategies and goals concerning maintenance and operations business issues. In ebusiness scenario, ebusiness regards the total network system, and it has partly common vision, objectives, strategies, architecture and roadmap. All participants in the network should know the main picture of the total network information system, and they can take it into consideration when they develop their internal systems. System includes commonly agreed application or service interfaces to facilitate integration work. Value analysis of the total network is used in this scenario to find the most value adding network processes, which are reasonable to electrify.

6.2.2 Ebusiness vision

The fourth ebusiness scenario seems to offer the best advantages for the total maintenance network, and it is discussed more detailed in chapters 6.2.2 - 6.2.7. Summary of other scenarios is presented in table 9 in chapter 6.2.7.

For the fourth scenario, the corresponding total network ebusiness system would have a vision that supports the network vision, which is to optimize operations, costs and quality in the network. Ebusiness solution supports the goal to minimize total costs of forest industry customers´ machinery and devices during their life cycles. Also ebusiness architecture and utilised technologies support the optimisation of the total business system. Business cases for the ebusiness system must be created. All system modules in the ebusiness system should add

value. Furhermore, the ebusiness system must add value for all network participants – not just for the most powerful companies in the network. The total ebusiness system objectives, strategies and functions are designed and developed together by all network participants, and development is based on continuous development philosophy.

In that total maintenance network ebusiness vision, the role of the CASE Net is to be one sub-system of the total ebusiness system and it must support the total ebusiness system vision. The CASE Net makes cooperation and transactions in the service provider network more efficient, and on the other hand improves customer service. It concentrates especially on supporting processes of physical maintenance work services of the local service providers and on integrating information flows between partners. The CASE Net provides application and service interfaces to the network partners´ systems. Furthermore, the CASE Net adds value for the total network and individual companies in the network. The CASE Net objectives, strategies and functions are designed and developed together by all CASE network participants, and the development is based on continuous development philosophy. The development and maintenance of the CASE Net system must also be a profitable business.

6.2.3 Ebusiness objectives and strategy

The total network ebusiness system must support the sources of the competitive advantage and the operation model of the network. The maintenance network provides total services for its customers to optimise total life cycle costs and profits of facilities and equipment. Information must be transparent, when it is useful for partners, and it is refined for different companies so that each company or person in the network gets information on right time, on right quality, on right costs, and on right place. Easy communication and different information services (e.g. remote diagnosis) toward the customers increases the competitive advantage of the network against competitors. Furthermore, the ebusiness system can oblige to purchase from the catalogued contract service providers. The ebusiness model must be first defined, and after that the processes must be streamlined, standardized and electrified. The focus must be on the core processes and on non-value adding processes such as invoicing. Only those processes, in which electrifying add value, should be electrified. Sub-network information systems are needed when the process similarities are found among the network companies. The total network ebusiness system must be flexible; it evolves when technology and business environment change. Flexibility of the total network information system will be achieved by

utilising the current systems of the participants in the network and using information hubs, extranets and network information systems, which integrate the network processes and information flows between the companies. Continuous and equitable development will be protected with the inter-organisational development team.

Those abovementioned strategies can also be applied for network sub-systems such as the CASE Net. Sources of competitive advantage for the CASE network service providers are cost efficiency, quality, responsiveness and wider service offerings. Ebusiness system must support those competitive factors.

The main objective of the CASE Net system is to support the business model, which adds value for the customers in dynamically changing business environment, and this value-add can have a positive effect on the growth of market share for the local service providers. Value drivers for the CASE service providers were introduced in chapter 6.1.4. The goals of the CASE Net information system must be based on those value drivers. So the CASE Net should support to provide wider service offerings for the customers, to utilise more efficiently capacity and resources, to minimise total costs, to reduce administration and transaction costs, to increase market share, and to entry new markets.

The goals of an ebusiness system of business unit network of global corporation, and an ebusiness system of different SMEs, are business process reengineering, best practices utilisation, standardized processes, common metrics, and integrated and transparent processes. The greatest differences between a business unit network of global corporation and a local SME network are as follows:

- smaller transaction volumes in SME network
- no common leadership, management and strategies among SME network companies; and
- business relationships can be short in non-juridic SME network.

Because of those differences, an SME network ebusiness system must be more flexible than an ebusiness system of global corporation. Furthermore, because of smaller transaction volumes, the automation of business processes is not always necessary in an SME network.

6.2.4 Ebusiness model

The ebusiness model responds to the value drivers introduced in the former chapter. The CASE Net information system helps to maintain competitive advantage of the service providers. The CASE Net saves costs in the network transactions; and on the other hand, the customer satisfaction increases that means the continuation and deepening of business relationship with the customers. The CASE Net is a transaction intermediary, which integrates core processes of the network companies; and an infomediary, which share information on right time, on right partner, on right costs, on right format and on right quality. The core processes will be introduced in next chapter.

6.2.5 Core processes and electronic processes in the CASE network

The organisation and core processes of the CASE network are presented in figure 29. Ellramm et al (2004) have introduced the same kinds of tactical and operational level processes for service business. According to Subramani (2004), competitive performance comes from operational and strategic benefits. Knowledge specificity is more potent than business-process specificity as a basis for deriving strategic advantage. Knowledge management is one of the core processes also in the CASE network and it can be seen as a part of supplier/customer relationship management process. Hub companies are the local SME service providers, which manage the local service provider network and thus offer broader service offerings and fewer interfaces for the customers to improve customer service and fulfil the customer expectations.

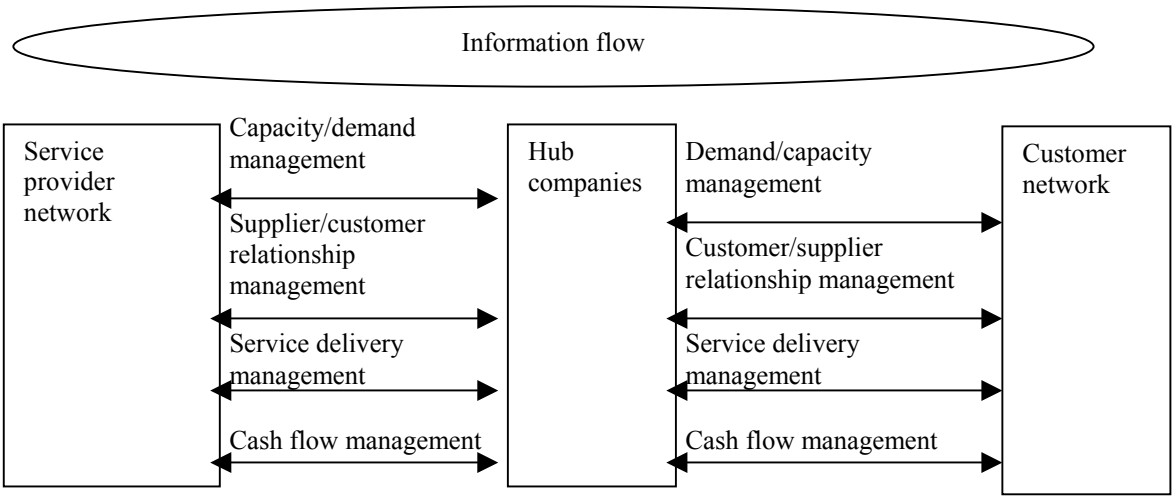


Figure 29. Core processes in the CASE network.

In the following, the core processes and ICT solutions that support the processes are introduced.

Capacity management

Capacity allows a supply chain to increase its level of production to respond to customer demand. Furthermore, network companies can have different kinds of skills to respond to customer needs in the future. This means that capacity can also be managed at personal level instead of company level. Capacity information can include data on the availability of technicians, skills and equipment needed in the maintenance work. The service providers must offer capacity information to the customers. On the other hand, the customers should make capacity reservations early enough for the service provider to be able to allocate and reserve technicians for the customers in advance. From the buyer´s (customer or hub) standpoint, the process of procuring maintenance services always begins with the identification and specification of a need. After that the optimal and available service provider group is reserved to perform the work.

Demand management

Demand management in the CASE network focuses on how to respond to customer demand. Services cannot be inventoried, and thus the service sector must respond to uncertain demand with capacity buffers. In the CASE network, there are two kinds of shutdown processes.

1) Unplanned emergency shutdowns when the responsiveness of SMEs is needed. In this case, the delivery management is the core process for the local service providers.

2) Planned/forecasted shutdowns when e.g. machinery suppliers provide proactive maintenance and operations services, and local service providers are utilised to perform the maintenance work. The service providers can utilise their resources more efficiently when shutdowns are planned collaboratively with machinery suppliers and customers. This means that shutdown more accurate shutdown information must be given beforehand for the service providers. Then the service providers can plan better their own operations and utilise more efficiently their resources. As a benefit, the customers get better service

with decreased costs from their service providers. In this second shutdown process, collaborative supply and demand planning is the core process.

Customer / supplier relationship management (CRM / SRM)

To improve customer service and fulfill the customer expectations, the CASE network service providers must integrate processes and optimise overlapping operations to provide one customer interface and common service offering. For example an order-to-invoice process must be integrated in the service provider network, so that network works like one company from the perspective of the customers. This integration responsibility primarily belongs to the SME hub companies in the network.

CRM is about a good understanding of what the customer needs and how to meet those needs. Customer satisfaction, needs and problems should be collected into the CASE Net and solutions should be found to serve the customers better. The knowledge of the network companies is utilized in the innovation of process improvements, new working methods and new services. Operations analysis is a sub-process of CRM and includes the generation of reports on different performance indicators and statistics – e.g. of customer profitability or service provider performance. Furthermore, the CRM/SRM process provides direction for the steering of the network and enables efficient and flexible business process execution through strategies, business plans, performance measurement and competence development. In the CASE network, there are contracts between the customers and the service providers. New customer acquisition and new supplier selection are out of the scope of this study.

Service delivery management

In service level agreements, a buyer clarifies the specifications (e.g. what to do for the machinery) and expectations (e.g. the timetable of shutdowns) for the maintenance work. Order management, working time reporting, scheduling and allocation of work for different companies and individuals, work steering (e.g. working instructions), dispatch management (e.g. status of work and priority of work), and feedback about the maintenance work and repaired targets are sub-processes of service delivery management. Those transactions waste time in the companies, and cause administration costs for the

CASE network. Cost savings can be achieved with managing and automating the network transactions efficiently with ICT. One goal is to decrease the use of fax, phone and email in routine transactions. The ultimate goal is that the whole workflow from ordering to invoicing and accounting is supported by ICT. Human inspection will only be needed in exception management and other problematic situations, but high-volume, routine and non-critical transactions should be even totally automated and standardised. Making services as products and coding of services are needed to construct common ecommerce catalogues for the customers.

Service delivery management also includes project management in investment projects and in planned shutdowns. Project management system is not useful in unplanned daily maintenance work, because work of different companies is quite independent and there is no time and need for planning.

PC is not the best terminal for mobile service staff to entry data, instead there is need for mobile terminals to make process more efficient.

Cash flow management and invoicing

The party (customer or hub) responsible for service delivery management should determine the timing and the amount of payment made. The self-billing method could be utilized. In other words, instead of the service provider, the customer or hub makes the invoice based on the reported hours of service providers and hour prices in the contracts. Furthermore, there is high potential, if many individual orders will be aggregated to fewer invoices.

Inter-company communication is extremely important at strategic, tactical and operational level processes in partnership relationships. Some processes are reasonable to electrify totally, some processes partly and some processes are better to manage with human-to-human interaction. The most benefits from ICT solutions come from the electrifying of operational level processes, such as service delivery management and cash flow management. ICT solutions do not add as much value for tactical and strategic level processes, because the data volumes and update frequencies are smaller than in operational level processes. The processes and information flows in the CASE network are introduced in appendix 3.

Processes and applications in the network can be company specific (internal processes), standardized for company group (common internal processes), specific between two companies (external processes), standardized between some companies or company groups (external processes), or standardized for all companies (common processes) (figure 30).

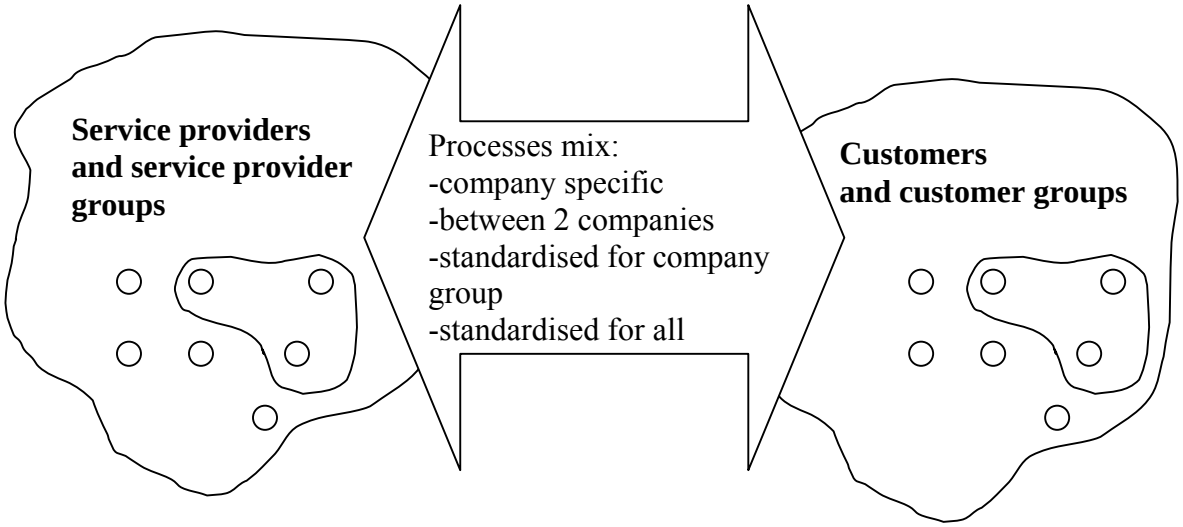


Figure 30. Process mix in company network.

6.2.6 Ebusiness architecture

The company network is dynamic, and the business and technological environments change all the time. Factors that influence on the role and the features of the CASE Net in the future are presented in table 8. Because of turbulent environment, the architecture of the network ebusiness system must be modular and decentralised. The modular architecture is not necessarily optimal from the perspective of IT management, but it is flexible in changing environment. Furthermore, in modular and decentralised architecture, the companies can utilise their own current and familiar internal systems in their processes. However, new tools are needed for network management, information sharing, interaction, data conversions, integrations, content management and transaction management. The total network ebusiness system is a hybrid solution of different kinds of technologies and standards, and applied technology is chosen case by case for example in different company pairs. The CASE Net or other network information systems must also provide preparedness to interfaces to different information systems, and systems must be flexible to respond to company and role changes in the network.

Table 8. Factors that influence on the role and the features of the CASE Net information system in the future.

- Outsourcing and networking decisions of the customers.
- Outsourcing and networking decisions of the service providers.
- Duration and characteristics of relationships (e.g. market competition, partnership, strategic alliance).
- Network structure.
- Sourcing strategies of the customers. The local maintenance service provider network is only one part of the global customer´s service provider network. The customers will make global decisions, which target to total optimum.
- IT politics and strategies of the customers (e.g. attitude towards third party information hubs and openness in information sharing). Maintence eprocurement and electronic supplier management is only one part of the customer´s ICT strategy and eprocurement strategy.
- Information system decisions of the customers and the service providers. For example extranet solution decisions of the customers.
- Common processes among the customers. Same information hubs can be used among the customers in common processes, but different hubs can exists in different processes.
- Common processes among the service providers. Same information hubs can be used among the service providers in common processes, but different hubs can exists in different processes.
- Number of customers and service providers in network. Critical mass of service providers is necessary because of economical reasons for developing, implementing and maintaining the network information system.
- The future concern of who is the customer of the local service providers.
- Changes in the customer expectations.
- Changes in the principles of the trade union related for example to outsourcing.
- Negotiation powers of the participants.
- Transaction volumes (e.g. orders, order rows, invoice rows), and amount of manual routine work in transactions.
- Importance of information system related to business model and business objectives.
- Business chances of the network information systems. Do they add real value.
- Technological starting points (ICT infrastructure, systems and applications).
- Participants´ will to develop ICT solutions.
- Development of ICT and standards.

The probable to-be-state of the partner and information system architecture in the total network is presented in figure 31.

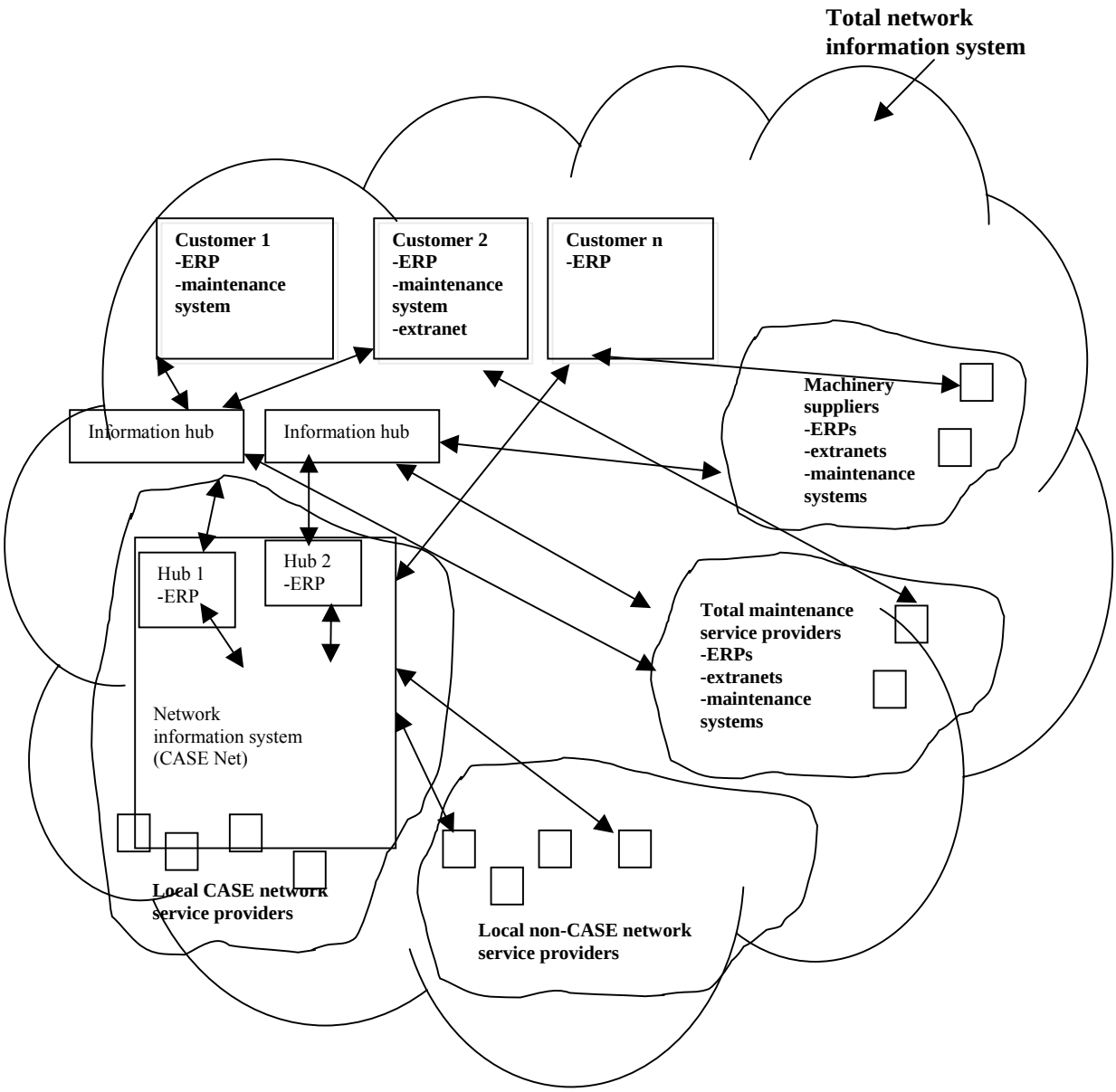


Figure 31. Partner and information system architecture of the total network. Probable to-be-state.

The total network information system will consist of the following systems and process integration solutions:

Network companies´ own information systems (e.g. ERPs, maintenance systems). Some companies have separate ERP and maintenance information systems, which are or will be integrated. Some other companies develop maintenance management features inside the ERP systems.

ERP extranets. Some customers have plans about extranets for their suppliers and service providers. Customers will provide extranets via their own ERP extensions or via information hubs of third party operators. Extranet model is common when a supply chain master implements ebusiness solution for its SME network. Total maintenance service providers and machinery suppliers may also have their own ERP extranets. Web browser-based extranet solution is adequate for small service providers in small-volume transactions. Batch file integration can be utilised in the extranet model so that a customer shares for example all orders of the day in a batch file, and a service provider can enter semi-automatically this data into its own system at end of a day by utilising conversion application.

Network information system. In the CASE network, common network information system is suitable for the SME service providers because they are quite equal with each other and there are process similarities among the service providers. This system can include both standardised internal ERP processes for the service providers and standardised external ebusiness processes among the network partners. Network information system can also provide data conversion services to integrate information systems of companies. Network information system makes possible to share system development and maintenance costs for the network companies. Network information system can include for example content management tools such as document management and knowledge management. At present, the CASE Net is a network information system in the CASE network. Today the CASE Net concentrates on static, common and standardised CASE specific processes of the SME service providers; and in the future, on dynamic processes of the SME service providers and on interfaces into information systems of the customers, the total maintenance service providers and the machinery suppliers. Network information systems can also be developed for the common processes of the customer groups; e.g. common inventory management. In a decentralised network information system, the best alternative for the human user interface is a web browser.

Information hub. Trading partners use their own internal systems and those systems can be integrated via information hub. The information hub solution via operator provides for a company one link towards many partners, while direct system-to-system integration must be constructed separately for every partner. Furthermore, information hub can integrate different network information systems (e.g. CASE Net) of different networks; for example service provider networks on different geographical areas. Information hub gathers data from different sources (information systems of the network companies), and aggregate, filter, refine and share information for the right participants in the network. So an information hub integrates internal processes of different participants. An information hub can also provide some new common applications and electronic processes, which do not exist in companies´ internal systems, when it acts like a network information system. A third party operator can be used as an information hub, because a third party operators can efficiently overcome the problems arose from scattered standards. On the other hand, information hubs are needed to bring flexibility for network information system when environment is changing. In the CASE network, one alternative is that an information hub could manage transactions such as orders, order confirmations and invoicing, and system-to-system integration services between the customers and the SME service providers, while a network information system, such as the CASE Net, could concentrate on more static processes. In the total network, there can be many different information hubs, which have their own core competencies such as order-to-delivery, invoicing and content management processes.

Direct system-to-system integration. System-to-system integrations will be utilised in big-volume transactions in long-term business relationships. Furthermore, supply chain partners, especially large companies with equal negotiation power (in this case, the customers, machinery suppliers and total maintenance service providers), are not willing to use each others´ or third party operators´ information systems, but only their own internal information systems. Thus there is a need for direct system-to-system integration between companies

In shorter business relationships, modularity and flexibility are important in ebusiness solutions, while in longer relationships solutions can be more long-standing. Transaction volumes and duration of relationship influence on integration and automation degree.

Transaction volume-busines relationship duration matrix is presented in figure 32. Different process integration alternatives are positioned on matrix.

Transaction volume	Short	Long
High	System-to-system integration via third party information hub	Common network information system or direct system-to-system integrations
Low	Extranet for human users via third party information hub	Extranet (ERP extension)

Duration of relationship

Figure 32. Transaction volume-relationship duration matrix.

The following application architecture is needed to support processes presented in the chapter 6.2.5:

1.Content and document management and publication. This includes e.g. ecommerce catalogues of services, life cycle machinery and device data, support information (e.g. technical manuals, working guides, drawings, factory layouts, memos, reports) and public web sites for machinery suppliers and for other potential partners and customers.

2.Knowledge management and business intelligence. This includes e.g. elearning, market information, competitor activities, R&D, best practices, innovations and customer relationship management.

3.Integration applications. This includes integration of customer ERP or/and maintenance information systems to the service providers´ systems or the CASE Net.

4.Transaction applications. This includes workflow management; e.g. orders → work orders → work hour reporting → invoices → archive of workflow data (history data). Also cost and payment allocation for the network service providers is needed.

5.Collaboration applications. The application features are collaborative shutdown and capacity planning, resource reservations, project management and collaborative spare parts and spare devices management.

6.2.7 Ebusiness development strategy

The CASE Net was developed as an individual information system project, and there were no integrated plans that linked the CASE Net into a cohesive whole of total network ebusiness system. In the next development step, this link will be required, and the development should be based on the continuous planning philosophy. Vision, strategies, architecture, ebusiness model, eprocesses, applications, features and alternative technology considerations should be created for the CASE Net and those should be updated continuously by the inter-organisational development team. Resources and costs needed for the development of the CASE Net, should be divided among the network companies. Furthermore, in the next development step, corrective actions to cause-effect analysis results introduced in chapter 6.1.10 and in appendix 2 are required.

In the CASE Net continuous development can be utilised a continuing business model innovation process of Mitchell & Coles (2004):

1. Understand and optimally apply the current ebusiness model; what needs to be done to deliver and receive the most benefits.
2.Establish, understand and follow an appropriate ebusiness model innovation vision; identify the ideal benefits of business model improvements and innovations.
3.Ongoing design and testing of potential ebusiness model improvements.
4.Understand and begin installing the next ebusiness model improvement or innovation.

The fourth ebusiness scenario was discussed more detailed in chapters 6.2.1 – 6.2.6. Summaries about that scenario and other scenarios are presented in table 9

Table 9. Summary of scenarios.

Network scenario	The customers and the local SMEs have partly common strategies and goals concerning maintenance and operations business issues	The customers and SMEs are partners but do not state common interests of future.	The SMEs do not get enough support and commitment from the customers, and eventually end up working for competitors and maybe loose independency as entrepreneurs.	Total maintenance and operations network should be regarded as a total system, and it has common strategies and goals concerning maintenance and operations business issues.
Ebusiness scenario	The CASE Net or corresponding network information system is developed in cooperation among the customers and the local service providers to support their collaborative processes	It will accepted that the CASE Net can not add value either for the customers or the local service providers and other systems such as ERP extranets of the customers will be utilised.	The role of the CASE Net can change, because new customers do not necessarily accept it. The CASE Net may continue as a separate network information system of SMEs.	Network information system is regarded as a total ebusiness system of all network participants, and it has partly common vision, objectives, strategies, architecture and roadmap.
Ebusiness vision	The CASE Net has the vision that supports the CASE network vision, which is to optimize operations, costs and quality in the network. System adds value for all participants.	There is no vision for the CASE Net.	The CASE Net has the vision that supports the service provider network vision. Another perspective can be that there is no vision.	Ebusiness system has the vision that supports the network vision, which is to optimize operations, costs and quality in the network. System adds value for all participants. CASE Net is one sub-system.
Ebusiness objective	The CASE Net supports a business model, which adds value for forest industry customers.	There is no objective for the CASE Net.	The CASE Net supports a business model, which adds value for the local service providers and customers whoever they are. Another perspective can be that there is no objective.	Network information systems support a business model, which adds value for the end customers in dynamically changing business environment.
Ebusiness strategy	CASE Net is utilised to integrate processes between forest industry customers and local service providers and to facilitate communication between them.	There is no strategy for the CASE Net.	The CASE Net is utilised to integrate and standardize processes among the local service providers. Another perspective can be that there is no strategy.	Information hubs and network systems are utilised to integrate processes among all participant in network and to facilitate communication in the network.
Ebusiness model	The CASE Net is a transaction intermediary, which integrate core processes of network companies; and an infomediary, which share information.	The CASE Net is an infomediary of static information such as factory layouts. It does not support business processes.	The CASE Net is a transaction intermediary, which integrate internal processes of local service providers; and an infomediary, which share information.	Network information systems are transaction intermediaries, which integrate internal processes of network companies; and infomediaries, which share information.
Ebusiness architecture	The CASE network ebusiness system architecture is modular and decentralized. Preparedness to interfaces to the customer systems is important.	The CASE Net is a separate system from other information systems in the network.	Preparedness to interfaces to different systems is important. Another perspective is that the CASE Net is a separate system from other information systems in network.	Total network ebusiness system architecture is modular and decentralized. Preparedness to interfaces to different systems is important.
Ebusiness development strategy	Development of CASE Net is based on the continuous planning philosophy, and it is integrated to system projects of the forest industry customers.	Development of the CASE Net is reactive and modest, and it is not integrated to other system projects in the CASE network.	Proactive or reactive development of the CASE Net is related to the service providers business strategy.	The development of system is based on the continuous planning philosophy, and it is integrated to other system projects in the network.

7. CONCLUSIONS AND FURTHER DEVELOPMENT

7.1 Conclusions

This study report concentrated on ebusiness scenarios, ebusiness vision, ebusiness strategy, ebusiness architecture, ebusiness model, core processes, electronic processes, and ebusiness development strategy in the total maintenance network and especially in the CASE network, which is a part of the total network. This CASE network includes the four forest industry customers and their 14 local mechanical small and micro-size maintenance service providers.

Network participants in the total maintenance network are the forest industry customers, the maintenance departments or business units of the customers, machinery suppliers, spare parts suppliers, total maintenance service providers, the local CASE network SME service providers and local non-CASE network SME service providers. At present the maintenance departments of the customers or the mill service companies operate as total maintenance service providers in the network. The total maintenance service providers have the total network management responsibility, and they match the demand and the supply in the network. In the future, some local SME hub service providers will have some sub-management responsibilities, and they match the demand of the total maintenance service providers to the supply of the local service providers.

In process manufacturing such as forest industry, it is crucial to achieve high level of operational efficiency and reliability, which sets up great requirements for the maintenance and operations. Therefore partnerships or strategic alliances are needed among the network participants. In partnerships and alliances, deep communication is significant, and therefore information systems in the network are critical.

The CASE Net is the network information systems between four forest industry customers and their 14 SME service providers in the maintenance and operations business in South Karelia of Finland. However, the CASE Net has not been utilised as planned, but it has been used only on sharing static information in the network. Causes for that can be divided into technical, organizational, change management, content producing, business and system definition causes. In the current form, the CASE Net does not add value enough to the CASE network companies.

Four different ebusiness scenarios were introduced in this report. The ebusiness scenario, in which ebusiness system regards the total maintenance network system, seems to offer the best advantages for the total network, and it was discussed more detailed.

In this study, the vision for the CASE Net information system was defined that the CASE Net is one sub-system in the total maintenance network ebusiness system, and it must support the total network ebusiness system vision. The CASE Net should make cooperation and transactions in the service provider network more efficient, and on the other hand improve the customer satisfaction. It should concentrate especially on supporting processes of physical maintenance work services provided by the local service providers and on integrating information flows among the service providers and with the customers. The CASE Net should provide application and service interfaces to the information systems of the network partners. Furthermore, the CASE Net should add value for the total network and the individual companies in the network. The development and the maintenance of the CASE Net should also be a profitable business

Value drivers for the local service providers of the CASE network came from the customer expectations and the observed problems in the CASE network. The goals of the CASE Net were derived from those value drivers. The CASE Net should support to provide holistic service offerings for customers, to utilise more efficiently capacity and resources, to minimise total costs, to reduce administration and transaction costs, to increase market share, and to entry new markets.

The strategy for the CASE Net should include that information should be shared to optimise resources and costs in the network; information should be transparent when it is useful for the partners; ebusiness system should be flexible and it should evolve when technology and business environment change; the customers should have easy to communicate toward the local service providers; information should be refined for different companies (right time, quality, format, cost, place); business model should be first defined, and after that processes should be streamlined, standardised and electrified; only those processes, in which electrifying adds value, should be electrified; a network information system is needed when process similarities are found among the network companies; and continuous and equitable development should be protected with the inter-organisational development team.

The main objective of the CASE Net system is to support the business model, which adds value to the customers in dynamically changing business environment, and this value-add have positive effect on the growth of market share of the local service providers. The CASE Net information system is the transaction intermediary, which integrates the core processes of the network companies; the network information system, which provides common standardised processes for the local service providers; and the infomediary, which share information on right time, on right partner, on right costs, on right format and on right quality.

The core processes in the CASE network are demand/capacity management, customer/supplier relationship management, service delivery management, knowledge management and cash flow management. The most benefits from ebusiness solutions come from the electrifying of operational level processes, such as service delivery management and cash flow management.

Modular system architecture is flexible in changing business and technological environment, and companies can utilise their own current and familiar internal systems in their processes. In the future, the existent information systems of the companies and network will be utilised, but new tools will also be needed. The total network information system will consists of network information system(s), such as the CASE Net, for the common standardised processes of the network companies; information hub(s), which integrate the processes and the existent systems in the network; direct system-to-system integration; network companies´ own internal information systems; and ERP extranets. The ebusiness system will be a hybrid solution of different technologies and standards, and the utilised technology is chosen case by case.

Application architecture includes content/document management and publishing, knowledge management and business intelligence, integration, transaction, and collaboration applications.

7.2 Further development of the CASE Net

The current CASE Net has been developed to support electronic communication among the four customers and the 14 mechanical maintenance service providers. Information in the CASE Net is mainly static. However, the business environment is changing. The customers

have new global expectations and demands from their service providers, and this means requirements for integrated and standardised processes with their partners. Furthermore, the network is coming more dynamic. The CASE network will expand by about new 40 local maintenance service providers from different industries (e.g. hydraulic, engineering and electricity industries). This CASE network expansion project has been started. The CASE network strategy work is also in progress and the network strategy will be a starting point for the CASE Net development. Some local service providers will be developed as hub companies during the strategy process.

The hub company model, the network expansion and the CASE Net system development should be developed parallel. The current CASE Net is a good starting point, but it must be re-evaluated. In the current version of the CASE Net, electronic work steering processes were designed and even programmed, but they have not been implemented. These eprocesses must be re-evaluated and re-developed, and after that implemented and rolled out in the change management process. Information flow and transaction volumes within the hub service providers will exceed considerably volumes compared to volumes of the current service providers. This means more value-add from ICT solutions. Furthermore, new hub companies and new companies from other industries and will need some new applications. The CASE Net should provide a tool for the hub companies to manage their customer and service provider networks; for example in payment and cost allocation processes. The CASE Net must still concentrate on processes in long-term relationships, but also on processes in more dynamic shorter term relationships.

Until now the CASE Net has been developed in one development project, and after that the development has been modest. In the future, the development process should be continuous and integrated with other information system projects in the total maintenance network. Furthermore, business case and business logic of the CASE Net should be re-evaluated to ensure high quality system and continuous system development. The benefits of the CASE Net should be listed, and after that the value-adds of the system (e.g. savings in transaction costs) for the network companies should be defined. Those value-adds can be used as a basis of pricing of the system usage. The CASE Net will not necessarily be the only information hub or network information system in the CASE network, but there can be different systems (for example extranets of the customers), which concentrate on specified tasks. Other alternative and complementary operators and systems should also be evaluated for the CASE

network communication. If eprocesses are specified for the CASE network, it can be reasonable to develop the customised local system such as the CASE Net. If eprocesses in the CASE network are generic and there are suitable systems on the market, a network information system would be reasonable to buy from the market instead of make it. On the other hand, if there is no that kind of system on the market, the business potential of the system for other corresponding local networks should be considered. However, a duplication of the network maintenance information system of the local service providers is not obvious for many other geographical areas in Finland or even in the world, because this CASE network includes extraordinarily large forest industry centre in the whole world. The next development step of the CASE Net must concentrate on issues presented in table 10.

Table 10. Next development step of the CASE Net.

- Establish the CASE Net vision, strategy, objectives, architecture and business model.
- Align the CASE network and the customer business vision and strategies with the CASE Net system vision and strategy.
- Align the customer expectations and demands with the CASE Net development.
- Get the full commitment and support from the customers.
- Establish business case and business logic for the CASE Net to ensure the high quality system and system development.
- Take into account factors, which will influence on to-be-state of the CASE Net (table 8).
- Analyse the causes why the current CASE Net has not been used as planned (chapter 6.1.10), and after that find the means to perform better in the next development step.
- Define the new requirements and information needs (for the current and new industries).
- Dynamic information such as work process steering and transactions.
- Collaborative processes such as forecasting and capacity management.
- Find processes, in which the electrifying adds most value.
- Find the standard processes for company groups in the network.
- Finding customised processes for companies or company groups in the network.
- Streamline and reengineer the processes and work flows.
- Make services as products and code the services. This makes possible electronic service catalogues and electronic commerce.
- Exception management.
- Create objectives and measures for the processes to indicate the benefits of the CASE Net.
- System integration and data conversion services.
- Create links to other information system projects in the total network.
- Change management and implementation project.
- Produce training material (e.g. the process descriptions and the CASE Net manual).
- Establish the CASE Net development strategy and move to continuous development philosophy.
- Establishing the steering, development and testing teams.

REFERENCES

Aberdeen Group, 1999, Strategic Procurement: The Next Wave of Procurement Automation, In: Executive White Paper, June, pp.1-16.

Brännback, M. & Carsrud, A. A Service Marketing Approach to High Technology Innovations Management: Insights from IT and Biotech. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.124-142.

Christopher, M. 1998. Logistics and Supply Chain Management – Strategies for reducing Cost and Improving Service.

EKAMK. Täydennyskoulutus- ja yrityspalvelut. 2002. Raportti eky-net järjestelmän käytön arvionnista.

Ellram L. M., Tate W. L. and Billington C. (2004) "Understanding and Managing the Services Supply Chain", in The Journal of Supply Chain Management. Fall 2004. pp.17-32.

Fahey, L. 2003. How corporations learn from scenarios. In: Strategy and Leadership. Vol. 31, No 2, pp.5-15.

Huovinen, P. & Hawk, D., L. 2003. Towards Collaborative Customer-Supplier Relationships in Global Building Product Businesses. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.143-162.

Kalakota, R. & Robinson, M. 2000. e-Business. Roadmap for Succes.

Karhu, E. 2002. Kilpailukyvyn kehittäminen yritysten välisen yhteistyön avulla. Case: Etelä-Karjalan metsäteollisuus ja pk-sektori. Lisensiaatitutkimus. Lappeenrannan teknillinen korkeakoulu.

Kemppainen, K. & Vepsäläinen, A.P.J. 2003. Web Breeds Services Apart-But How to Get Them Right. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.104-123.

King, D., Lee, J., Warkentin, M. & Chung, H.M. 2002. Electronic Commerce 2002. Managerial Perspective.

Korper, S. & Ellis, J. 2001, The E-Commerce Book. Building the E-Empire.

Kunnossapito nettikirja web site, 2004, http://www.visido.fi/nettikirja/

Laine, H.S. 1998. SCEMM. Keep it Running. Industrial Asset Management. Scandinavian Centre for Maintenance Management.

Laine, H.S. 2001. Management Systems Oy. Teollisuuden kunnossapidon sähköinen verkottaminen. ANI-seminaari. March 27th 2001.

Löppönen, P. 2002. Future Trends in Maintenance Management. Case: Raute Oyj. Euromaintenance 2002. Helsinki June 5th 2002. http://www.managementsystems.fi/Euromaintenance%202002_files/slide0003.htm.

Management Systems Oy web site. 2004. www.managementsystems.fi

March, J.G. 1991. "Exploration and Exploitation in Organizational Learning". In: Organization Science (2:1), pp.71-87.

Means, G. & Schneider, D. 2000. MetaCapitalism.

Michaelides, Z., Ho, J., Boughton, N. & Kehoe, D. 2003. The Development and Evaluation of Internet-based Supply of Non-production (MRO) Items. In: International Journal of Logistics: Research and Applications. Vol.6, No.4, 2003, pp. 319-332.

Mitchell, D.W. & Coles, C.B. Establishing a continuing business model innovation process. In: Journal of Business Strategy. Vol.25 No.3 2004, pp.39-49.

Norris, G., Hurley, J., Hartley, K., Dunleavy, J. & Balls, J. 2000. E-Business and ERP. Transforming the Enterprise.

Oksanen, A. 2003. SAP kasvaa monopolin logiikalla. Tietoviikko. December 12th 2003.

Perttula, M. 2003. Growth the KONE Way. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.163-174.

Porter, M.E. 1985. Competitive Advantage. Creating and Sustaining Superior Performance.

Pärnistö, J. & Salmela, H. 2003. Combining Local and Global Expertise in Technical Services: Case Fujitsu Invia. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.175-192.

Pöllänen, E. 2003. EP Consulting. Etelä-Karjalan ja Kymenlaakson puunjalostusteollisuuden kunnossapitomarkkinat.

Salmela, E. 2004. Ebusiness between Global Company and its Local SME Supplier Network. Research report. Lappeenranta University of Technology.

Salmela, H. & Jahnukainen, M. 2003. IT-Enabled Global Customer Service: Findings and Conclusions from Six Case studies. In: Reponen, T. Information Technology-Enabled Global Customer Service. pp.258-278.

Salo, R. 2004. Vision for SME Sector in MRO Business Field. Research report. Lappeenranta University of Technology.

Subramani, M. 2004. How Do Suppliers Benefit from Information Technology Use in Supply Chain Relationships? In: MIS Quarterly Vol.28 No.1 March 2004, pp.45-73.

Turban, E., Lee, J., King, D. & Chung, H.M. 2000. Electronic Commerce. A Managerial Pesrpective.

Yrittäjät web site, 2004. http://www.yrittajat.fi

INTERVIEWS

Albayrak, A. Development manager, Kustannusosakeyhtiö Koivuniemi. Espoo. April 28th 2003.

Forström, S. SAP Finland. Espoo. April 16th 2003.

Haapala, R. Purchasing manager, Stora Enso Oyj, October 7th 2003.

Haapasalo, H. Purchasing manager, Oy Botnia Mills Service Ab. Joutseno. April 15th 2003.

Hentunen, K., Managing director, JTT Konepaja Oy. Joutseno. February 11th 2003.

Hietala, A. Area manager, YIT Services. Imatra. February 2nd 2003.

Kangas, T. Key account manager, YIT Services. Mikkeli. March 12th 2004.

Kari, H. Anilinker. Tampere. April 25th 2003.

Kauppinen, J. Maintenance manager, M-real Simpele Board. Simpele. February 13th 2003.

Kemppinen, R. Managing director, Rei-Ke Oy & Haapala, R. purcahsing manager, Stora Enso Oyj. Ruokolahti. December 10th 2002.

Kiiveri J. Marketing manager, Artekus. Nokia. May 27th 2003.

Kiljunen, T. Managing director, Lappeenrannan Konemetalli. Joutseno. February 19th 2003.

Knuutila, K. Maintenance coordinator, UPM-Kymmene. Lappeenranta. February 13th 2003.

Laine, H.S. Consultant, Management Systems. Helsinki. May 28th 2003.

Luojus, J. Nokia Mobile Phones. Phone interview. April 8th 2003.

Minkkilä, A. YIT Sevices/Valio Oy. Kouvola. April 23rd 2003.

Mäkynen, M. Manager, Yrityskehä Oy. Lapua. April 29th 2003.

Paananen, J. Consultant, T:mi Rat-Paja. Lappeenranta. March 3rd 2003.

Pentikäinen, M. General manager, Stora Enso Oyj. Imatra. January 22nd 2003.

Pöllänen, E. Consultant, EP-Consulting Oy. Lappeenranta. April 23rd 2003.

Pöllänen, E. Consultant, EP-Consulting. Lappeenranta. November 17th 2003.

Raunio, R. TietoEnator. Espoo. April 30th 2004.

Salmi, H. Elma Oyj. Espoo. May 28th 2003.

Snellman, J. Material manager, Loviisa nuclear plant. Loviisa. November 18th 2003.

Viitakangas, J. Maintenance coordinator, Stora Enso Oyj & Kölli, P. SAP project manager. Imatra. Febtuary 26th 2003.

Ylä-Jussila, Y. Project manager, Etelä-Karjalan Ammattikorkeakoulu. Lappeenranta. February 12th 2003.

Ylä-Jussila, Y. Project manager, Etelä-Karjalan Ammattikorkeakoulu. Lappeenranta. June 3rd 2003.

APPENDIX 1. The themes of the interviews.

SME service providers (managing directors, supervisors):

-basic information (e.g. turnover, personnel)
-organisation
-vision, mission statement, strategy
-critical success factors
-customer segments and volumes
-customer relationship management
-market area
-services and products
-core competences and core processes
-measuring
-competitors
-partners
-development projects
-collaboration with customers and suppliers
-networking
-problems in cooperation with customers and partners
-internal information systems
-problems in communication and information systems
-benefits from communication and information systems
-development ideas
-CASE Net information system

Forest industry customers (general managers, maintenance managers, maintenance coordinators):

-department information (e.g. volumes)
-organisation
-strategies
-service provider and supplier segments
-maintenance and operations processes
-communication with service providers and suppliers
-supplier relationship management

-development projects
-problems in cooperation with service providers and suppliers
-internal information systems
-problems in communication and information systems
-benefits from communication and information systems
-development ideas
-CASE Net information system

CASE Net developers:
-history of system
-implementation and roll out of system
-as-is-state of system (e.g. applications, supported processes, user volumes)
-content production and responsibilities
-usage costs
-problems (technical and usage)
-user interface
-utilised technology
-system criticality
-automated and manual features
-system development
-integration with other systems
-change management

Furthermore, the researcher used the CASE Net system and familiarised himself with the system documentation.

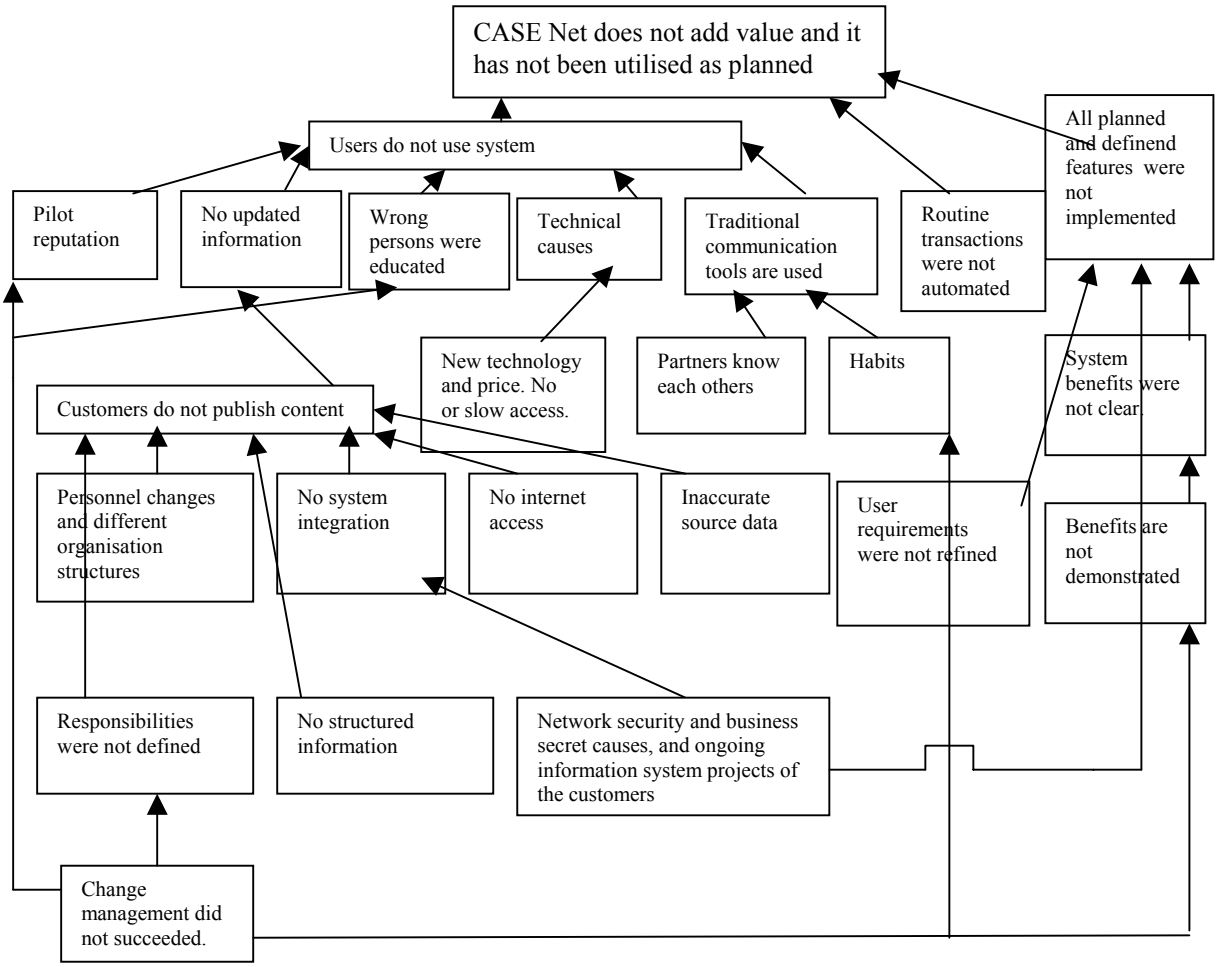
Information system specialists of the customers and information system consultants:
-processes that systems support
-next generation system visions
-system projects in progress
-internal systems
-links to partners´ systems
-transaction, collaboration and optimisation systems
-utilised technologies

-business cases
-integration
-system architectures
-user interfaces
-benefits from systems

Maintenance and operations consultants:
-maintenance and operations processes
-maintenance and operations measures
-cooperation with information system vendors
-information system consultation
-productizing of maintenance services
-maintenance and operations in different industries
-best practices in maintenance and operations
-benefits from ICT solutions for maintenance and operations
-visions about maintenance and operations
-company networks
-potential development areas

Operators:
-role of operators
-solutions for company networks and collaboration
-cooperation with consultants and information system vendors
-best practices
-implemented ebusiness process in company networks and in maintenance industry
-visions about a role of third party operators
-when operator is a good alternative in ebusiness
-ebusiness projects and change management in company network
-business logic of operator

APPENDIX 2. Cause-effect analysis why the CASE Net has not been utilised as planned.



APPENDIX 3. Processes and information flows in the CASE network.