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THE ROLES OF INFORMATION SYSTEMS IN A VALUE NET

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Tutkielma

Tässä analyyttis-empiirisessä tutkielmassa tarkastellaan tietojärjestelmien rooleja arvoverkostoissa. Käytettyjä tutkimusmenetelmiä ovat olleet mm. kirjallisuuskatsaus, teema-haastattelut, sekä web-pohjainen kyselytutkimus.

Arvoverkostot ovat uusi liiketoimintamalli, jossa informaatioteknologiaa sekä elektronisen liiketoiminnan sovelluksia avainkomponentteina käyttäen tuetaan organisaatioiden välistä yhteistyötä ja yhteistoimintaa. Verkostomaisen toimintatavan mahdolliset hyödyt verkoston osallistujille esitellään tutkimuksessa. Tutkielmassa keskitytään kahteen erilliseen verkostoon, jotka muodostuvat ostajaorganisaatioista valittuine toimittajineen. Erityisesti tämä tutkimus keskittyy verkostomaisen toimintatavan, sekä sen mahdollisuuksien ja edellytyksien selvittämiseen, sekä tutkimustulosten kriittiseen arviointiin ja implementointiin, edellä mainittuihin verkostoihin soveltaen.

Yksittäisten yritysten rakenne, yhteistoimintasuhteiden rakenteellistaminen, sekä erilaiset tuotantomallit yhdessä sosio-teknisten ongelmien kanssa vaikeuttavat yritystenvälistä yhteistyötä ja yhteistoimintaa. Yritystenväliset riippuvaisuusssuhteet vaikuttavat ristiriitojen määrään sekä luonteeseen, lisäämällä koordinoinnin tarvetta. Tutkimuksessa esitetään näkökulmia, sekä malli onnistuneen organisaatiomuutoksen aikaansaamiseksi, sekä sosio-teknisten ongelmien minimoimiseksi.

Avainsanat: Arvonluontijärjestelmät, arvoverkostot, verkottuneet liiketoimintamallit, osallistujien roolit, tietojärjestelmät, sosio-tekniset kysymykset, inhimilliset tekijät, virtuaali organisaatiot

ABSTRACT

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This analytic-empirical study examines how an operations model called value net, using information technology and e-commerce as its key components, may be implemented to support the co-operation and collaboration of a purchasing organization and its' suppliers. The possible benefits from this new operations model, from the point of view of all network participants, are introduced in this thesis.

The structures of individual organizations as well as the structurability of business relationships together with socio-technical issues make collaboration difficult. This is because the amount and nature of interdependence in a relationship increases the potential for conflict by increasing the need for coordination. This thesis also introduces various considerations and a sequence for successful organizational change that allows for the risk of unwanted socio-technical issues from occurring to be minimized.

This study uses various methodologies in examining why the implementation of interorganizational systems is difficult to accomplish. These methodologies for information gathering include a literature survey, theme-interviews as well as the implementation of results from a web-based survey-questionnaire.

Keywords: Value creating systems, value nets, networked business model, roles of participants, information systems, socio-technical issues, human factors, virtual organization

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1 INTRODUCTION

This chapter aims to provide the reader with a general idea of the topic, research problems, limitations of this study, important concepts, and methodologies applied in this master's thesis.

1.1 The subjects of the study in brief

The requirements and conditions pushing changes in interorganizational collaboration are growing. The changing competitive environment accentuates the business requirements towards a more customer-oriented direction requiring for shorter lead-times for bringing new products onto the markets, serving customers and a means of fast supply. As a result, the companies' interest in co-operation and collaboration has increased, and at the same time made the 'traditional' supply-chain model inadequate to some extent. All this together, added with the overall complexity of the ICT-industry and its' companies' dependency on complementing technology and resources, forces the companies of this industry to find other partners.

The forces driving the change towards a network-like model of co-operation in supply operations, leading companies' to form collaborative strategies and to have interorganizational systems in place, can roughly be divided into four main categories. These categories being: Environmental forces such as globalization and environmental turbulence, the support role of IT in reducing transaction costs and transaction risks, enabling the role of IT in making the collaboration feasible, and the motives of the co-operating parties dealing with issues such as resource pooling, risk sharing, utilizing relative advantages, reducing supply-chain uncertainty and increasing resource utilization. (Kumar & Van Dissel, 1996, 282)

Another motivating factor behind the larger companies interest when forming a close partnership with SMEs is the possibility to benefit from the flexibility and speed as well as from the specialized expertise of smaller organizations, thus increasing the overall flexibility, quality of products and supply capability of the supply-web. For SMEs, the collaboration with larger companies might expand their markets to global dimensions. In addition, it usually increases the SMEs recognition as a good quality supplier in the industry. Additionally, smaller organizations seek to benefit from the complementing expertise of larger companies, as well as from their financial resources and sales channels. Altogether, both parties benefit from the collaboration, which has resulted in to a situation where the competitiveness of the industry is becoming more overly competitive between separate value nets than individual companies.

The subject of this study is "The Roles of Information Systems in a Value Net." The purpose of this thesis is to examine the benefits and possibilities, which companies' may realize from co-operation and collaboration with their suppliers in a network-like setting, called a value net. Importantly, this thesis analyses the various roles of information systems within different network and relates socio-technical issues, a.k.a. human factors, to the analysis.

Engaging into networked business processes requires the companies to reconsider their strategy and adjust their ways of conduct accordingly. The usage of information technology and electronic commerce applications for business has become the critical success factor for the companies in the ICT-industry. Therefore, this master's thesis examines the possibilities and considerations for implementing a technology enabled networked business model into co-operation between the purchasing organizations and its' suppliers in a real-life example. However, to be functional and able to create additional value for participants, the socio-technical issues of co-operation and collaboration are crucial and must be taken into consideration.

Two companies from the ICT-industry, with their individually selected suppliers, are the case-companies of this thesis. For the reasons of confidentiality and for these companies' business reasons, these companies are throughout this study regarded as

Buyer A and Buyer B. Furthermore, Buyer A: s supply-web consists of four first- tier and four second-tier suppliers. Respectively, Buyer B: s supply-web includes three suppliers, each representing their own distinct tier.

1.2 The research problems and limitations of this master's thesis

This analytic-empirical master's thesis analyses the concept of value nets, enabled by interorganizational systems (IOSs). These systems break organizational boundaries and at best, create additional value for the network participants. The theoretical background for this study is mainly derived from various books and articles examining IOSs and industrial networks. The empirical material derives its insight mainly from two sources: Theme-interviews that were held during the year 2001, and from a web-based survey questionnaire.

The main research problem of this study is phrased in the following question:

Why is the implementation of interorganizational systems difficult?

The research problem is further divided into the following sub problems that refine the scope of this thesis accordingly:

1. What are the methods and impact of active and effective management of hub-companies, suppliers and external resources, in those tasks which are intended to create additional value from a value net to its' participants?
2. What are the distinctive IOS architectures that allow a value net creation?
3. What are those socio-technical issues that affect the networked business-model?
    a. What impact does the architecture of interorganizational information systems have on the experienced socio-technical issues?
    b. How can / should value nets be constructed / managed to avoid the occurrence of unwanted socio-technical issues from arising?

Regardless of the customer-centricity of value nets, the limitation of this thesis is to focus on the buyer-supplier relationship in a networked business setting. Further, the focus is buyer-centric in a way that the buying companies are the hub-companies (original equipment manufacturers (OEM: s)) of this study. The suppliers form separate tiers according to a hub-company based on their business relationship with one another.

Within these limitations, this study analyses the following aspects:

- The importance of a value net-wide strategic plan in ensuring a functional value net.
- Linking of a source strategy into a research and development process.
- The operative order- delivery process in the light of value nets and different production typologies.
- Different production typologies and their distinctive Customer Order Decoupling Points.
- Prerequisites for the usage of ISs.
- Socio-technical factors related to information technology and value nets.
- Analysis of the data received from the survey.
- Applying the results of the analysis into real life situations.

This study combines earlier research and models of value nets, as well as introducing the empirical findings of the web-based survey, performed for the purposes of this project. Additionally, several interviews have been made at the project-companies and this thesis intends to integrate the information acquired from these various sources, and present it in a form, that best suites the needs of the project's participants.

1.3 Concepts of the study

An industrial networks is defined as:

> A form of the economic organization between anonymous markets and integrated firms. Economic agents have to "compete on the markets" and "cooperate in the hierarchies", whereas they can both compete and cooperate in the networks. The industrial network is based on bilateral and multilateral contracts. The network consists of companies that are under separate ownership. These companies make specific investments in this network. In the network, a company has a voice option, which it does not have in the markets. Respectively, the company can be permanently excluded from the network. On the one hand, the network company has an exit option, which the subsidiary company does not have. On the other hand, the network company cannot carry out influence activities without costs (Nurmilaakso, 2000, 5).

The essence of the whole networking concept is defined as being about "creating value for customers, the company and its suppliers" (Bovet & Martha, 2000, 2). The work of these authors is concentrating more on the scope of industrial networks creating direct value for their customers that usually is a non-company consumer. In turn, this study has its scope on a more industrial view where the networks primarily create direct value for the network participants and in the process indirect value for their customers as a 'by-product', by improving their processes within the network, being able to decrease costs, improve quality and thus, at the end also providing additional value also for the individual consumer.

In this study, a hybrid of these previously introduced definitions is used. The definitions of various authors are combined and expanded in an analysis of various network designs that are enabled by the advanced IT technology. The factor(s) determining and identifying the architecture of networks in this thesis is the permanence of business relationship between participants. Additionally this study considers the concept of value created by the network, and how it is shared between the network participants. Instead of being a general examination of industrial networks, a specific scope for two different networks of buyers and suppliers (value nets) is presented and the research and analysis performed towards that end.

As a general definition for the purpose of this project:

> Value net is a customer-centric collection of companies, collaborating to create additional value for the individual network participants, as well as for the whole network and its customers. The system formed by the individual companies operates as a 'virtual organization', similarly to a strategic alliance where a group of companies operate in a network while remaining legally and strategically independent. Value net engages in joint-operations and makes investments to exploit new arising business opportunities, as well as to take advantage of the synergy benefits that collaboration which a network offers.

By referring to strategies, two distinct views needs to be established; one for the participating companies as individual entities and another for the value net as a group. An example of this context entail that the companies seek additional value from joint efforts and therefore, create a common value net-wide strategy for network operations. Regardless of common strategy, the participants need to engage in both short-term as well as long-term strategy planning processes for their individual operations outside the value net.

The current technological advances enables the value nets to be created in an efficient manner, and for the companies to integrate their systems in a way that automated processes of certain activities between companies are possible. The Internet has made it possible especially for the value net partners to communicate real-time and to share information amongst each other. The availability of information, optimally, aids the participants in making better future projections and e.g. lower the inventory levels, make material acquisitions at the right time and in general, to improve the functions and activities of individual companies.

"Interorganizational systems (IOS) are information and communication technology-based systems that transcend legal enterprise boundaries" (Kumar & Van Dissel, 1996, 279). This is because IOSs enables co-operation and collaboration across organizational boundaries. Furthermore, the boundary-spanning aspect implies a level of co-operation

and coordination beyond that of the traditional relationship which exists between organizations that act as "free-agents" in a market (Kumar & Van Dissel, 1996, 279).

Structural authority in the companies with IOS does not tightly couple the coordination and co-operation: s enabling collaboration with partners', as usually exists in vertically integrated hierarchies (Kumar & Van Dissel, 1996, 279). This is because all companies maintain a level of independency, causing possible conflicts of interests and leaving room for opportunism. In a value net, these issues must be considered and management activities planned and implemented accordingly. Overall, "IOSs can be considered as planned and managed co-operative ventures between otherwise independent agents" (Kumar & Van Dissel, 1996, 279-280).

This study intends to introduce these and other relevant concepts thoroughly, as well as evaluate the positive and negative implications of value nets as a whole. The technical requirements of a value net and the related socio-technical factors to network operations are considered.

One of the reasons for companies to create value nets is that the form of organizational hierarchy has changed from vertical to horizontal. The new organizational culture with the emphasis on teamwork, small and fast reacting teams and easily adaptable processes replaces the old form of bureaucratic, slow and highly hierarchical organizational culture. However, it is important to keep in mind that even though the importance of hierarchy is decreasing, it has not seized to exist. The following figure (FIGURE 1) illustrates the differences of the 'traditional' supply-chain and value net model.

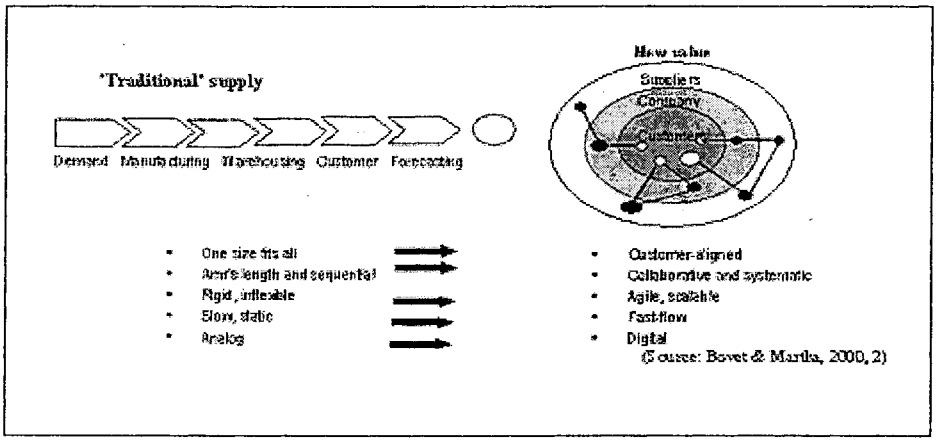

FIGURE 1, 'TRADITIONAL' SUPPLY-CHAIN MODEL IN COMPARISON TO A VALUE NET-MODEL

Figure one, is an illustration of the characteristics of a 'traditional' supply-chain-model in comparison to the characteristics and possible benefits of a value net-model. The 'traditional' supply-chain model differs from the value net model, as the output of one unit becomes the input of another unit in a sequential fashion while the value net operates in a reciprocal fashion.

Coase's law states, "a firm will tend to expand until the cost of organizing an extra transaction within the firm become equal to costs of carrying out the same transaction on the open market" (Coase, 1990, 44). The cost by any means is not the only factor to consider. The increasing need of speed and flexibility often requires external, third, parties to be used for a satisfactory completion of a certain task. Furthermore, the organizations have come to notice that everything does not have to, or is not even feasible, to perform in-house.

Tapscott, Ticoll and Lowy analyze that the motivation behind the change of company hierarchies towards networked business relationships is that the "big companies are complicated and find it hard to manage resources efficiently" (Tapscott et al., 2000, 8). Therefore, outsourcing some activities is cost effective and enables the outsourcing companies to fully concentrate on their core competencies when an outside vendor performs the non-crucial tasks. In many cases, the external party improves the quality of the end-product or service as the externals often pose better expertise in the field

required for a certain product or service to be manufactured in the best possible manner, both quality- and cost wise.

Hoogeweegen, Teunissen, Vervest and Wagenaar (1999) expand on this idea and state that virtual organizations (organizations operating in a 'networked' setting) are able to combine core competencies of multiple organizations in temporary alignments in response to specific customer preferences. For the purposes of this project, this concept of virtual organization is extended to include the value networks with more permanent (static) alignments.

As referred earlier, a distinction between the two different forms of value net architectures, static- and dynamic architecture, must be made. These architectures are very similar in the infrastructure they require and based on the same principle ideology for a large part, but differ in a fundamental way. This fundamental difference can be characterised as the stability or the permanence of the value net as a group of collaborating companies, with the same participants and the longevity of these business relationships. In short, the distinction here is such that a static value net is a more permanent strategic alliance and a collection of companies seeking long term advantages from collaboration than a dynamic value net. Therefore, a dynamic value net is a temporary alignment of companies seeking advantage from collaboration with which to solve one or more clearly defined business situations after which the alignment dissolves.

Dynamic value net (a.k.a. modular network) is built in a way that the participants of such a system may change rapidly depending on the customers' requirements while the static value net is built upon mutual goals and long-term relationships. Another way to describe the differences of these two types would be to state that a dynamic value net seeks long-term benefits by conducting a series of short-term actions, while a static value net aims to achieve long-term goals through improved processes and longer-lasting partnerships.

Structure and process wise the Information and Communication Technology (ICT) enables the companies to re-design their organizational architecture in either way (Hoogeweegen et al., 1999, 2). Technically, it is possible to build an operational value net but the cost of the necessary investments in technology, education and support functions is often beyond the reach of small- and medium size enterprises (SMEs). Especially if the permanence of a 'network-like' business relationship is evaluated to only last for a short time, the expected return on investments is low or the amortization time of investments long. Beyond technical difficulties, a value net is also vulnerable to the so-called socio-technical factors, human related issues affecting the success of a network. The number of functions and participants within a value net increases the amount of those socio-technical issues.

Depending on the view of the author, and what is understood by the concept of a value net, there is a somewhat conflicting relationship in the concepts of virtual organization and value net as such, that requires attention. As an example, according to Nurmilaakso (2000, 5), industrial networks reduce opportunism, as the joining into-, exiting-, or being excluded from the network is costly, forcing the network participants to avoid misbehaviour. On the other hand Tapscott et al., states that "virtual corporation [value net] is a temporary, opportunistic partnership [by nature]: Complementary resources existing in a number of cooperating companies are left in place, but are integrated to support a particular product effort for as long as it is economically justifiable to do so" (Tapscott et al., 2000, 15).

These differences, as mentioned earlier, are caused by the various different possible points-of-view, from which the value nets may be observed. The permanence of a value net for example is a critical factor affecting the participating companies' conduct. In a static value net, the network has a better means with which to control the participants, and the stakes are often higher. The time it takes to offset the investments made in technology required for the networked processes is often a factor that forces the companies to collaborate.

In this thesis, the research of socio-technical issues, "[issues caused by] human action in complex and unpredictable environments where interaction with technology is one, but not only one, of the centre elements" (VTT [1[1]], 2002), influencing the use of IT and ISs, is within the scope of the research. Additionally, the importance of these issues towards the overall success of a network is considered. For socio-technical issues the term 'human factor' is often used instead. The problem with the term 'human factor' is that it is highly undefined, and is used to define almost everything that involves undesired human activity. In this thesis the term socio-technical issues is used to describe issues resulting from human-machine interaction. The Technical Research Centre of Finland[2] defines the research of human factors as:

> The research of human factors [related to technology] extends the technological scope of research to include a point-of-view from the field of behavioural-science. Automation, as a socio-technical system, always holds the aspect of interaction of human activity- and technology issues. Therefore, these aspects must be considered from a company- / department level, all the way to the points-of-view of individuals [users, employees etc.] and individual tasks. (VTT [2], 2002)[3]

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[1] Caption of the text in Finnish: Ihmisen toimintaa monimutkaisissa ja vaikeasti ennustettavissa ympäristöissä, joissa vuorovaikutus tekniikan kanssa on yksi keskeisistä - mutta ei ainoa - elementti.

[2] Valtion Teknillinen Tutkimuskeskus (VTT)

[3] Caption of the text in Finnish:
Inhimillisten tekijöiden tutkimus tarjoaa käyttäytymistieteellisen näkökulman tekniikkaan. Automaatioon sosioteknisenä järjestelmänä sisältyy aina ihmisten toiminnan ja tekniikan välinen vuorovaikutus. Siksi asioita on tarkasteltava monitieteisesti ja systeemisesti yritys- ja laitostasolta yksilöön ja yksittäisiin työtehtäviin. Tarkastelussa ovat mukana sekä normaalitilanteet että häiriöt ja niiden hallinta. Tutkimukset toteutetaan kiinteässä yhteistyössä kohdealueen teknisten asiantuntijoiden kanssa. (VTT, 2002)

1.4 Methodology

According to the characteristics provided by Järvinen & Järvinen (2000, 8-10), the methodology of this master's thesis is 'conceptual-theoretical'. In the following sub-chapters the various methodologies for information gathering used in the making of this study, is introduced.

1.4.1 Literature survey

For this study, a variety of different information sources is exploited. Including: Articles, publications, and other information will be collected from various sources including public-, and university libraries, the Internet and outside expertise by conducting interviews with related persons in the related fields of interest.

Special attention must be given to evaluate the integrity of the information. Especially the information on the Internet is largely composed of advertisements. This undoubtedly results in one-sided information that needs to be verified before using. In addition, since the industry itself changes rapidly the time of publication must be evaluated.

A few useful books used in this study:

Beer, M., Eisenstat R.A. & Spector, B. (1990) "The Critical Path to Corporate Renewal"

Bovet, D. & Martha, J. (2000) "Value nets breaking the supply-chain to unlock hidden profits"

Kankaanpää, T. (1999) "The use of production control software in a specific production typology"

Nurmilaakso, J-M. (2000) " An Economical Study on Industrial Networks"

Parolini, C. (1999) "The value net: A tool for competitive strategy"

Tapscott, D. & Ticoll, D. & Lowy, A. (2000) " *Digital capital: Harnessing the power of business webs"*

Fischer, L. (WfMC) (2001) "The Workflow Handbook 2001"

Wise, R. & Morrison, D. (2000) "Beyond the Exchange: The future of b2b"

1.4.2 Evaluation of existing ISs

For this study, the maturity of the project companies existing information systems is evaluated. This evaluation is done to chart the overall grade of the technology used by the companies', as well as to evaluate their employees' capabilities when using those systems. Additionally, this evaluation clarifies those areas where the information systems are used and the project companies' possibilities for IT-enabled co-operation and collaboration of companies. This evaluation is based on the responses of the web-based survey questionnaire and theme-interviews.

1.4.3 In-depth interviews

To support the applicable theories and to bridge the gap between theory and real-life a series of semi-constructed interviews at companies operating in the ICT-industry, as well as at their suppliers was arranged. The interviews were performed in a discussion-like manner, where the author provided the topics discussed during the interview. At first, the discussion was kept on a very general level in order to chart the interview-invoked sub-topics, and then sharpening the focus according to the status of the interview and the purposes of this thesis. After the interview the information was analysed and a report written for the interviewee to read, correct possible misunderstandings, and to approve. Additionally, based on the report the interviewer had a possibility to make additional clarifications that were missed or overlooked during the actual interview. For the sake of confidentiality and to be able to have accurate findings the personality of the interviewee was promised to / and is kept anonymous.

1.4.4 Survey questionnaire

To find out whether the introduced theory holds against empirical evidence a web-based survey questionnaire was conducted. The survey questionnaire was conducted in co-operation with two other researchers participating in this project. The survey was conducted during the summer 2001, and its respondents were especially selected from the companies participating in this project.

2 FROM VALUE CREATING SYSTEMS TO VALUE NETS

In this chapter, the concepts of the value-creating systems and the value nets are elaborated in detail. The impact of these value-adding models on businesses is evaluated and for the value nets, the analysis is deepened to include two distinct value net architectures as well as the effect of various production typologies for the networked operations. Additionally, in this chapter some of the management activities as well as possible incentives and sanctions for ensuring partners' commitment and operational value net design are considered.

2.1 Value-creating systems

Within the context of a concept described as value-creating systems (VCS: s), a product is viewed as a sum of activities of different companies. A finished good carries the trademark of one company, but the whole VCS are needed for the good to exist (Parolini, 1999). Furthermore, the customer does not necessarily know, nor care about the system behind the product but projects the perceived value of a product to the company that's name, or brand, is presented on the product. For this reason, the perspective of strategic analysis needs to be broadened from individual companies to cover the whole value-creating system, as it is the companies together that create the finished good, and thus the value experienced by consumers. (Parolini, 1999, 77-79)

Furthermore, VCS: s can be defined as systems where economic players work together to co-produce value. A motivating factor behind the formation of such a system is that VCS: s can increase the net value given to its customers by adjusting the different elements of its offer in such a way as to increase the level of the performance allowed by the product or by reducing the level of the total cost that purchasers have to bear (Parolini, 1999, 125). Parolini provides a more detailed definition of this concept as the following key-points (Parolini, 1999, 61):

- A VCS can be defined as a set of activities creating value for customers.
- These activities are carried out using sets of human, tangible and intangible resources.
- They are linked by flows of material, information, financial resources and influence relationships.
- VCS: s also includes consumption activities; insofar as the value that the customers enjoy is also a function of the way, they use and consume the potential value received.
- Final customers not only receive and consume the value created, but can also participate in value-creating activities.
- Activities may be governed by the market, a hierarchy or intermediate forms of co-ordination (company networks).
- Various economic players may participate in a VCS (companies, families, public bodies, non-profit organizations) by taking responsibility for one or more activities.
- An economic player may participate in more than one VCS.

The differentiating factor, separating the concept of VCS from value nets is that value-creating systems do not have boundaries, in a way making them intangible. As a result, focusing the strategic analysis on VCS: s could lead to the identification of activity systems that are too large and complex to be analyzed. Attempt to analyze too large of an area ties down company's resources, e.g. time and work force, and does not necessarily yield accurate results. Therefore, strategic analysts have to define how far they want to analyze, where to set the boundaries in terms of what area is useful to be analyzed and what is needed. A failure to do so results in wasted resources and may even misguide the analyzing organization with inaccurate or incorrect data results. (Parolini, 1999, 77-79)

An important decision a company must make is to decide which VCS to engage in. Furthermore, since all of the economic players in a VCS contribute towards the same goal with their work efforts, the companies usually cannot afford to lose their reputation

over bad quality or negative brand recognition, it is important to carefully evaluate which companies to allow into the VCS. Common objectives are of importance and may be considered as one possible selection criteria when considering individual companies to either join in the system or be allowed into one. Without common goals, an individual company may come to realize that their own position within a system is wasted because the VCS they are participating is a loser, or that they are creating a value that the end users cannot receive or perceive. Depending on the other members of the system an individual company may even come to notice that they have simply become pawns subject to the decisions of their more influential and far-sighted system partners. By this we mean a situation where a larger, or more influential, company uses its' influence over its' partner in order to benefit its' own goals. (Parolini, 1999, 62)

A good example by Parolini (1999, 66-68) of a losing company is the example of Apple, the computer hardware manufacturer. Apple for a long time was the main rival competing against products based on Microsoft operating systems. Apple had excellent quality products and an advanced proprietary operating system. However, the company did not pay sufficient amount of consideration to other aspects of the field, e.g. software and started to lose out on the competition. All because of their negligence to adjust their way of conducting business, as time passed. Apple did not grant any licenses, in order to obstruct clones. In time, the IBM-compatible computers improved their standing, enabling Microsoft and Intel to emerge as the key companies. Microsoft was able to imitate a lot of Apples' excellent hardware solutions and bundle those with their own solutions. From the point of view of the final customer, Apple became too limited a choice as its' competitors had by far a better production mix to offer their customers.

In short, as Parolini states: "Apple became a leader of a losing VCS. In the short term the refusal to grant licenses increased the company's power over it's customers, but in the long term led to a lack in the supply of compatible software, accessories and complementary products" (Parolini, 1999, 68). This example illustrates at least two important considerations; first, it is important to note that the strategic perspective must include both parties involved in a trade activity, the final customers and the company offering its' services and / or products itself. Secondly, nevertheless how advanced or

superior a company's product / service at one time is, all companies must realize that the market as a whole (including the actions of competitors) must be constantly followed and the operations of a company adjusted accordingly.

2.2 value nets

Parolini (1999, 68) states the purpose of a value net is to describe value-creating systems in a way that illustrates as clearly as possible:

- The overall VCS in which the individual economic players operate (the perspective is enlarged to include all of the activities and supply-chains involved).
- The make / buy/ connect choices that the players in the system have made or can make.
- The activities whose control ensures the greatest profitability.
- The activities that add insufficient value in relation to the resources required, or which even subtract value from the system.
- System bottlenecks.
- The possibility of reconfiguring the role of final customers and their involvement in value-creating activities.
- The possibilities for innovation in the system.

The purpose of a value net is to create value (whether direct- or indirect) for the customers, the company and its suppliers (Bovet & Martha, 2000, 2). Referring back to figure 1, we can see that the 'traditional' supply-chain manufactures products and pushes them through a distribution channel in the hope that someone will buy them. In contrast, a value net begins with the customers allowing them to self-design products and furthermore, the value net builds to satisfy actual demand.

Another difference between the 'traditional' supply-chain- and value net thinking arises in the concept of the supplier. The 'traditional' supply-chain is built on conventional supplier-purchasing agent relationships whereas a value net is more collaborative and dynamic, searching strategic solutions with the help of suppliers. Another way of considering the value net concept is through the previously mentioned Coase's law (please refer to chapter 1.3). Tapscott et al. (2000, 11) implicates that the value creating activities of firms, even industries, in the digital economy become easier and cheaper to disaggregate out to the open markets. This transformation is possible due to the digital infrastructure that enables firms to expand into very focused areas of competency.

The 'traditional' supply-chain- and value net models differ from each other in the handling of materials. According to Bovet & Martha (2000) the difference of these two models may be summarized as follows:

> Characterizing the traditional supply-chain, materials flow slowly and sequentially down the chain when information moves back up the chain. As a result, supply and demand rarely matches. Inventories are increasing as buffers against supply failures and demand forecasts are seldom accurate. Optimally a value net captures customers' real choices in real time and transmits them digitally to other net participants. Pathways for information and material flows are aligned with the service needs and this diminishes the above mentioned failures rising in the value chain. (Bovet & Martha, 2000, 2-4)

Tapscott et al., (2000, 17) introduces a term business web (*b-web*) to describe a value net. According to these authors, b-webs are "inter-networked, fluid – sometimes highly structured, sometimes amorphous – sets of contributors [value net participants] come together to create value for customers and wealth for their stakeholders. This definition rephrases the definitions of e.g. Nurmilaakso (2000), Parolini (1999) and Bovet & Martha (2000) but what makes this definition of Tapscott et al., (2000, 5) noteworthy is that the authors further in their book introduce the term digital capital, and present a variety of different b-web architectures as a mean for enabling accessing and increasing the amount of digital capital. The terms digital capital and digital economy are

introduced next and the b-webs architectures relevant for the purposes of this thesis later.

According to Tapscott et al. (2000, 5), digital capital is a result of three types of knowledge assets internetworking. These assets being: Human capital, that is interested in what people know, customer capital, considering who you know and who knows and values you, and structural capital, evaluating how and what you know is built into your business systems. Individual companies as well as value net partners are able to create digital capital. However, Tapscott et al., (2000) imply that b-webs are a powerful way to enhance value creation, increasing the amount of digital capital, as "internetworking enables the gaining of human capital without owning it, customer capital from complex mutual relationships and structural capital that builds wealth through new business models" (Tapscott et al., 2000, 5).

"The environment of b-webs and digital capital may be called digital economy" (Tapscott et al., 2000, 11). Within this environment, the core of Coase's law is emphasized, as it is argued that with current information technology the cost of organizing an extra transaction is less expensive in the open markets than producing extra output in-house. Additionally, the coordination tools of the digital economy are argued to enable the companies to expand into highly focused areas of competency (Tapscott et al., 2000, 11).

As an embodiment of a VCS, value net participants must have the right to participate in multiple networks. Furthermore, one of the underlying presumptions behind a network of companies is that the collaboration within the network does not significantly affect the competition between individual network partners' (Nurmilaakso, 2000, 14). Awkward as it might seem, under the market-economy companies' collaborating in one value net might compete with each other in another value net. This however is necessary in order to ensure fair price-competition between, and thus to protect the customers'.

The communities and markets are fundamentally opposed to monopolies, as they, by the laws of economics increase prices and distort competition. Sometimes, close collaboration of companies is suspected by the public to be based on a cartel agreement. Cartel agreements are undesired as they impair the position of customers' by causing distortion in the markets. The law does not allow these agreements to be made, as they influence prices and might prevent new entrants from entering the markets. The office of Free Competition of The European Union, and its' counterpart in the US enforce that the structure of the markets, as well as competition remains in the global markets.

We have stated that a value net must be built upon common goals and trust. Does this ability of companies, to partake in multiple networks, cause controversy and hinder the formation of value nets? The answer is no, as a company participates in a value net, or value nets, to benefit from networked operations. According to this logic, it would not serve a companies best interests to misbehave in its' network, and risk losing its' reputation or face being excluded from a network. Additionally, the investments are more justified, and amortized faster when the same technology may be used for other processes as well. Therefore, this freedom of participation actually encourages the formation of value nets. As an example of collaboration between competitors', the automobile industry could be mentioned, where the competitors collaborate in a value net (ANX) to achieve cost-savings and for common R&D, but in the meantime compete fiercely against each other.

An absolute asset of a value net is that it does not require ownership to integrate its participants. Sometimes minority share-, cross ownerships or joint ventures are engaged as to ensure commitment of companies into a value net and to provide incentives for the companies to perform to their fullest capabilities within a network. These incentives are later considered in more detail.

2.2.1 Value nets and production typologies

Depending on the company, the good(s) it produces and of the industry it participates in, different production typologies exist for different companies. In this study, five typologies are introduced, from which the fifth is only briefly introduced, for it is a combination, a 'hybrid' of others.

Understanding the impact of different production typologies and related decoupling points of participating companies in a value net is a prerequisite for the system to be operable. Production typologies are the origin of many conflicts and mismatch between the participants of a value net as they have varying systems and reasoning in use for e.g. inventory-management and production. Therefore, the understanding of these concepts is crucial and allows for a more effective and accurate planning within the network. Additionally, understanding the characteristics of production typologies enables the functions and activities of a network to be planned and carried out successfully. The typology of a company affects its needs for making material acquisitions, its production schedules, and overall strategic planning for the individual company as well as for the whole value net. As a result, the typologies influence the composition of a network.

The following text is a detailed description of different production typologies, after which an example of the impact of different typologies is provided. The production typologies introduced here are:

1. Engineer-To-Order (ETO).
2. Assembly-To-Order (ATO).
3. Make-To-Order (MTO).
4. Make-To-Stock (MTS).
5. A combination of typologies (Hybrid).

We start the introduction of these concepts from the least complicated typology. Make-To-Stock, as stated in the name, is a typology describing a company that produces

standard good(s) before receiving actual customer orders. The production amounts are based on forecasts, usually based upon the historical demand the company has experienced. The finished goods are after production stored in the company's warehouse(s) until there is an actual demand (customer order) for the products, and the goods are shipped to retailers or directly sold to end-consumers. An example of a company like this is e.g. a factory producing standard goods. (Kankaanpää, 1999, 28)

Make-To-Order typology is very similar with MTS-typology. An MTO-company produces standard goods based on forecasts, but when an actual customer order is received, the production method is changed from forecast-based production to actual demand, materializing as customer orders. The main difference between MTS- and MTO-typologies is that instead of producing goods for the inventory (warehouse), the produced goods under the MTO-typology are in a way already "sold" by the time they are produced.

Assembly-To-Order typology differs from MTS and MTO by assembling the goods from standard assemblies and semi-finished components based on customer specifications. Therefore, it may be stated that in a way ATO combines the different production typologies. An ATO-company produces semi-finished standard components based on the forecast, and stores them in the warehouse, like an MTS-company. The customer order then converts the production to the final assembly of the product. A traditional example of an ATO-company is an automobile assembly plant. (Kankaanpää, 1999, 28,46)

Engineer-To-Order is the typology by which, "even the product design is customer order driven" (Kankaanpää, 1999, 28). The final product is not fully specified at the moment an actual customer order is accepted. From that point the engineering task that defines the final specifications of the product begins. The customer orders are therefore, molding the process all the way until the actual production. (Kankaanpää, 1999, 28-29)

To illustrate the differences of various production typologies and the effect each of them have towards networked operations, let us imagine two separate companies, company A

and company B. Company A is a producer of a standard good, a good composed of readily available materials, throughout the year in quantities needed. Company B again produces a product which production requires one or more scarce material(s) to be used. Additionally, the good may not be readily available throughout the year in quantities needed. In other words, scarcity exists for this good. In this example, company A is a Make-To-Stock (MTS) company, while company B is operating under Make-To-Order (MTO) typology.

Obviously, these two companies must engage in planning activities distinct from one another. Company A is able to plan further ahead of time and to prepare itself for the fluctuations in the supply and demand with the help of increasing or decreasing the size of a companies' inventory. In case of an unexpected peak in demand, company A is able to purchase more of the needed raw materials and attempts to satisfy the demand by producing additional amounts of goods. Additional production therefore, being limited only by the factors inside the company, such as the company's production capacity, size of inventory, financial feasibility studies of producing extra and the availability and cost of manpower for producing additional amounts.

Planning ahead and responding to demand fluctuations is a much more difficult task for company B. The factor of scarcity of a required material(s) causes company B to either produce according to its' forecasts based on expected demand or to stock up on the scarce material. The first option carrying a risk of the company not being able to satisfy unexpected peaks in demand, in case there isn't enough of the scarce material(s) in the market at the time of need, or if the sudden peak in demand rises the price(s) of scarce material(s). The second option a company has with these challenges is to stock up with the scarce material(s) and thus prepare for fluctuations in demand. Stocking up allows for production increases within the amounts of materials in inventory, given that there is enough production capacity to allocate as well as work force. As a downside, stocking up includes high capital costs of inventory and a risk of the raw materials becoming obsolete. Additionally there is a risk of fluctuating material value; prices of raw materials may either increase or decrease.

Consequently, there may be companies with different production typologies collaborating in the same value net. With the previous example of the two companies operating under different production typologies, some arising problems resulting from this were introduced. When coordinating in a value net and working for the same goal a delay of one partner could easily affect the whole network. A value net cannot increase the amount or lower the price of a scarce resource at a time of need, but with cooperative planning and overall availability of information, these situations should seldom occur.

Again, a distinction between a static- and dynamic value net architecture should be emphasized. (A static value net architecture can be described to be more stable in time, and in general; more standardised than a dynamic value net.) When the previous example is applied to what we know about value nets with dynamic architecture, there are issues to consider. In case of a dynamic value net, the availability of information is generally non-existent until the temporary alignment of companies is formed. At that time the common planning activities and sharing of essential information, such as demand forecasts is occurring rather too late. Unless a company has a monopoly, the companies dealing with the needs of scarce raw materials in a situation like this must use the stock up method in order to be beneficial for the network and to be allowed into the temporary value net at all. It could be argued that as a result the overall costs increase as the extra costs are allocated among value net participants.

What is the optimal production typology of a value net? As a rule of thumb, the typology that best fits into the description and expectations of a value net is ETO, as the value nets are market- / customer-driven. The underlying idea of the networked business setting is to avoid excessive inventories with collaborative planning and synchronised production processes. Therefore, the MTO and MTS are fundamentally opposed to these goals.

In real life, a value net is composed of various individual companies from which not all are operating by ETO-typology. This does not prevent the network from being operable nor prevent the interoperability of the participants, but is a fact that must be taken into

consideration for the system to be as effective and efficient as possible, and to avoid any future problems. As an example, material acquisition and handling must be planned to accommodate the existence of different typologies in a network.

A value net as a whole, the virtual organization, has a hybrid production typology. A hybrid typology can be said to be a mixture of other typologies. Therefore, the structure of a value net and customer needs define the typology in which the companies operate by.

2.2.2 Value nets and the Customer Order Decoupling Point

The customer order decoupling point (CODP) defines which part of the supply-chain is customer order driven. Additionally CODP illustrates which investments in resources, products and processes, has been made independently of customer orders. Kankaanpää states that the customer order decoupling point can be defined as the anonymous stock point that lies the furthest downstream in the goods flow (Kankaanpää, 1999, 12). The following figure (FIGURE 2) illustrates this concept more thoroughly and relates it to the different production typologies introduced in the previous section.

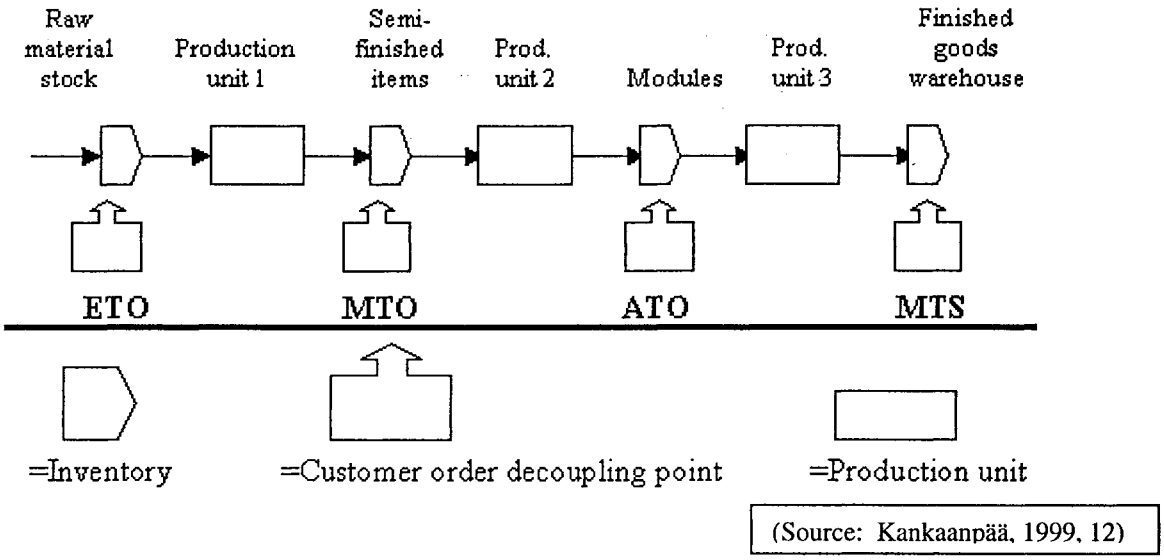


FIGURE 2, ILLUSTRATION OF PRODUCTION TYPOLOGIES AND DECOUPLING POINTS

Figure 2 by Van Veen (1992) [c.f. Kankaanpää, 1999] represents the different production typologies with the related customer order decoupling points in a goods flow. It is assumed that beyond the customer order decoupling point no anonymous stock exists, meaning that all the stock that exists after the customer order decoupling point, is dedicated to a customer order. (Kankaanpää, 1999, 12) For each typology, the CODP occurs at a different time.

The CODP in the goods flow of a company operating by the Make-To-Stock typology is in the inventory of "finished goods" as the company produces standard goods and stores them in the warehouse to wait for the actual demand. The production task is performed regardless of whether or not there is actual demand for the product at the time of production. The goods remain anonymous, unconnected to the customer, until they are actually sold and transported from the inventory to the customer.

In Assembly-To-Order the CODP is in the inventory of assemblies and components. The components, or modules, remain in the warehouse until an actual customer order is received and the final product assembled. In the production of the end-product the already manufactured components are used. Therefore, it could be argued that ATO-

and MTS typologies are identical for a large part of the goods flow between various production situations. To elaborate, in both of these typologies the production begins prior to the actual customer order being received; production of the end-product in MTS and the production of components and assemblies used in creating the end-product in ATO. Both of these typologies require inventories but in ATO typology, the inventory is more flexible as the components do not depreciate as quickly as the finished product and there is more flexibility with components, as they can be used in creating various end-products.

In Make-To-Order- and Make-To-Stock situation, the production of a standard good begins anonymously. By this, we mean that the good in production is not produced for a certain customer order. However, the difference in these typologies is visible as soon as a company operating under the MTO typology receives an actual customer order. As soon as the customer order is received, the previously anonymous stock is dedicated towards a certain customer order in MTO situation.

Engineer-To-Order typology has the customer order decoupling point at the beginning of the manufacturing process. The manufactured product is customized according to customer preferences. Therefore, the first task in ETO is the engineering task where the final-product specifications are created. There is not any anonymous stock in the ETO typology and thus, the need of inventories is lower than with other typologies.

2.2.3 Value nets and inventories

Regardless of the effectiveness of a company's production process the end-value experienced by customers is influenced by the speed and reliability of the VCS: s logistical network. Therefore, a company's logistics play an important role in its' overall success. Inventories are required for the company to prepare for any unexpected fluctuations in demand, to store unsold items and to prevent customers from choosing

complementary products in the absence of stock. Almost all companies, regardless of the typology the company is operating by, have inventories.

Traditionally companies have had either many warehouses in dispersed locations or one or few central warehouses. Maintaining a network of warehouses is costly; as for each warehouse, there are fixed costs as well as transportation costs involved. To cut costs, generally the companies aim to maintain low levels of inventories as possible. A method to decrease inventory sizes is in production planning based on future demand forecasting.

Inventories are troublesome. The physical location of inventory might be far from buyers' actual location, causing an increasing need for logistical services and thus, increased transportation costs. Depreciation of products in the warehouse is a problem as it forces the companies to minimise their losses and to sell fully depreciated products for a price lower than the cost of production. Inventories tie working capital of a company.

To evaluate how the case-companies of this project manage their inventory a series of interviews were held. Buyer B operates in an industry where it is dependent on the material flows from many suppliers and on the reliability and quality of its' contract manufacturers products. As a result, a conclusion is made that not all suppliers are equal, and therefore require a different approach to ensure continuous material flows and a 'frictionless' business environment. Based on the information received from an interview of two development managers of their company's, operating in the ICT-industry, sourcing department. Buyer B currently has an inventory management system known as vendor-managed inventory (VMI) or supplier-managed inventory (SMI) in use. In addition, the company uses another inventory management model of its' own. These above mentioned models rely on accurate forecasting data as well as on availability- and visibility of inventory related information. The models are similar in their function, the main difference being that under VMI- / SMI model, the supplier is responsible for replenishing the consignment inventory levels within negotiated parameters, specified in contracts. Furthermore, under VMI- / SMI model buyer (B)

only pays based on materialized demand. Under Buyer B's own inventory management-model, the signal responsibility of replenishment is at Buyer B. (Development managers [1], 2001)

From the hub-companies point of view, an advantage of these models include the decreasing sizes of material flows between companies, as often the suppliers move their physical inventories closer to the customer. Additionally, the benefits include that the responsibility for maintaining the availability of the required materials within the inventory levels specified by the contract is shifted to the partner. As a result, the need of a separate order-process between the hub and supplier is removed.

The above-mentioned inventory management models are only applied between the suppliers, with whom the business relationship is abiding, consistent and continuous. Between the hub and its' contract manufacturers the "traditional" order-based supply-management process is still used. The Internet offers excellent possibilities to improve the effectiveness of 'traditional' business. An Internet-based planning-and ordering system improves the visibility of the whole supply-chain and thus allows the companies to virtually unite and exchange e.g. forecasting information in real-time. As a by-product the quality of information improves and the possibility of negative Socio-technical factors from surfacing decreases. The increased efficiency of operations, resulting from automated information exchange processes, allows for the human capital to be allocated into more important, and value-added operations.

One motivation behind the companies interest in improving their processes and bettering their business environment through the creation of operational value nets is the possibility to decrease inventory sizes, enabled by better planning acquired through the availability of information. Value net partners may have common warehouses and thus decrease the per item cost of producing. Overall, it should be remembered that value nets do not eliminate the existence of warehouses. With effective logistical arrangements and procedures the inventories may be dispersed among the suppliers, thus the cost of inventories is additionally distributed within the value net. For some companies this will allow cost savings, but some might incur additional costs.

2.2.4 Value nets and workflows

As a general definition, provided by the workflow management coalition and the E-workflow organization, workflows are defined as enablers of "the automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules" (e-workflow, 2001). In other words, "workflow is about using automation to share information, making sure that the information needed in a business process is available to the right people, at the right time, and in the right sequence" (WfMC, 2001). The motivation for workflow usage is to achieve, or contribute towards an overall business goal. Whilst workflow may be manually organized, in practice most workflow is normally organized within the context of an IT system to provide computerized support for the procedural automation. An obvious advantage of automation includes the decreased possibility of socio-technical factors affecting the information-exchange-processes and the additional possibility of freeing human capital to more productive tasks.

With the usage of workflow technologies, an organization is better able to automate and manage their processes. According to editor Layna Fischer in the WfMC Handbook 2001, the benefits of workflow technology may be divided into two classes: Tangibles and intangibles. The tangible benefits of workflow technology include reduced operating costs, improved productivity, and faster processing times. The intangible benefits improves services, conditions for employees, change management, communications, planning capability, and raise the quality of e.g. production by automation, and with all the aspects mentioned above; offers decision support by providing right and timely information. (2001)

Socio-technical factors within each separate company of the network are important to be understood and considered. The size and scale of the impact of 'human factors' is often underestimated and overlooked, even as they affect not only one company but also the entire network of companies. Previously automation was mentioned to decrease the

occurrence of socio-technical factors. The statement is twofold as the information passed in the network influences the tasks of individual companies. Even automated processes between various information systems are not a solution intrinsically in a case where the cause of experienced 'human factor' is incorrect, corrupt or unusable information, not the information-exchange-process it self. Obviously, the transferred information must be correct, in a correct understandable form and available at the right place at the right time by the right people.

This might be one of the largest problems of working in a network as the employees in various companies' process the information, at least at the transmitting end, which is then relayed to each participant. In case of faulty information a network that has automated processes in use, will have a problem. Theoretically, automation enables the incorrect information to be spread automatically throughout the system. In the worst case, faulty information undermines the trust that participants have in the usefulness and correctness towards the availability and visibility of shared information, as well as affect the inventories and tasks of companies'. The definition of roles and responsibilities, as well as the sequence of task-execution of each participant it must be determined prior to the automation, and overall for the collaboration to be successful.

From technological perspective, it is necessary to connect all the players involved in the processes into a single collaborative unit in order to extend the whole concept of workflows into the value net. After successful integration, the Web, in theory, enables the formation of seamless business processes. However, in addition to the technological perspective the business processes must be synchronized for the information-exchange to be meaningful.

Due to the reasons explained it seems probable that the companies will continue to build supply webs. However, it is likely that those webs will be built based on mutual trust and shared information, rather than the pursuit of the lowest prices, which in the short run might seam as an attractive option. However, with the web built on trust it is possible to form long lasting relationships with the suppliers, and to lower transaction

costs in the long run as some of the coordination tasks may be shared among the web participants.

2.3 Creating a value net

Hoogeweegen et al. (1999, 1) states that "to deliver the required levels of flexibility suitable for today's business environment, new organizational forms emerge, all of which share the basic premise of produce-to-order [MTO, ATO and ETO] rather than produce-to-stock [MTS]." Creating a value net begins from the need of such a system and the incentive for creating such a system may be proposed by anybody, from suppliers to customers. The motivation may be for the standard product producer to establish more permanent business relationships with its' buyers, or an intension to save costs in the long run. Usually the companies that have collaborated for a long time are the innovators and visionaries that break the organizational boundaries and decide to form even tighter relationships.

The form of a network and its functionality is only restricted by the participants' own will and wishes. The system must be controlled and stable in its operations therefore, all participants must share the vision of what will the value net help to accomplish for the system to work. The specifications of the network and common strategies are then created on top of that vision and those specifications. It is important that these factors are decided at an early stage as overly optimistic expectations of the system could hinder the functioning of the whole system if one or more of the participants would later feel that the value net did not meet the expectations or did not deliver its promises. To avoid this all of the participants should be included in the planning process at an early stage.

The required investments for the information systems, hardware and software, education of employees as well as support functions are considerable. To avoid unnecessary investments from being made and ensure the participants commitment for the creation

and future operating in the system, the exact specifications of a value net must be agreed upon by all of the participants at an early stage. The specifications should clarify the functions for what the value net will be used, what are the tasks, activities and functions

Two fundamentally different scenarios may be stated for the value net creation: The best-case scenario where the hub, first - and n–tier suppliers are all willing to invest in the information systems needed for the value net, and the benefits experienced from the systems exceed the costs. The worst-case scenario is that, especially, the second -tier suppliers are not willing, or are not able to invest the required amount of capital into the value net, even when 1st- and 3rd- tier suppliers are. Needless to say, in the worst case scenario the value net fails in most parts as the information does not necessarily reach all of the participants in the form and manner needed, or some of the agreed procedures and processes cannot be implemented throughout the network.

In order to extend the concept of workflows, automation which enables the sharing of information between companies, into the value net approach, it is necessary to connect all the players involved in the processes into a single collaborative unit. After the integration of workflow technology, the Web enables the formation of seamless business processes across organizational boundaries.

Regardless of architecture by which the value net is constructed, the building, maintaining and operating a value net result in additional costs to the participating companies. Transaction costs[4], the costs resulting from the increased need of (for instance) e.g. communicating, required investment costs etc. will certainly increase. However, with the web built on trust it is possible to form long lasting relationships with the suppliers and share some of the transaction costs occurring from e.g. the need for monitoring- and controlling activities, which inevitably increase within the supply

[4]Transaction costs include: 1) Search costs necessary to set up the minimum social unit for the exchange, 2) contracting costs related to the negotiations of the terms of trade and the drawing up of the contract that regulates the exchange, 3) control and regulation costs for implementation of the contract under conditions of uncertainty and the policing of the deviations from the contract terms, and 4) the maintenance costs of the whole transaction. (Kumar & Van Dissel, 1996, 292)

web. However, the cost savings achieved from the forecasts that are more accurate and resulting in decreased inventories, according to the value net theory, have the potential to offset costs.

A value net is composed of individual companies that have many different functions within the system and within the market / industry they participate in. Generally speaking the activities of companies, regardless of industry have common attributes by which the different activities may be labeled under one of three classes; realization-, support- and external transaction management activities. This type of categorization enables the companies to improve their planning processes and to better monitor their collaboration activities.

In short, these three important classes of activities can be described as follows. The realization activities are for example the activities aimed at the physical creation of goods and their transfer in time and space. Support activities are the activities aimed at maintaining or improving the effectiveness and efficiency of other activities and which do not intervene in the physical production of individual products or services. External transactions management activities are aimed at managing and controlling the transactions arising in the presence of exchanges between distinct economic players. (Parolini, 90)

2.4 Static- and Dynamic value net architectures

Earlier in this study, the two distinct types of value net architectures, static- and dynamic, were introduced. To elaborate on this idea, and to better explain these two concepts, it is necessary to expand our mindset by revising and clarifying the concept of virtual organizations further. Another perspective with which to look at virtual organizations is to evaluate them as a group of companies collaborating, working together as one, to achieve a common pre-defined goal and benefit all parties involved

in the process. In other words, an alignment of many companies that form an entity resembling one "company without boundaries."

As mentioned before, as a prerequisite for achieving the desired functionality in the network creating a value net requires the participating companies, regardless of size and financial status, to invest into the technical infrastructure. These investments, depending on the individual company's grade of technological infrastructure, are often sizeable. Additionally, investing into educational activities of the personnel as well as in support functions is required for the system to operate in an effective manner.

The chosen architecture of a value net to be constructed, influences the individual companies investment decision. The system may either have static- or dynamic architecture. A crude description of the differences of these two architectures could be stable- vs. liquid value net architecture. By definition, these architectures differ severely and must be taken into consideration at an early state as they, in the end determine the nature of companies' business relationships. The technical compatibility of information systems requires consideration, as often various IT-equipments are not interoperable, or at least process data is in a different form or have different types of files.

A simple example of this may be illustrated when considering dates. Expressing a date in European format differs from the format used in the US. Consider the different expressions of the same date in a European- and in the US format: "22.05.2001" "05/22/2001". The computer would interpret these sets of numbers as distinct values, possibly resulting in an error in data processing. To create an environment where companies are able to technologically come together and collaborate requires the technology to be interoperable. Tapscott et al., (2000, 22) suggest that voluntary adherence to open standards and technologies minimizes dependence on the proprietary methods of individual b-web participants. In other words, with standardization and common agreed rules the interoperability is best ensured.

The cost issues affect the formation and selection of value net partners, stability and permanence. Using the market involves significant transaction costs in finding a reliable

supplier, contracting it, monitoring and enforcing the contract and coordinating with the supplier for the duration of the contract.

2.4.1 Static value net architecture

Large investments are often more justified when companies intend to form a long-term business relationship as the time to offset the investments can be planned in more detail. The name of a static value net architecture is a little misleading, as even by this model, the business relationships do not become "carved in stone" after the specific value net partners are chosen and the value-network (specific network within the supply-web come together to engage in business activities) created. The differentiating factor with a dynamic architecture between these architectures is that by nature the static architecture is planned to cover a longer period, and may be more easily expanded to also include other business tasks within a dynamic network.

The required investments, whether in technology, education-, support functions or to fulfil a particular customers needs (intended to be fulfilled through networked operations), are often large and cannot be made based on the mere opportunity of being allowed to participate in a temporary- (dynamic) value net. A production task requiring other participants to make investments that are "value net-case-sensitive", e.g. building factories to increase production capacity, can be better justified when the value net partners commit themselves to a business relationship for a considerable period.

A static value net architecture allows more leeway for the individual companies than value net operating under dynamic architecture. Optimally the companies together decide upon the type of investments to be made, and therefore minimize the risk of ill investments being made. In the end the operability of a value net is better ensured when the companies collaborate from the very beginning.

2.4.2 Dynamic value net architecture

Hoogeweegen et al., (1999, 2) has a detailed description of dynamic value net architecture. According to these authors, the characteristics of a temporary virtual organisation, in this study called dynamic value net architecture, is a:

> Network of organizations, from which temporary alignments are formed to combine the specific core capabilities of its members in order to quickly exploit a specific product or service manufacturing opportunity after which the temporary alignment is dissolved and the members become available for another virtual and temporary assignment. (Hoogeweegen et al., 1999, 2)

A dynamic network bases on Modular Network Design (MND) that "takes the approach of supporting the assessment of alternative allocations of production tasks among the members of a [temporary] virtual organization using Information and Communication Technology [ICT] as enabler" (Hoogeweegen et al. 1999, 2). According to this approach the parties involved as well as both the requirements and the production tasks are considered as interoperable modules that may be aligned in various ways that best suites the business problem at hand

In order for the value net with dynamic architecture to work in the most effective manner the presumption must be that each candidate in the pool of "network participants" have information systems that are interoperable and are able to transfer information in a form every participant can use. This is not the case in real life. The severity of this problem however, depends on the amount- and type of information as well as on the data processing methods exchanged and processed in a value net. It must be noted that since the life cycle of a dynamic value net is predefined, the information exchange must be very controlled. In other words, the availability of information in a dynamic value net is not as open as in static value net.

The possibility of reaching automated processes, information exchange between computers without human intervention, within a dynamic value net is currently very difficult to achieve. This is because of the above-mentioned problem of companies possessing and using non-interoperable ICT equipment.

2.5 Managing a value net

As mentioned earlier, at the *general level* the responsibilities of each participant (roles and responsibilities) must be decided at an early stage in order for the system to function properly. At *organizational level,* according to Hoogeweegen et al. (1999, 2), the managing party, usually a group of representatives of each company, of the value net must engage in *metamanagement activities*. This term refers to the management of virtually organized tasks, consisting of four basic activities. These activities being:

1. Determining and analyzing customer requirements.
2. Tracking the possibilities for satisfying customer requirements.
3. Developing and allocating the production tasks among value net partners.
4. Assessing and adjusting tasks and allocation procedures.

A value net requires an effective monitoring mechanism, as it is a function that must be continuously performed at all times, and adjustments made immediately and when necessary. At employee level, the participating companies must together be able to provide the tools for individuals to manage the organizational and personal work, and to more effectively fulfill their commitments. (Hoogeweegen et al., 1999, 2)

In order to enhance visibility and availability of information the participants of a value net exchange a lot of data, information and knowledge among each other, and thus create an abundance of information. Having necessary and helpful information is an asset for a company but as the human capacity of producing attention is limited, the abundance of information might become overwhelming and confusing (Tapscott et al.,

2000, 6). One possible solution for knowledge management is having automated processes, that are enabled by information systems, between participants of a value net.

When it comes to considering management activities of a value net type of network, it is substantial to note that the two value net architectures introduced both require distinct approaches. Regardless of the architecture, the coordination of a network is a difficult task, influenced by the uncertainty of the business environment, the need of trust between participants; both in terms of opportunistic behavior and availability of information as well as each other's capabilities to perform as expected towards common goals. The party coordinating the operations must have access to an adequate amount of information to make sound decisions. The managing party must for example at all times be aware of the supplying parties supply capacity (how much can the suppliers supply and thus, how much can be produced at a given time) as well as about the value nets *production capacity* (given the amount of supply and labor, how much can be produced and promised to clients at a given time).

In a static value net the company that links the participants by providing the incentive for collaboration or provides the technical backbone for the system, most often acts as a network coordinator. Even though the topic of discussion here is the management activities of a value net, the term "manager" would poorly suite the party overseeing the actions of a network. This is because, as mentioned earlier, the network is a collection of independent companies cooperating together. Hence, the term "coordinator", as used by Hoogeweegen et al. (1999, 2), is also used in this thesis.

It must be remembered that a static value net is most often created to serve companies that have long-term business relationships and is composed of companies with a different status, when it comes to size and function in value-creation for the customers. In this study, because of the project settings, the management activities are in the hands of the *hub-organizations* that link the participants, first-, second- and n-tier suppliers, together and work as n-tier suppliers to hubs.

In the functionality of value net, the socio-technical issues have an important role. Some of the arising questions that must be answered are "how to integrate the required information systems into the companies", "how to commit people into the new concept", "how to ensure that the system is used consistently and correctly", "how to control the system" and "who should control the system." The incentives for entering in and conducting properly within a network as well as the sanctions for the network misuse or violating common agreed rules must be considered.

In order to function properly the responsibilities of each participant must be decided at an early stage. In addition, companies must provide the tools for individuals to manage the organizational and personal work and help the employees to fulfil their commitments more effectively.

The value net has many participants, whose responsibilities must be charted for the value net to have an operational and functional design and purpose. For users to participate e.g. in a workflow, each must know the exact role they play, and the process in which they are participating must be defined, including the business rules which govern the processing of information within the workflow. Without the previously mentioned order in the value net, the companies could engage in overlapping activities, or incorrectly assume some tasks to be taken care of by someone else.

2.6 Incentives and sanctions related to value nets

Economical control achieved through arrangements of ownership may be used to provide strong incentives for companies to conduct themselves in a proper way in a network and to reduce the risk of opportunism.

2.6.1 Minority share ownership

Nurmilaakso states that founding value net operations on trust and ensuring commitment of participants into the network through specific investments are sometimes seen overly expensive- or slow to arrange or are inappropriate for the specific situation. In theses circumstances, a minority share ownership ensures the commitment of companies involved in ownership arrangements. However, this ownership requires two factors for a value net to exist. First of all the arrangements of ownership must be "light", so that the economical control and influence of the shareholders remains in the hands of the individual company. In a case of a majority share ownership the resulting system fits poorly or not at all into the description of a value net. Secondly, as stated by Nurmilaakso the companies must have an ongoing business relationships or the system cannot be described as a value net. (Nurmilaakso, 2000, 55, 56)

2.6.2 Joint venture

The website of the Legal Information Institute of Cornell Law School defines joint ventures as:

> A joint venture is a legal organization that takes the form of a short-term partnership in which the person(s) jointly undertake a transaction for mutual profit. Generally each person contributes assets and share risks. Like a partnership, joint ventures can involve any type of business transaction and the "persons" involved can be individuals, groups of individuals, companies, or corporations. State partnership, contract, and commercial transactions law govern joint ventures. A joint venture is also treated like a partnership for Federal income tax purposes. A joint venture corporation involves the same type

of activity as above but within a corporate framework. (Cornell Law School, 2001)

Generally stating joint venture is an indirect arrangement of ownership where collaborating companies establish a separate company together. Before establishing a new company, the participants decide upon the sharing of profits and control within the venture. Often the division is done in a manner that allows for an equal share of profits and control. Additional benefits of a joint venture are for example the easiness of each shareholder to terminate the collaboration by selling its ownership in the established company. For this particular reason joint ventures are well applicable for short-term business relationships.

2.6.3 Cross ownership

Cross ownership indicates arrangements of ownership where both the collaborating companies own a share of each other's capital stock. The benefit of this arrangement is that the companies achieve some say in the partner companies' decision- and policy-making processes. Additionally, depending on the arrangements, the companies get to place their own representative on each others board of directors, thus receiving information of each others actions and conduct of working. An important note that must be made here is that the companies' share of each other's capital stock should not be large enough to make the business relationships look mire like a parent- daughter company relationship than a network.

Nurmilaakso (2000) states that cross ownership is better suited for the companies engaging in long-term strategic collaboration, as the disengaging from the collaboration requires mutual arrangements, and involves risks if the owners of the partner company are changed whilst collaborating.

2.6.4 Committing suppliers

Bakos and Brynjolfsson (1993) argue that tightly coupled operations supported by IT requires increased investments by suppliers also in noncontractible resources, such as quality, innovation and information sharing. In a situation where a value net holds many competing suppliers in its' supply-web the bargaining power of individual suppliers is decreased, making the guarantees on their return on investments insufficient and compromised. Reducing the number of suppliers is presented as a possible solution to increase the bargaining power of suppliers in a value net, giving them an incentive to make these investments (Bakos & Brynjolfsson, 1993).

2.7 Conclusion

Value nets are an embodiment of value creating systems (VCS: s) that differ from the 'traditional' supply-chain model by breaking the sequence of information and production flow into, allowing for reciprocal sharing of information, and production. Value nets are boundless in size and form, but require clearly defined rules- and roles of both participants and procedures to be operable. Instead of being restrictive or exclusive, any value net partner may also be a member of another, competing value net. To exist, value nets require for common strategy and goals.

The changing business environment, developing technology, and increasing competition, as well as the aspiration of companies' to concentrate on their core-competencies, drives value net formation. SMEs seek entrance to the global markets with the help of larger companies, while the larger companies are better able to concentrate on their core competencies when the supply-web is adequate in its' supply-capability, and functional in design.

There are two distinct value net-architectures; static- and dynamic value net-architecture. As stated by name, static value nets' are more stable and permanent than dynamic value nets'. The risk for opportunistic behavior, misconduct and error differ between architectures.

3 FUNCTIONS AND ACTIVITIES IN A VALUE NET

In this chapter, the different functions and activities of a value net are presented through a model called Generic Channel Model (Vepsäläinen & Saarinen, 1998). The aim of this chapter is to present the specific considerations for the network-like business operations in the light of some of the relevant theories. Socio-technical factors related to information exchange are also presented in this chapter.

3.1 Generic Channel Model

The Generic Channel Model (FIGURE 3) is a useful model for explaining the various functions and activities taking place in a value net. The advantages of this model include that it offers a somewhat simplified method for presenting many important views and tasks of an organization(s) to be considered in a graphical and illustrative way. Additionally, the model may be used in illustrating the operations of either an individual company or a value net as a collection of companies.

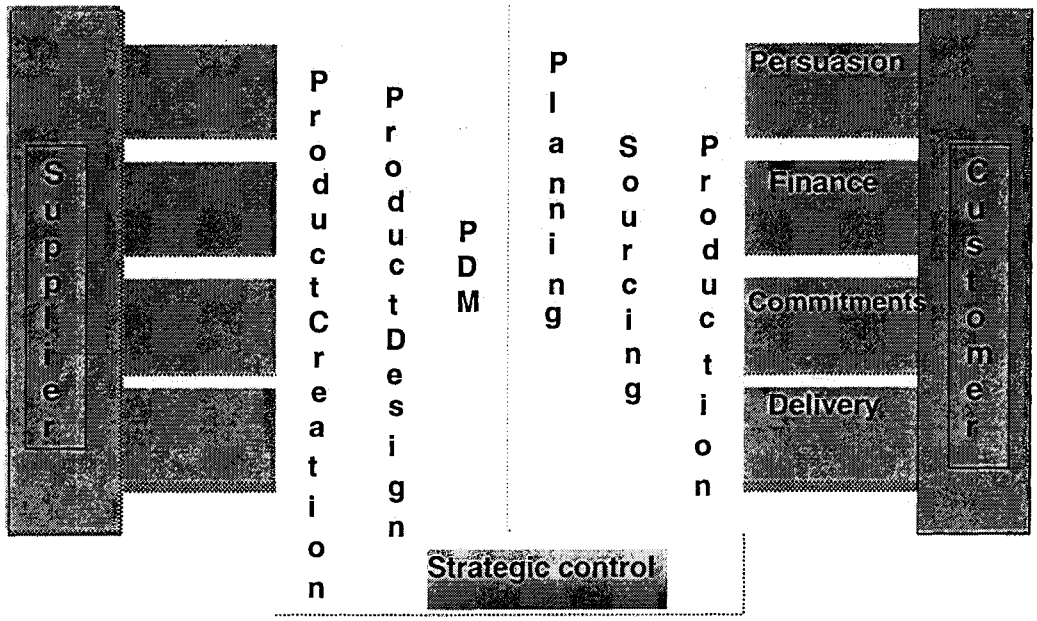


FIGURE 3, THE GENERIC CHANNEL MODEL WITH BUSINESS TASKS

Figure 3, is an illustration of a generic channel model, originally by Vepsäläinen & Saarinen, (1998) and extended later by Heikkilä, Kallio, Laine, Saarinen L., Saarinen T., Tinnilä, Tuunainen & Vepsäläinen, (1998), displaying the trade activities present in any commercial transaction as channels.

These previously mentioned trade activities, or channels in this model, are marketing / persuasion, ordering / commitments, finance and delivery. The persuasion-channel communicates the market offerings to the customers, carries out persuasion and provides feedback from customers. The finance-channel supports payments, funding and ensuring transactions. In general, the finance-channel manages the return on investment, risks, and incentives for co-operation. Ordering-channel facilitates the administration orders, guarantees, customer complaints, and other commitments. The delivery-channel accomplishes manufacturing and deliveries through the warehouses to the final customer, as well as managing after sales services as maintenance (Kallio et al., 1999). At one end of the channel is the supplier and at the other end is the customer. The channels of this model, as in real-life, support two-way information flows between the business parties.

On top of the channels is a block that was originally presented in a report by the Technical Research Centre of Finland. The block is composed of those various tasks that an organization must perform to be operational in design and function. These tasks are product creation, product design, product data management (PDM), production planning, sourcing, and production. The tasks may be called by other terms, when required, as long as the necessary tasks of an organization, that require the usages of channels to relay information, are considered. Each of these tasks is managed through strategic control that oversees the integration of individual tasks to the channels, enabling the task to be operated. Through strategic control the organization may also assure that the usage of market information in the factor of production as well as in the production markets itself is sufficient.

Parolini argues that instead of considering a value net as sets of economic players, it should be seen as sets of activities that are jointly involved in the creation of value (Parolini, 1999, 59-68). These activities are crucial for collaboration to take place and being successful in distributing value created by the system. To illustrate this aspect further it is necessary to combine the tasks of the generic channel model, which takes a more economical approach to the value nets, in the three classes of activities, provided by Parolini. These classes, as mentioned earlier are realization-, support and external transaction management activities (Parolini, 1999).

When the tasks of an organization are divided into these three classes, as illustrated in the following figure (FIGURE 4), of activities the attributes common to that class become easier to evaluate and perceive. These two approaches can therefore be categorised to be mutually inclusive, as they complement one another and may be used in charting the activities of both an individual company' as well as value nets' activities. When applied to the design phase of a value net these two models serve as a framework for laying out specifications and thus, help in the creation of a value net.

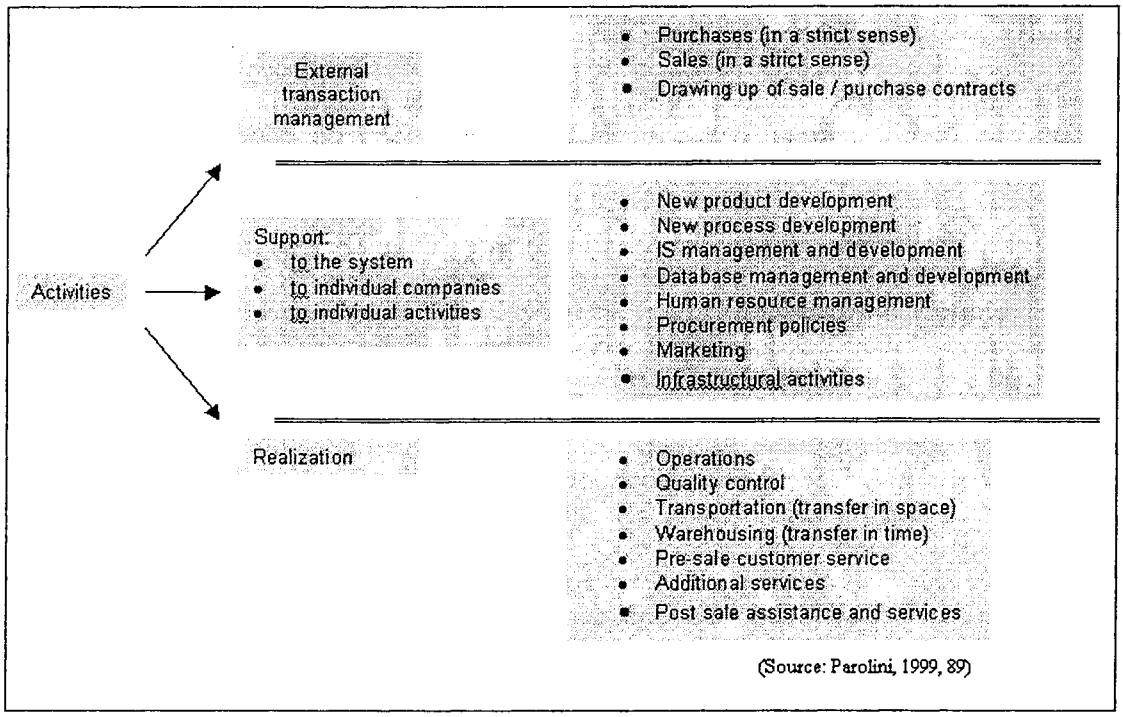


FIGURE 4, THE CLASSES OF ACTIVITIES OF A COMPANY

Figure 4, illustrates the classification of value net activities. The activities are divided in three classes of activities called: Realization-, support- and external transaction management activities. This figure, as it provides a detailed description of the activities of a certain class, illustrates how the tasks mentioned with the generic channel model may be allocated into different classes of activities. Parolini states that "focusing on companies leads to the classification of activities on the basis of their position in the value chain of individual companies, rather than on the basis of their economic structure and their contributions towards the creation of value for the final user (Parolini 1999, 88).

3. 2 Realization activities

"Realization activities aim to create goods or services and transfer them in time and space" (Parolini, 1999, 90). Instead of just producing, the realization activities actually start earlier, and e.g. the physical / technical transformation, the transportation of goods,

warehouse management, pre-sales activities and post-sale activities are all examples of realization activities aimed at creating additional goods or services. These activities contribute physically to the supply of a good and therefore, a distinctive factor of realization activities is that they are the activities that must be performed each time an additional unit is produced, or at least are proportional to the produced volumes. (Parolini 1999, 90-91)

The costs of realization activities according to traditional cost classifications may be either direct or indirect. The direct costs are for example the cost of direct manpower and material acquisitions aimed at producing a certain product or service. The indirect costs are e.g. indirect manpower and depreciation. When the costs are further divided into variable- and fixed costs the realization activities account for most of the variable costs sustained by the companies. According to the nature of the variable costs, all costs incurred from the production of the product or service all the way from material acquisitions to transportation and post-sale activities are summed together and divided by the amount of good or service produced. The fixed costs are the costs which the company will have to pay, even if they are not currently producing anything. An example of fixed costs are e.g. the cost of manpower and rent. An inventory depreciates in time and contributes as a cost towards the realization activities along with fixed structural costs. Therefore, it is obvious how the companies aim to decrease their inventory levels and plan their production as accurately as possible. Afterall it is all about profit, and eventually the survival of the company. (Parolini 1999, 91)

3. 3 Support activities

"Support activities aim at improving the effectiveness and efficiency of other activities, but do not intervene in the physical production of individual products or services" (Parolini 1999, 92) These activities are e.g. the research and development, design of products and processes, human resource management, the development of information systems, the definition of procurement policies, marketing, infrastructural activities, the

management of relationships with public bodies. Support activities do not include the administrative management of customer or supplier relations or the legal definition of contracts. This is because these specific activities should be included in the transaction management activities. (Parolini 1999, 92)

The aim of the support functions is to improve the effectiveness and efficiency of other activities by increasing the stock of intangible resources such as information and knowledge. The support functions are independent from the amount of goods or services produced and generate some knowledge as a by-product. Today the support activities have become the most important activities for the companies to consider and the technical infrastructure in most companies offer excellent possibilities for these activities to be carried out. (Parolini 1999, 92-93)

Support activities are not directly related to the realization of a product or service, but may be fundamental to their physical production and also provides it with an immaterial value. This is because it is possible to improve the status of products or services with marketing or improve the functioning of a product by utilizing the information generated by the support functions.

Depending on their impact on realization and transaction management activities the support functions may be further divided into three sub-categories. (Parolini 1999, 96)

- The activities that support *individual activities.*
- The activities that support *individual companies.*
- The activities that support *the system as a whole* (e.g. value net).

Support activities are mainly composed of fixed structural costs as they are continuously carried out and cannot be avoided (Parolini 1999, 99). Especially when new technology is implemented in a company the activities such as process re-engineering and employee education to battle the unwanted socio-technical factors are necessary. An important note that must be made is that it is possible to outsource some support activities. In a value net type networked organizations all participating

companies may and should collaborate in producing and offering necessary support activities to ensure the effectiveness and efficiency of the co-operation.

3. 4 External transaction management activities

As stated by Parolini, external transaction management activities only exist when legally distinct economic players manage realization- and support activities. Essentially these activities consist of purchasing and selling activities, but only in the strict sense of the definition. Therefore, these activities include the activities such as solicitation of customer orders, contractual negotiations, the placing and management of orders, the chasing up of deliveries, the drawing up of supply contracts and verification of contractual adherence. External transaction management activities however, exclude the activities such as marketing or defining procurement policies. (1999, 99-100)

3.5 Functions and activities through the generic channel model

When the generic channel model is analysed further, and applied to a specific business context, it becomes evident to notice the high number of interfaces, between the separate tasks and channels. These numerous interfaces make the creating and managing activities of the system very difficult. The channels appearing between the organization and its separated task each represent points of interfaces that must be taken into consideration. The following figure (FIGURE 5) is an illustration of the points of integration.

The participants roles and responsibilities differ in every channel, resulting in the need for specialised information systems. The real challenge with differentiated information systems is especially in their integration for the agreed processes and the exchange of information. Throughout the value net, the interfaces should be somewhat consistent

with each other. Each system needs to be able to perform similar tasks and to produce an output understandable and useful to other value net participants, and their equipment. Thus, the expenses of creating an operational value net that satisfy participants' needs are high.

In the best-case scenario the hub, first- and second-tier suppliers are all willing and able to invest in information systems, and the benefits resulting from the system exceed the costs. The worst-case scenario is that, especially, the second -tier suppliers are not willing, or are not able to invest the required amount of capital into the value net.

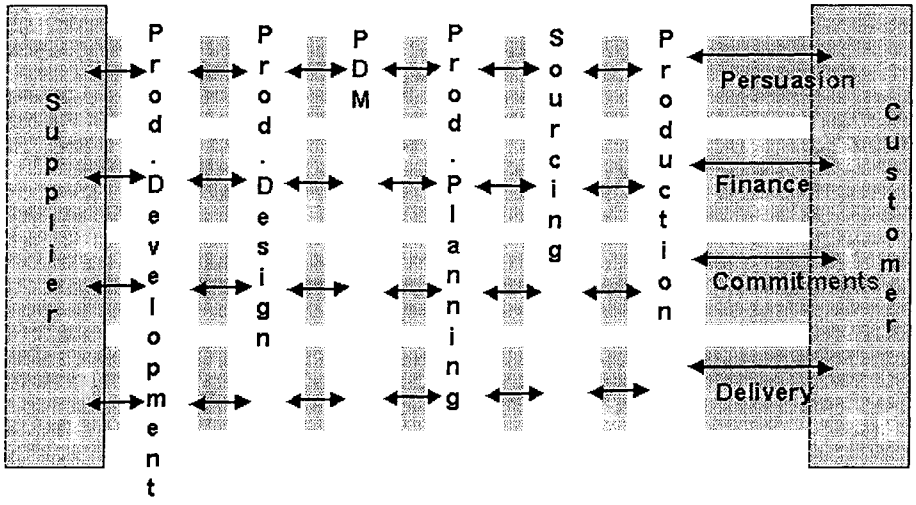


FIGURE 5, THE POINTS OF INTEGRATION

Figure five, again illustrates the functions of an organization. The vertical blocks on top of the generic channel model are the separate tasks that need to be performed for the final product to reach markets. In this figure, individual tasks are separated from one another and the arrows mark the places of interfaces. The need for integration therefore is between all the separate tasks as well as between the channels. In other words, one separate task must be able to exchange information (and / or material), in understandable form for all parties, not only between other business tasks, but also within the channels. Additionally, the information flow capabilities must be bi-directional.

As an obvious result, it can be stated that this type of an extremely complicated system is difficult to manage, and the allowable margin of errors is minimal. This fact is emphasized when we deepen the concept to cover the whole supply web, composed of companies from a variety of different fields of business and with different fiscal and political situations. From the point-of-view of the integration activities, this kind of system requires that the information be consistent thus, the automatic information exchange and highly automated processes require all participating companies to adopt a similar kind of transaction-processing method(s).

The channels are increasingly becoming differentiated as organizations want to concentrate on their core competences and increase efficiency with outsourcing. Typical areas where outsourcing is successfully being used are for example, marketing, delivery and finance. With strategic outsourcing it is possible to exploit other companies core competencies and improve ones' own product or service. However, as one or more of the tasks of an organization are separated, e.g. outsourced, the need of communication, coordination and monitoring increases.

The following figure (FIGURE 6) illustrates an example of a company engaging in outsourcing activities.

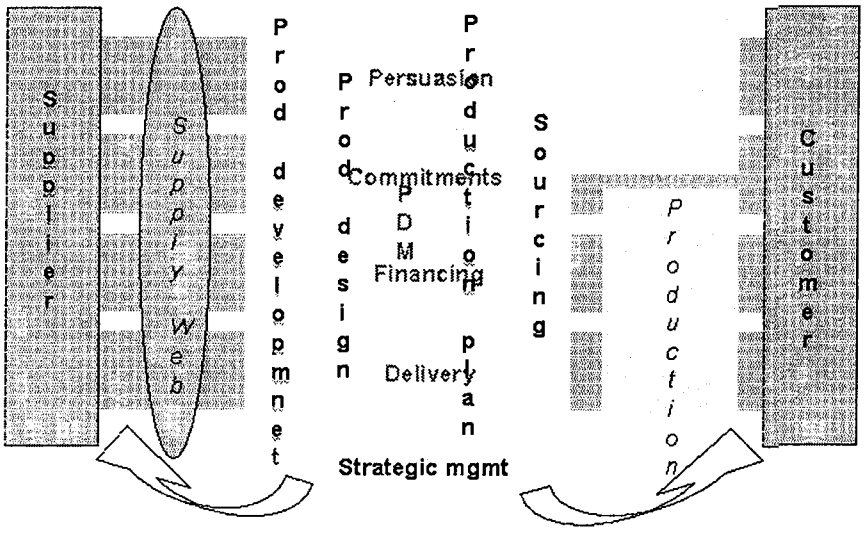


FIGURE 6, PARTIAL OUTSOURCING

Figure six, presents a partially outsourced situation where the production task is outsourced for finance and delivery.

A company must concentrate on it's core-competencies and would therefore outsource the actual production task to a third party producer. As a result, a great deal of materials and components needed in the production are supplied to the outsourced partner by the core organization. To save expenses during production the core company itself bids in it's own supply web for the lowest possible prices. However, this might result in a problem, since it forces the suppliers to fiercely compete with each other, and to sell their products with minimal profits. This might decrease their motivation to collaborate and undermine the trustful relations companies have spent years forging. (Wise & Morrison, 86)

With the given outsourcing situation the 'core company' must now also coordinate the channels of finance and delivery between themselves and their outsourced part as well as between the finished product and the customer. The need of strategic control, as was illustrated in the previous figure with arrows, increases at both ends: dealing with the supply web and with the outsourcing company. Due to the growing need for

coordination and communication for mutual adjustments the transaction costs of the hub organization increases as it must take precautions against a situation where something goes wrong with the production (that is outsourced and thus) and it cannot respond to it's liabilities.

The following figure (FIGURE 7) takes this previously illustrated example further by elaborating on the idea of outsourcing tasks, not included in core companies core-competencies.

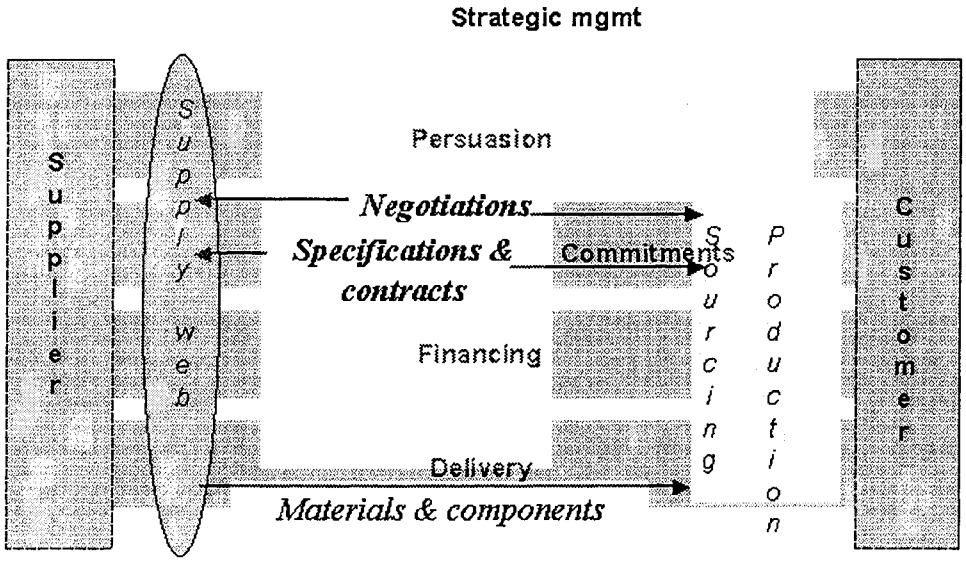


FIGURE 7, OUTSOURCING

Figure seven, represents a situation where both the production and the acquisition are outsourced for delivery, finance and commitments.

In this example, the outsourced "task units" are responsible for acquiring the needed raw materials. One obvious benefit with this situation is that the materials and components are delivered straight to the party actually performing the manufacturing or

assembling, thus decreasing the inventory costs for the hub-organization. However, there is now a need for timely and accurate information increases, e.g. the type and quantity to produce, bill-of-materials, and is in the best interest for all parties to share that information across the supply web. Furthermore, it can be stated that the need of ad hoc communication increases noticeably. Especially communication across traditional medias, such as telephones and mobile devices increases.

In order to enable all the possible and relevant information across the supply web it is feasible to include the "task units" into e.g. negotiations, and in defining the specifications. These functions however stay in the power of the core organization.

In addition to availability- and visibility of information, the coordination activities of a value net requires for direct communication. From available coordination mechanisms, standardization requires the least amount- and mutual adjustment the greatest amount of communication (Kumar & Van Dissel, 1996). With direct communication, there is always a risk for undesired socio-technical factors to be experienced. These mentioned 'human factors' being e.g.: misunderstanding, conflict of interests, experiencing errors in operations and poor personal chemistry. In a value net, the need for mutual adjustments, often at a fast speed, is evident, thus making the presence of socio-technical factors evident.

From the traditional business perspective it must be stated, that with an arrangement depicted in figure 7, the business arrangements must be well founded on trust and common goals. The quality of the finished products must be such, that the customer is fully satisfied with the product. Otherwise, the efforts are wasted as the negative feelings of an unsatisfying product are projected towards the core company, not the actual party manufacturing it.

With these figures and explanations the importance and relevance of successful IS integration is emphasized. It has been shown that a functional supply web increases the need for coordination and transaction costs as well as operational processes. In order to

decrease transaction costs it is feasible to automate as many operational processes as possible.

4 THE VARYING ROLES OF INFORMATION SYSTEMS IN A VALUE NET

This chapter evaluates the roles of information systems in the light of interorganizational interdependency, structure and structurability of an interorganizational interdependency. In addition, this chapter introduces the organizational issues of transactions, as well as identifies the possible sources of conflicts related to collaboration and co-operation enabled by various IOSs. Finally, some possible solutions for overcoming these unwanted socio-technical issues from occurring.

4.1 Interorganizational interdependence

Co-operation of companies entails a certain level of interdependence between the organizations. Relating back to concepts where IOSs were defined, we state that interorganizational systems support and implement co-operation and strategic alliances between two or more organizations. To understand the role of IT in enabling interorganizational co-operation the various roles of the information systems needs to be examined. This is important, as the underlying assumption is "that un-nurtured IT enabled co-operation may degenerate into conflict" (Kumar & Van Dissel, 1996, 279).

To identify possible risks of conflict among co-operative parties and to minimize the likelihood of conflicts from recurring Kumar & Van Dissel (1996, 279) created a typology for characterizing IOS along the dimension of interorganizational interdependency in interfirm relationships. This typology classifies IOSs into three types: Pooled information resource-, value/supply-chain-, and networked IOSs. For each of these types the potential problem areas are in the characteristics of their technical solutions, socio-political arguments and in economic issues. (Kumar & Van Dissel, 1996, 279)

Kumar & Van Dissel (1996, 283) introduced three different categories, pooled-, sequential-, and reciprocal dependency, describing the natures of interdependencies between the works of various business units. Each category has its' own characteristics but any given firm is not bound to fit only into one category. In fact, the most complicated organizations have sequential-, reciprocal- as well as pooled dependency (Kumar & Van Dissel 1996, 283).

Pooled dependency signifies a type of interdependency where the units share and use a common "pool" of resources, but otherwise remain independent. In sequential dependency the work is performed in sequence (i.e. like on an assembly line), so that each unit works towards the same goal are dependent upon the work of their predecessor as the output of one unit becomes the input of another unit. The third category describes interdependency, reciprocal dependency, signifies a model where the work of various parties is passed back and forth between units and / or organizations. (Kumar & Van Dissel, 1996, 283-284)

The following figure (FIGURE 8) graphically combines the different elements of the three distinct interorganizational interdependencies. Each of the three categories holds the potential and source for conflict of varying kinds in the amounts that is determined by the nature of interdependence and quantity and type of structure in the value net at hand. The underlying assumption being such that "increased level and nature of interdependence is likely to increase the potential for conflict by increasing the need for coordination (Kumar & Van Dissel, 1996, 283)." Relating back to the concepts of functions- and activities of a value net, the work of Kumar & Van Dissel, presented here, confirms our thinking in line with the generic channel model. On a vertical scale, the pooled interdependence involves the least amount of interdependence, sequential interdependence is in between the scale and the reciprocal interdependence holds the greatest amount of interdependence.

The differences in the amounts of dependency is such that with pooled dependency any one participating unit can be excluded from the pool of resources while others may continue their work as before, taken that the pool of resources itself remains intact. With

sequential dependency the organizations are dependent of each others output as their own input, thus making them dependent not only on each other but also in the quality of their predecessors (in a chain) output. Reciprocal dependency holds the largest amount of interdependency as the information and inputs have no predefined sequence to follow. Therefore, possible problems may affect organizations both up- and downstream. Consequently, managing interdependence by anticipating risks and reacting to them proactively, rather than reactively, becomes the crucial component for the systems success in a value net. (Kumar & Van Dissel, 1996, 279, 283)

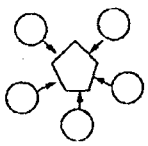
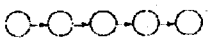
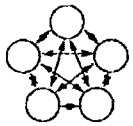
The need for communication differs in each of the three categories of interdependence. In the category of pooled interdependency, the need for continuous communication is lower than in the categories of sequential- and reciprocal interdependencies (Kumar & Van Dissel, 1996, 284). Earlier in this study, we have stated that the value net increases the availability and visibility of information, as well as increases the need for ad hoc communication. However, the more adjustments and communication of different parties is required by a system, the more coordination the system requires. Consequently, the increased need for coordination and communication increases the room for human errors and conflicts. The risk of bullwhip- or Forrester effect[5] increases when there is room for distortions or disruptions between the organizations' communication (Heir, Juneja, Kalilainen, Karhusaari, Nylander & Rasimus, 2000, 31).

5

"Supply-chains of physical goods often exhibit an increasing variability of orders in the downstream direction (from the retailer to the primary suppliers). In other words, the demand propagation from the customer to previous stages experiences some distortions and disruptions, leading to an amplification of orders. This effect is commonly called the *bullwhip* or *Forrester effect*. The consequences are high inventories as well as stockouts, unpredictable orders, and, therefore, bottlenecks in delivery - resulting in more stockouts, increased safety stocks and even more unpredictable orders" (W3Stud, 2001).

4.2 Structure of an organization and structurability of a relationship

Structure and structurability are important terms to understand in their context to IOSs. The structure "formalizes the form, process and content of a relationship, which implies a level of agreement about mutual expectations... [Additionally] an organization's structure defines the expectations for each role and the connections between each role" (Kumar & Van Dissel, 1996, 284). Additionally, "structurability of an interorganizational relationship is the ability or the potential to specify the structure. [The structurability of the relationship] influences the degree to which the relationship can be programmed and embedded in the IOS" (1996, 285-286). The lack of structure contributes to the risk of conflict (Kumar & Van Dissel, 1996, 284). In a way, structure is about forming a value net according to a set of rules and agreed procedures that are enforced with contracts and controlled with agreed management activities. Additionally, the arrangements for committing participants to avoid the undesired socio-technical factors from incurring is a task that should be taken into consideration while forming the structure of a system.

Type of Interdependence	Pooled Interdependency	Sequential Interdependency	Reciprocal Interdependency
Configuration			
Coordination Mechanisms	Standards & Rules	Standards, Rules, Schedules, & Plans	Standards, Rules, Schedules, Plans, & Mutual Adjustment
Technologies	Mediating	Long–Linked	Intensive
Structurability	High	Medium	Low
Potential for Conflict	Low	Medium	High
Type of IOS	*Pooled Information Resource IOS*	*Value/Supply-Chain IOS*	*Networked IOS*
Examples of Implementation Technologies and Applications	Shared Databases Networks Applications Electronic Markets	EDI Applications Voice Mail Facsimile	CAD/CASE Data Interchange Central Repositories Desk–Top Sharing Video–Conferencing

(Source: MIS quarterly / September 1996, 287)

FIGURE 8, INTERDEPENDENCE, STRUCTURE, AND POTENTIAL FOR CONFLICT

Figure eight is a graphical illustration by Kumar & Van Dissel of the three types of interdependencies compared against each other. Each of the three categories of interdependency involves "different levels of structurability and therefore imply different potentials for conflict" (Kumar & Van Dissel, 1996, 289).

"Typical IS / IT resources shared in a pooled fashion include: common databases, ...common communication networks, ...and common applications..."(Kumar & Van Dissel, 1996, 287). The companies using the same pool of resources may be competitors with each others, and as the coordination mechanisms require standards and rules for the systems usage, thus making the usage of the system restricted to its predefined functions, meaning that the system as such is not very scalable to be used in other functions as such. This is because the sharing of information through ISs would need to flow through the pool, making the delivery of the right information (accuracy & integrity) to the right people (authentication) at the right time (coordination) a difficult task. The main incentives for the companies to engage into this type of co-operation are economies of scale, the consequent cost, risk sharing, and the participation of externalities, as the value of the pool of resource is increased as the size of the pool

itself grows (Kumar & Van Dissel, 1996, 287). Thus, by its nature shared IS / IT resources in a pooled fashion is not meant to be used as a system which enables value net-like operations. (Kumar & Van Dissel, 1996, 291)

The other type of shared IS/IT IOS, value / supply-chain IOS supports customer-supplier relationships, has become a strategic necessity rather than a strategic advantage, as they reduce the uncertainties within the supply-chain, and fasten the cycle time, and improve quality (Kumar & Van Dissel, 1996, 288).

> At the most primitive level the value / supply-chain IOSs include the use of e-mail, fax and voice communication to coordinate interorganizational joint ventures and partnerships. At a more advanced level, they could involve the use of desktop / screen-sharing technologies, CAD / CASE data interchange and repositories, discussion databases, synchronous and asynchronous time / place computer-based systems to supporting collaborative work, and the integration of these technologies with video-conferencing (Kumar & Van Dissel, 1996, 288).

As illustrated earlier, the superior process & supply-chain expertise improves companies' access to resources, and additionally, functions as a barrier to enter for new entrants. Economies of scale may be better-achieved and exploited through effective, and efficient, supply-chain management. However, the above listed benefit of such systems depends on the structure of the VCS at hand, as well as on the participants of the system.

The characteristic of a reciprocal relationship is the IOS configuration, which best portrays the characteristics required of a value net. There is no 'sequence' or 'pool' determining the flow of information-exchange between partners' and the system is most scalable for additional functions, as the entering into as well as exiting from the system does not affect the flow of information of the already established connections.

> ...Most of the structure in such a system [networked IOS] is likely to come from the participants and the use-process. As the participants in the

> interorganizational alliance [value net] interact by actively using IT-based support, they discover elements of a deep structure within the interaction situation and incorporate this structure into their evolving use of the technology. Moreover, IT itself becomes one of the structuring partners in the reciprocal relationship. Thus, while IS / IT influences the group structure and dynamics, the group processes themselves influence the appropriation and structure of IS / IT that is used. [With reciprocal interdependency] information technology is more likely to provide the process support for a mutual adjustment between the partners rather than information support. (Kumar & Van Dissel, 1996, 288)

As mentioned while discussing the characteristics of a value net in the previous chapters, as well as stated by Kumar & Van Dissel, the risk of conflict is greatest with reciprocal interdependency because of the lack of structure of the IOS (Kumar & Van Dissel, 1996, 287). However, other factors than structure, such as value net architecture and the cost of misbehaving of an individual partner, also determines the amount of opportunism existing in inter-company co-operation as well. The risk of opportunism may be minimized in this type of relationship if: the value net benefits all parties involved, is based on trust and a common understanding, has agreed rules governing the functions and activities, and has clearly defined roles for each participant. A value net operating by these principles, even without financial arrangements of ownership, may be fully functional as the misbehaving companies may be excluded from the system, thus constituting to a much greater risk for any individual partner to misbehave.

4.3 Organizational issues of transactions

The basic transactions of virtual organizations, such as communication, coordination and control, when applied to the concept of transaction costs, explains the formation of virtual organizations by building on issues such as performance ambiguity, goal incongruity, and information asymmetry (Kumar & Van Dissel, 1996, 291). Built upon

these issues is the concept of transaction cost economies (TCE) (Kumar & Van Dissel, 1996, 291). For these basic transactions of a virtual organization with incomplete goal congruence, the TCE-concept assumes the human agents to be open for opportunistic behaviour. Therefore, "transaction costs are the costs of managing the interaction while keeping the opportunistic behaviour under control... [Thus,] TCE has a direct relevance for explaining the co-existence of co-operation and the possibility of conflict within an interfirm alliance" (Kumar & Van Dissel, 1996, 291). Transaction costs further divide into coordination costs and transaction risks.

Coordination costs are the direct costs from ensuring the proper functioning of and in a value net (Kumar & Van Dissel, 1996, 292). As stated in many researches, IT has the ability to lower coordination costs (Kumar & Van Dissel, 1996; Clemons et al., 1993). Importantly, it is arguable whether this generalization applies as such in the context of value nets. IT undeniably allows for decreased costs of coordination as such, when measured on 'per transaction bases'. At the same time however, as companies form IT-enabled value nets, the overall need for coordination, communication and control activities is increased. The greater the value net is in size, the greater the need for the above-mentioned activities. In addition, the greater the value net is in size, the greater the amount of existing coordination costs.

In theory, there is a possibility of sharing the coordination costs within the other value net participants. With this type of arrangements, it is possible to lower the overall amount of the transaction costs experienced by some participants, but on the other hand, it increases the overall amount of transaction costs of the other participants. The sharing of costs within a network always requires an agreement to be made beforehand. Additionally, the costs of establishing and operating the information channels and decision processes, between both partners as well as markets, are included in the coordination costs (Kumar & Van Dissel, 1996, 292).

The transaction risks are the costs of being subject to conflicts in interfirm relationships (Kumar & Van Dissel, 1996, 292). Transaction-specific capital (a.k.a. action-specific

capital), information asymmetrics and loss of resource control are the major sources of transaction risk (Kumar & Van Dissel, 1996, 292).

Transaction-specificity describes to what extent a specific investment of one (any) party can be used for other purposes that differ from the interactions for which the investment has originally been made for (Kumar & Van Dissel, 1996, 292). The technology required by value nets seldom is transaction specific, when it comes to hardware and telecommunications (Kumar & Van Dissel, 1996, 292). Therefore, most of the investments on hardware are not prone to cause conflicts. Development and implementation of software on the other hand may be a source of conflict, as they are somewhat transaction-specific tasks (Kumar & Van Dissel, 1996, 292). To diminish this risk the software created should be reusable, modular, portable, and coupled with open standards (Kumar & Van Dissel, 1996, 292).

Information asymmetrics affects the monitoring performance in a value net, thereby increasing the possibility for performance shirking by one party at the expense of others (Kumar & Van Dissel, 1996, 292). Effective monitoring and coordination decreases the likelihood of this unwanted socio-technical issue from occurring. The theory behind value nets allows for another point of view for the consideration of this aspect. Especially in a value net based on trust and common goals, and operating under static value net architecture, this type of opportunistic behaviour would not benefit any of the participants, thus decreasing the likelihood of its occurrence.

One source of transaction risk, loss of resource control occurs when resources, either tangible or intangible resources, are transferred as part of the relationship, and these resources cannot be returned or controlled in the event of termination of the relationship (Kumar & Van Dissel, 1996, 292). Thus, the risk of loss of any meaningful information, specialized expertise or company's knowledge needs to be controlled within virtual organizations. In today's business environment, companies' core-competencies most often is the expertise and knowledge that the company has. Consequently, the importance of Intellectual Property Rights (IPR) management is rapidly increasing its importance.

Value nets require IT-based, as well as human and legal/contractual mechanisms to be implemented into the network for the loss of resource control risk to be managed (Kumar & Van Dissel, 1996, 293).

4.4 The sequence of intervention for renewal

Building interorganizational information systems or business networks with companies' suppliers is not the solution to prevent unwanted socio-technical issues from occurring. As Beer, Eisenstat & Spector (1990, 6) point out "effective changes in the way an organization manages people do not occur by changing the organization's human resource policies and systems". However, a company facing problems with its' functioning and in its' operations often try to remedy the problem with new systems and technology. When a company's problems considerably affect its' operations, the large-scale improvement processes should be abandoned and the fixing of small, individual problem areas implemented, instead of doing it all at once. In fact, "formal organizational structure and systems is the last thing an organization should change when seeking for renewal" (Beer et al., 1990, 6).

Instead of engaging in a large-scale renewal of the organizations formal design (information systems, organizational structure and employees), the companies should manage their change-process systematically, starting with the change process from the modification of the informal behaviour within the company. The sequence for successful organizational redesign has four steps. Each of the four stages assumes the proper execution of the previous stage. (Beer et al., 1990, 101)

The first step seeks to affect the informal behaviour at the unit level of an organization. This first step of change aims to redefine the roles, responsibilities, and relationships of employees. The second step again affects the informal behaviour of a company, but at the individual or group level of an organization. Tools for a successful change in this

second phase includes providing coaching / counselling, training, process consultation, and team building for the employees of an organization. The third step aims to affect the formal design of an organization on an individual or group level. This stage includes the replacement, recruitment, career pathing, succession planning, and performance appraisal of employees. The fourth, and final step, affects the formal design of an organization at a unit level. During this last phase new compensation systems, information systems, organizational structure, and a measurement system are introduced. (Beer et al., 1990, 101)

This first step for organizational renewal aims to motivate the employees for future changes by creating a task-aligned vision together with the employees (Beer et al., 1990 101). This stage is important because getting the employees of an organization involved in the change process at the early stages of change-process can drastically reduce the resistance for change later on. During the second step, the necessary education and support for the employees and for their new job-tasks is provided (Beer et al., 1990, 102). The third step continues from the second step by replacing those employees that are not willing to participate in the change process, and recruits new needed talent into an organization. Lastly, the fourth step modifies the structure of an organization, and implements the new information systems necessary (Beer et al., 1990, 103).

5 NETWORKS OF CASE-COMPANIES

This chapter combines the relevant theories, introduced in earlier chapters, to the real-life examples of the projects case-companies. The case-companies and their suppliers are introduced as separate cases, and the goals

5.1 Project companies and their suppliers

The value net offers excellent possibilities for the improvement of support activities. In the value net the amount of information is increased throughout the whole network, and the general availability of possibly beneficial information allows for opportunities for e.g. forecasting, planning etc. allowing possible cutbacks in both fixed- and variable costs. However, it should be kept in mind that creating a value net is not the main goal of our project companies, but the enhancement of the effectiveness and efficiency of business operations and processes between the hub and suppliers is.

At this point, when some of the fundamental and basic theories which influence the value net are introduced, the case-companies and their suppliers need to be presented. To achieve a level of consistency between various researches performed in this study, the following descriptions of projects companies are largely based on the writings of Tiina Ojala (2001, 59-61).

5.1.1 Case-company A and its' supply web

Buyer A is a large company globally operating in the industry of mobile communications. Buyer A can be defined as a communication company belonging to the key industries of the ICT cluster. By combining its knowledge in mobile

communications, the Internet and service provision, Buyer A is a global telecom operator and provider of transaction and content services. Through its network access business, Buyer A offers voice and data services to consumers as well as corporate customers. Buyer A operates under ATO-typology. (Ojala, 2001, 59)

Buyer A's case network consists of eight suppliers, in a manner that four of the suppliers are so called first tier suppliers and the remaining four are second tier suppliers. The industries of suppliers, as well as their business relationships, are distinct from each other, and were described for the purposes of this project (Ojala, 2001, 59) as follows:

Cable 1: According to the definition of an ICT-cluster, this company is included in the supporting industries, as it manufactures the cable for network infrastructures. (Large company, status in this study is first-tier supplier operating under MTO-typology.) (Ojala, 2001, 59)

Cable 2: A company that allocates raw material to the cable manufacturers; thus, it is included in the supporting industries. (Large company, status in this study is second-tier supplier operating under MTO- / MTS-typology[6].) (Ojala, 2001, 59)

Software 1: Belonging to the supporting industries, this company develops software for invoicing- and management purposes of telecommunication networks. (Large company, status in this study is first-tier supplier operating under ETO-typology.) (Ojala, 2001, 59)

Software 2: This supplier is an internal division of Software 1. Thus, it is also included in the supporting industries. (Large company, status in this study is second-tier supplier operating under ETO-typology.) (Ojala, 2001, 59)

[6] The definition of typology in this occasion is troublesome as the Cable 1 and Cable 2 sometimes deal with scarce resources, forcing the company to acquire and store this resource when available for further use. However, often Cable 2 makes acquisitions based on the forecasts of Cable 1.

Component 1: Is a supplier of components for the communication networks, belonging to the supporting industries. (SME, status in this study is first-tier supplier operating under MTO-typology.) (Ojala, 2001, 60)

Component 2: Is a manufacturer of components to the communication networks, belonging to the supporting industries. (SME, status in this study is second-tier supplier operating under MTO- and MTS-typology.) (Ojala, 2001, 60)

Textile 1: Classifies as a contract manufacturer of textiles, for the network-builders. The company is part of the supporting industries. (SME, status in this study is first-tier supplier under MTO-typology.) (Ojala, 2001, 60)

Textile 2: This supplier produces raw material for Textile 1 and is part of the supporting industry. (SME, status in this study is first-tier supplier operating under MTS-typology.) (Ojala, 2001, 60)

5.1.2 Case-company B and its' supply web

Buyer B is a provider of mobiles, and broadband- and IP network infrastructures, including related services. Buyer B is a representative of the key industries. Buyer B operates on the global markets and is classified as a large company. Additionally, Buyer B can be classified to be a telecommunications company. Buyer B is operating under ATO-typology. (Ojala, 2001, 60)

Buyer B's case network consists of three suppliers, so that each of these companies form a separate tier in Buyer B's supply-chain. These suppliers can be presented (Ojala, 2001, 61) in the following way:

Equipment 1: Mounts components to the communications networks and belongs to the supporting industries. (SME, status in this study is first-tier supplier operating under ATO-typology.) (Ojala, 2001, 61)

Equipment 2: Manufactures and assembles components for the communications networks and belongs to the supporting industries. (SME, Status in this study is second-tier supplier operating under ATO-typology.) (Ojala, 2001, 61)

Equipment 3: Belonging to the supporting industries, this supplier manufactures components, as well as some smaller parts for telecommunications networks. From these smaller parts, only some are standardized whilst others are not standardized. (Large company, status in the study is third-tier supplier operating under MTO-typology for standardized products and under ATO- and ETO-typology for non-standardized products and larger components.) (Ojala, 2001, 61)

5.1.3 "As is"-stage of case-companies

When the business relationships of companies are illustrated in a graphical way (FIGURE 9), the separate value chains within the hub-companies supply-web become visible. The current situation of the business relationships of hub-companies and their supply-web is more like a collection of separate hierarchical value chains. In other words, the supply-web of Buyer A is actually a collection of four separate value chains and Buyer B has one value chain (in this example) composed of its' supply-web.

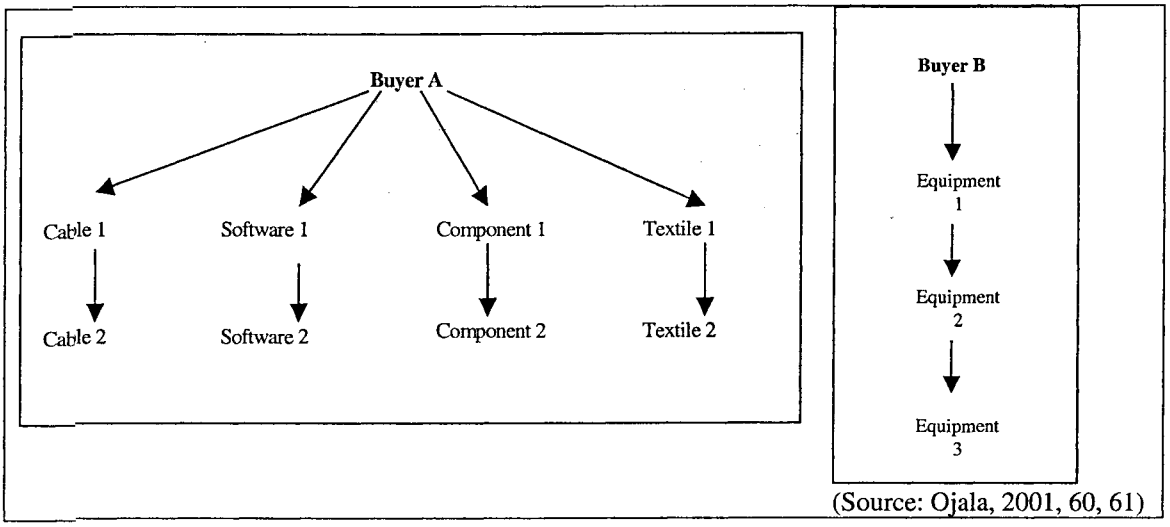
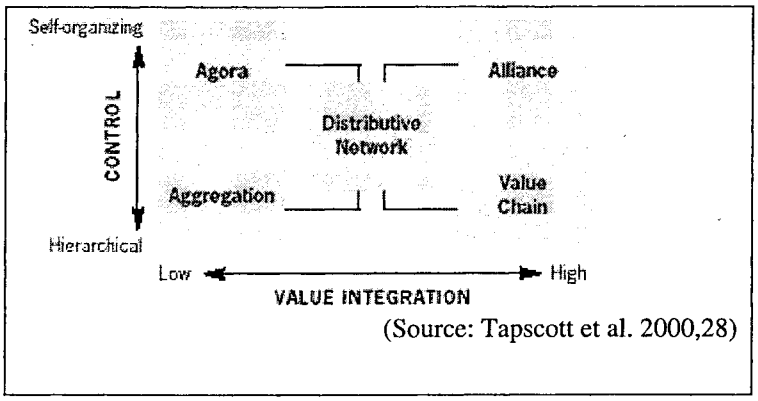


FIGURE 9, ILLUSTRATION OF THE PROJECT COMPANIES RELATIONSHIPS

Figure nine illustrates the position of each project-company in relation to one another. Additionally the separate 'supply-chains within the supply-web' are illustrated.

5.2 Project companies b-web types

Tapscott et al., (2000, 28, 29), introduced five different types of b-webs (FIGURE 10). The categorization was done in terms of evaluating the value integration and economic control of a b-web. These authors identified the five distinct b-web types as: Agora, aggregation, value-chain, alliance and distributive network. All of these network types fall loosely in between the static- and dynamic value net architectures, in other words have charasteristics of both distinct architectures. These models could be described to be a hybrid of the Japanese keiretsu, which are institutional and permanent business networks, and temporary opportunistic networks of companies (Tapscott et al., 2000, 15). In a way, these models are best described as semi-institutional and semi-permanent business relationships existing to create value for the customers.



(Source: Tapscott et al. 2000,28)

FIGURE 10, THE B-WEB TYPOLOGY

Figure ten is an illustration of the relations of five different b-web typologies provided by Tapscott et al. Additionally the figure divides the dimensions of differentiation further: Control in terms of self-organizing vs. hierarchical and value integration in terms of low vs. high.

According to Tapscott et al., economic control, as stated in the name, is about economics. Some b-webs have hierarchical economic control in which the b-web has a leader, who controls the content of the value proposition, the pricing and the flow of transactions. The other extreme, when markets and its dynamics define the content of the value proposition and price is described as a self-organizing b-web (2000, 29).

When contributions from multiple sources are integrated for the production of specific product the value-integration is said to be high. At the other end of the spectrum is a b-web with its' focus on a selection of products, low value-integration, meaning that the contributions from multiple source is used to a variety of products instead of one integrated solution (Tapscott et al. 2000, 29).

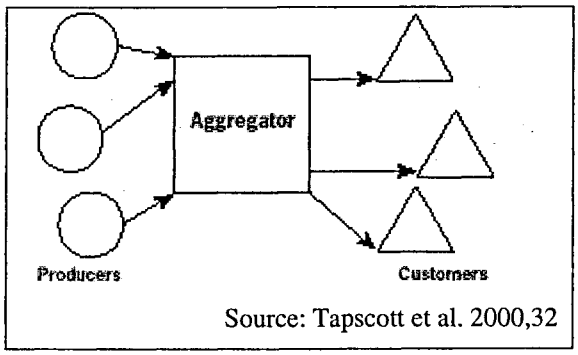
It is important to keep in mind that the project's buyer companies, also referred to as hub-companies in this paper, and their suppliers, also referred to as the supply-web have a different scope for their value net, as well as a different approach to managing their current supplier relationships. What is common among the buyers is that they both have a strategic- instead of operative business view when it comes to value nets.

One of the greatest differences between the hub-companies is the way in which the suppliers and hubs are integrated together. Buyer A has integrated with its' suppliers by dividing them into different categories differentiated from each other in regards to vendor-, contract- and business & process related objectives. When Buyer B again has integrated its' suppliers through product data. In neither case, is the supplier confined into one (and only one) supply-category or supply-chain.

Even though there are five different types of b-webs, we will examine the typologies of an aggregation and value-chain in closer detail, as they are the typologies that best describe the *as is* and *to be* stages of our hub-companies. However, as Tapscott et al., point out (2000, 31) the real-world b-webs has characteristics of several types of different categories. Successful businesses must construct a competitive b-web that best suites their needs, rather than blindly accept one model and ignore the others.

5.2.1 Aggregation

The product offering of an aggregation (FIGURE 11) is wide and value integration low. The B-web operates under aggregation as a typology, which has one participant that leads to the functions and activities of the network in a hierarchical fashion. Tapscott et al., call this leader as the *aggregator of* a b-web. When defined, its' tasks include taking responsibility for selecting products and services, targeting market segments and setting prices and ensuring market fulfilment (2000, 32).



Source: Tapscott et al. 2000,32

FIGURE 11, B-WEB TYPOLOGY: AGGREGATION

Figure eleven, is an illustration of the b-web typology called aggregation. Aggregator intermediates between producers and customers, ensuring the flow of goods as well as creating value.

When we evaluate our project companies in the light of what has been said here, we come to the conclusion stated before, that instead of operating as a virtual organisation (value net-like), the suppliers operate as separate members of the hub companies' supply-web, thus resembling the previously introduced aggregation typology. The companies' engagement in cooperative activities is close to nonexistent and overall relationships among companies loose. This can be seen as, based on information gathered from interviews, the suppliers are not significantly exchanging information or collaborating with one another. In some instances where information is exchanged, the amount and type of information exchanged is closely controlled and its availability restricted. In some instances, it is even arguable whether the suppliers are even aware of each other as being members of the same supply-chain, resembling the lack of common goals and shared vision.

Both of the hub companies work as an aggregator in their supply web and posses the greatest amount of information and control its distribution within the network. Instead of allowing for excessive availability- and visibility of information among partners, the aggregator controls the type of information to be shared, who receives the information and the means of its' exchange. As a result, currently the relationships between hub

companies and their suppliers are more similar to "traditional" *contractor - sub-contractor* relationship than *contract-manufacturer - buyer* relationship that would better encompass the nature of a virtual organisation.

Currently the hub-companies have a "one-to-one" relationship with each of their suppliers, and the contracts between the companies are "task- or case specific", meaning that there is always a need for negotiating new contracts for each new (or additional) business event. In time, as mentioned in the context of virtual organizations, the multilateral contract-management issues of supply-web participants, which requires time and capital, could be solved through the implementation of extensive blanket agreements between value net partners.

The current system of many individual companies requires the hub companies' to use their resources in excessive monitoring- and control activities as the suppliers are not aware of each others contributions, and the roles they play in the hub-companies business. The lack of common incentives, rules, strategy and vision prevent the companies from taking advantage of the economies of scale. Additionally resources are wasted because of a lack of common planning.

In the future, especially Buyer B hopes to accomplish better business processes by integrating information systems that allow for the automatic processes between the hub and its' suppliers. These systems are planned to minimize the need for direct human intervention from occurring while processes are executed.

The need for creating trust among partner companies is essential for the deepening of business relationships and for the value-net to be functional. Until the contract-management issues are solved, and most importantly common objectives, rules and goals established throughout the network the existence of 'human factors' such as lack of trust and possibility of opportunism prevent the value net-like operations from being executed. Hubs sharing "too much" of strategic or operative information among the suppliers could result in opportunities for opportunism them in the form of e.g. prices.

5.2.2 Value chain

Many companies participate in a value chain –typology (FIGURE 12), but one company oversees the entire effort describes the b-web typology called value chain. The difference between the aggregation typology and the value chain is that under this setting the suppliers cooperate among each other e.g. by sharing information, collaborative planning etc. On the other hand, a functioning value chain –typology requires that companies share a common vision, strategies and goals to be functional.

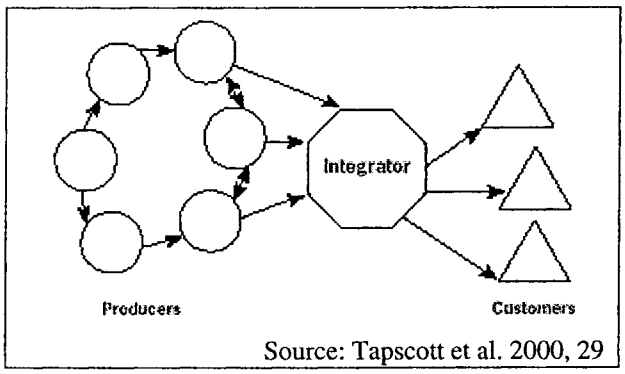


FIGURE 12, B-WEB TYPOLOGY: *VALUE CHAIN*

Figure 12 is an illustration of the b-web typology called value chain.

Instead of forming a "theoretically sound" value net, the project companies' future aspirations would better be described as partner companies working under value chain typology. Within this definition, the hub companies would again control the greatest amount of information, and in every sense work as an aggregator, but the benefits for them would be that as the suppliers collaborate they additionally individually carry a greater amount of responsibility for their actions. This results in cost-savings when some of the activities would be "automatically" performed within the terms of the

blanket agreement and even though the need for monitoring and control remains, not every minor detail would require special attention.

Other benefits are in the faster and easier response time in a case of ad hoc orders, joint learning and in time, better relationships and trust among participants.

6 ANALYSIS OF THE EMPIRICAL SYRVEY DATA

This chapter introduces the Internet-based survey questionnaire that was organized as a centralized way of three researchers' in the same project to collect information about the 'as-is'-stage of projects hub-companies, and their suppliers. This chapter has its' focus on the analysis of the results of the questionnaire, instead of being a detailed account of the issues related to the justification for using the Internet as the chosen media tool and how the survey was compiled. However, appendix one addresses these issues in more detail.

6.1 Background

The target group of this survey consisted of the respondents from Buyer A and Buyer B that are the hub-companies of this project. In addition to these companies some of Buyer A's first- and second tier suppliers, and some of Buyer B's first- up to third- tier suppliers were included into the target group. As a whole, the size of the target group was 13 companies that were all named beforehand. Out of these thirteen companies' two are the hub-companies. Additionally, there are five first- and second-tier suppliers, each. In addition, there is one third-tier supplier from case-B.

One hundred and sixty eight (168) e-mails were sent to the respondents that were named beforehand, asking them to answer the survey on the Internet. Ninety-six (96) respondents responded. After data checking however, the amount of acceptable responses was decreased to eighty-four responses (84). The main reason for the decreased amount of acceptable answers was the elimination of duplicate answers (e.g. the web-server had received data from the same form twice or more). Therefore, the response rate was confirmed as 50 percent. This is very satisfactory compared to the average of 20 – 30 percent response rate of similar studies. (Ojala, 2000, 74)

The factors affecting the experienced good response rate might be that the managers of those companies participating in the project provided support and encouragement for the personnel to reply. Following table (TABLE 1) illustrates a sample from the survey questionnaire. Additionally, it is probable that the respondents had a personal interest to respond. On the other hand, one motivating factor may have been the presence of two large companies' as principals of the survey. The small- and medium-sized companies may look up to the bigger company, as well as evaluate their business relationship important enough, and thus be eager to follow the large companies' projects. (Ojala, 2000, 74)

Table one introduces the sample of the web-based survey questionnaire held during the summer of 2001. Additionally, the table describes the companies' status in terms of tiers in the buyer-supplier relationship.

Table 1. Sample of the web-survey

The name of the company	The number of the respondents	The status of the company in the case value net
Buyer A	29	Buyer
Buyer B	18	Buyer
Cable 1	22	1st tier supplier
Cable 2	1	2nd tier supplier
Component 1	15	1st tier supplier
Component 2	7	2nd tier supplier
Element 1	8	1st tier supplier
Element 2	16	2nd tier supplier
Element 3	13	3rd tier supplier
Software 1	12	1st tier supplier
Software 2	5	2nd tier supplier
Textile 1	20	1st tier supplier
Textile 2	6	2nd tier supplier
TOTAL	168	
		(Source: Ojala, 2000, 67)

For the purposes of analyses for certain questions, the companies participating in the survey were divided into two groups of companies. Large companies (Large) and Small- and Medium size Enterprises (SME). Following table (TABLE 2) illustrates the

grouping of companies. The categorization was done according to the following classification provided by the Employment and Economic Development Centre (T&E Centre):

> SME companies are companies that have less than 250 employees and have a maximum turnaround of 40 million Euros or maximum sum of 27 million Euros on a balance sheet. Companies larger than the ones described here may own less than 25% of a SME company. (T&E Centre, 2001)

Table 2 separates the companies as "Large-" or "SME"-companies according to the size of the company. Additionally, the table categorizes the companies as first-, second-, or third–tier suppliers, expressed with the number following name.

Table 2.The grouping of companies

Buyer A (Large)	**Buyer B (Large)**
Chain 1 • Cable 1 (Large) • Cable 2 (Large) Chain 2 • Software 1 (Large) • Software 2 (Large) Chain 3 • Component 1 (SME) • Component 2 (SME) Chain 4 • Textile 1 (SME) • Textile 2 (SME)	Chain 1 • Equipment 1 (SME) • Equipment 2 (SME) • Equipment 3 (Large)

The following table (TABLE 3) illustrates the differences in response rates that existed between the case networks A and B. It is worth noticing that the respondents from case B were more eager to answer than the respondents from case A. The reasons for the difference may have been that the companies that build up case B were all part of the

same supply-web. In other words, there was only one company representing each of the three tiers.

Table 3 shows the difference in the response rates between the case value nets. As can be seen from table 3, the number of the respondents is quite irregularly distributed. Due to the descriptive objective of this study [defined in appendix 1], the irregularity did not cause significant hinders with which to implement the survey. (Ojala, 2000, 67)

Table 3. Differences in response rates between case value nets

The name of the company	Case A or Case B	The number of the respondents	The number of acceptable responses	Response rate per company
Buyer A	*A*	*29*	*7*	*24,1 %*
Cable 1	A	22	6	27,2 %
Cable 2	A	1	1	100,0 %
Component 1	A	15	7	46,7 %
Component 2	A	7	2	28,6 %
Software 1	A	12	9	75,0 %
Software 2	A	5	3	60,0 %
Textile 1	A	20	11	55,0 %
Textile 2	A	6	6	100,0 %
Buyer B	*B*	*18*	*8*	*44,4 %*
Equipment 1	B	8	6	75,0 %
Equipment 2	B	16	11	68,8 %
Equipment 3	B	13	7	53,8 %
TOTAL		168 Case A: 113 Case B: 55	N = 84 Case A: N= 52 Case B: N= 32	Overall: 50,0 % Case A: 46,0 % Case B: 58,2 %
				(Source: Ojala, 2000, 76)

Finally, the results from this survey-questionnaire are mainly considered from the point-of-view of the Buyer-level and the separate tiers of suppliers (1^{st}- & 2^{nd}-tier) as a whole. The analysis ignores the responses of the individual companies separately, because this thesis aims to clarify the differences between the separate tiers (as a whole) in a value net. For this reason the responses from the third-tier supplier is only analysed in the analysis of the data as whole.

6.2 Analysis of the current state of the companies information systems

This sub-chapter aims to clarify those functions of the above-mentioned companies where the electronic information systems have-, are-, and will be used. In the questionnaire, the respondents were requested to identify the functions where the information systems are used. To better understand the evolution of the information systems usage, the respondents were given a period consisting of the situation 2 years before (1999), the current situation (2001) and the situation after two years (2003-2004), projecting the future usage of the information systems. This question also evaluated the capabilities of participating companies to be a member of a value net. The following table (TABLE 4) summarizes the frequencies of responses for this particular question.

Table 4. This table demonstrates the answering statistics of the involved companies. The frequencies are the number of responses from the two distinct categories. The percentages inform how the two categories contribute towards the whole set of responses.

Table 4. Frequencies

Frequencies by company size		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SME	43	51.2	51.2	51.2
	Large	41	48.8	48.8	100.0
	Total	84	100.0	100.0	

Due to the differences of respondents' backgrounds: Employed by various departments, different length of employment, educational perspectives, attitudes etc, the design of this question would have required a possibility to indicate "I do not know" answering option. For this question, the answers indicating "no" needed to be discarded, as the

respondents were not given an adequate number of response options. The "yes" – responses however, provided a meaningful set of answers to be analysed.

There were some interesting findings in the companies' usage of the information systems. Some respondents reported that a certain system was used in the year 1999, and that the same system will again be used in the year 2003-2004, but is not currently used. E.g., see the frequencies of the use of "payment" enabling information systems. These responses could be interpreted to be either mistakes or that according to respondents, the company might have had undesired experiences with that type of system, and decided to discontinue the usage of that system temporarily.

Surprisingly many SME companies have used, and still use, a large variety of different ISs even more so than the large companies. The greatest increase was in the columns "Management of customer contracts" and "Management of contract documents". This however, did not come as a surprise as this trend became evident earlier in the thesis, while discussing the functions and activities of organizations within a value net through the Generic Channel Model. The need for both of these functions of an organization increases in volume and importance in those companies that have outsourced activities. Another important factor that can be seen from this data is that the "yes" response percentages increases over time for all of the companies.

Overall, from previously introduced results it can be stated that the companies capabilities of being a member of an automated network seem to be better than anticipated regardless of the size of the company. This is because currently almost all of the companies reported a relatively wide usage of various ISs and on a general level, expressed a trend implying an increased IS usage for the future. However, it is important to remember that the presented table (TABLE 5) only illustrates the overall opinions and expectations of the respondents. Thus, this question does not make a difference between the respondents' job titles, field of expertise, or their companies varying status within the value net. These results reveal the overall trend of ISs usage, as well as serve as a show-of-opinion. For these purposes, the results are more than promising.

Table 5, illustrates the large-, and SME companies valid "yes" responses in percentages. For this table, it must be noted that because of the question-design and answering options provided, only "yes" & "no", the figures do not represent accurate information from the analysis of "no" answers. This is because the "no" figures may represent two distinct situations; the respondent is either knowingly indicating "no", or the respondent doesn't know the answer to that particular part of the question. The design of this question in the web-survey was such that not ticking the check box, as an indication of "yes", was understood by the system as "no".

Table 5. Information systems usage in relation to a given period

	1999		2001		2003-2004	
	Large comp. (%)	SME (%)	Large comp. (%)	SME (%)	Large comp. (%)	SME (%)
Invoicing (60, 68, 88)	56	63	63	72	88	88
Ordering process (56, 74, 87)	54	58	73	74	85	88
Material management (48, 61, 75)	42	54	54	67	68	81
Production planning (33, 50, 69)	34	33	54	47	68	70
Customer register (56, 63, 73)	54	58	61	65	73	72
Management of customer contracts (17, 29, 60)	15	19	39	19	66	54
Management of contract documents (25, 39, 64)	32	19	46	33	71	58
Demand forecasts (30, 60, 74)	29	30	59	61	73	74
Production information (49, 67, 71)	54	44	66	67	66	77
Product information (44, 64, 74)	46	42	63	65	71	77
Payment (57, 67, 86)	54	61	61	72	85	86

When the responses are assorted by the companies' status in the value net, the differences become more meaningful and accurate. Following table (TABLE 6) illustrates the responses assorted by companies' status in the value net. A remarkable increase in the usage of various ISs can be seen to have taken place between the years 1999 and 2001. The hub-companies usage of "invoicing" enabling ISs has increased

tremendously and is still expected to increase by twenty percent during the next two or three years. The usage of "management of customer contracts" enabling IS usage doubled from 1999 to 2001, and is expected to continue increasing at a steady pace. Currently the "payment" functions are taken care of with electronic ISs in "only" about half of the hub-companies. The usage is expected to increase, as expected. The use of "demand forecast" ISs is not expected to increase in the provided time frame from the current level in the near future. This is somewhat surprising, because when forming a value net, better forecasts are often one of the main motives for creating such systems. This is because accurate demand forecasts affect the inventory levels, and thus costs for the companies. For this reason the anticipated percentage could have been higher. One of the possible explanations may be the different focus of the participating case-companies.

The first-tier suppliers information systems usage has also increased tremendously from the past. The future trend however, seems to be most remarkable for the systems used for "invoicing", "management of customer contracts" (increase of 34%, as based of respondents views), "payment" (29%) as well as "management of contract documents" (33%). Similarities with the hub-companies results are therefore remarkable, except in the usage of "payment" enabling ISs.

The second-tier suppliers seem to be the most optimistic with their expectations, when it comes to the information systems usage in the future. Based on the second-tier respondents views, the information systems usage is expected to increase for every function given in question four. "Invoicing" enabling systems use is reported to reach 100 percent in the near future, which differs greatly from the results of hub-, and first-tier supplier companies. Other areas where the ISs usage is approaching a full 100% is in the "ordering process" (96%), "payment" (96%) and "material management" (91%).

Overall, it is important to note how the expected increase of ISs usage varies by a companies' status within the value net. The hub companies illustrate a more conservative, or moderate, growth expectations while the first- and second-tier suppliers are much more radical. The expectations increase symmetrically from the hub to the

second-tier suppliers, and it may be speculated that the actual feasible growth-percentage to lie somewhere in the middle.

The hypothesis proclaiming increase usage of IS systems over a period of time proved to be correct regardless of the perspective of the analysis. Due to these observations, presented above it can be stated that the companies must be prepared to provide an increasing amount of education for their employees in the near future as the new ISs are implemented.

Another idea that might be cost-effective and improve a companies knowledge of each other, and thus improve their co-operation, is that when creating the value net the companies who intend to participate should also consult each other prior to any investment. The information systems that a value net requires needs to be scalable to accommodate for the growing need resulting from the different tasks of a value net. Another benefit of having similar systems is the easier integration process and possibility to achieve cost savings by having e.g. a common support function process, collective educational activities and companies benefiting from each other's experiences with the systems. The larger companies operating, as the core-companies within the value net should influence these investments since these companies have the adequate advantage over their suppliers and expertise in the field of IT.

Table 6, illustrates the respondents' valid "yes" responses in percents for the question four of the survey. The responses are assorted by the companies' status in the value net. The possibly status a company might have in this project is: a hub / case- company, first-tier supplier, second-tier supplier or third-tier supplier. For the analysis of this question the third-tier suppliers responses were ignored, as there is only one company participating in the project representing the third-tier supplier category.

Table 6. Usage of various information systems assorted by the companies' status in the value net

	1999			2001			2003-2004		
	Hub	1st-tier	2nd-tier	Hub	1st-tier	2nd-tier	Hub	1st-tier	2nd-tier
Invoicing	27	*72*	61	60	*74*	61	80	*85*	100
Ordering process	47	*56*	61	73	*74*	74	80	*85*	96
Material management	47	*49*	48	53	*67*	57	60	*72*	91
Production planning	33	*39*	35	53	*49*	48	60	*67*	74
Customer register	33	*72*	52	47	*74*	57	53	*82*	70
Management of customer contracts	20	*15*	22	40	*26*	30	60	*64*	52
Management of contract documents	40	*21*	30	53	*36*	44	67	*69*	57
Demand forecasts	40	*28*	30	73	*62*	52	73	*72*	74
Production information	53	*49*	48	60	*72*	65	60	*74*	78
Product information	53	*46*	39	60	*67*	65	73	*69*	83
Payment	33	*67*	65	53	*96*	78	80	*82*	96

6.3 Respondents perception of the state of their companies information systems in purchasing / supply management

Integration is one of the most difficult tasks when creating an operational value net. Companies with different IS / IT capabilities and infrastructure requires a different methods of integration. In the questionnaire, the respondents were asked to classify the current state of their company's information systems related to purchasing / supply management, according to their own insight. The different information systems that the respondents were asked to classify in terms of the level of automation were; order / delivery system, planning / forecasting system, and contract system. The five response options given for the respondents' went from "fully manual" to "fully automatic". "Manual" data-transfer implying that people use e.g. telephone calls and fax machines

for information exchange, and "automatic" indicating a direct data-transfer between computers. An EDI-system being an example of "automatic" data-transfer between computers. The responses assorted by categories of 'large'-companies and 'SME': s are presented in the following table (TABLE 7).

Table 7, illustrates the cross tabulation of the respondents views, assorted according to company-size as 'large' and 'SME', concerning the current state of their company's *order / delivery systems*, *planning / forecasting systems*, and *contract systems* related to purchasing / supply management.

Table 7. State of purchasing / supply management ISs of 'large' and 'SMEs'

IS category:	Answering options:		SME	Large company
Order / delivery system	I do not know	Count	5	1
		% Within companies	11.6%	2.5%
		% Of Total	6.0%	1.2%
	Fully manual	Count	9	2
		% Within companies	20.9%	5.0%
		% Of Total	10.8%	2.4%
	Mainly manual	Count	14	13
		% Within companies	32.6%	32.5%
		% Of Total	16.9%	15.7%
	Mainly automatic	Count	13	22
		% Within companies	30.2%	55.0%
		% Of Total	15.7%	26.5%
	Fully automatic	Count	2	2
		% Within companies	4.7%	5.0%
		% Of Total	2.4%	2.4%
Planning / Forecasting system	I do not know	Count	8	3
		% Within companies	18.6%	7.5%
		% Of Total	9.6%	3.6%
	Fully manual	Count	6	4
		% Within companies	14.0%	10.0%
		% Of Total	7.2%	4.8%
	Mainly manual	Count	14	14
		% Within companies	32.6%	35.0%
		% Of Total	16.9%	16.9%
	Mainly automatic	Count	14	18
		% Within companies	32.6%	45.0%
		% Of Total	16.9%	21.7%
	Fully automatic	Count	1	1
		% Within companies	2.3%	2.5%
		% Of Total	1.2%	1.2%
Contract system	I do not know	Count	17	2
		% Within companies	39.5%	5.0%
		% Of Total	20.5%	2.4%
	Fully manual	Count	13	12
		% Within companies	30.2%	30.0%
		% Of Total	15.7%	14.5%
	Mainly manual	Count	9	19
		% Within companies	20.9%	47.5%
		% Of Total	10.8%	22.9%
	Mainly automatic	Count	3	6
		% Within companies	7.0%	15.0%
		% Of Total	3.6%	7.2%
	Fully automatic	Count	1	1
		% Within companies	2.3%	2.5%
		% Of Total	1.2%	1.2%

The hypothesis, which was assigned to this question in the survey, holds for the order / delivery systems, as respondents' from larger companies, in general, indicated to have more automated processes in use than the SME companies.

The large percentage of "I do not know" responses, especially in the response column of SMEs is expected as the people who are not involved with the systems at issue, are not likely to know about their technical features. Additionally, the large percentage of "I do not know" responses generally describes the differences in the pool of respondents.

The hypothesis number two claimed that the most automated processes are found in the "planning / forecasting system" column. Surprisingly, this was proven to be incorrect. Instead, according to the survey the most automated processes are in the "order / delivery system" column. When the percentages of answers indicating even a slight usage of the automated processes, "mainly automatic & fully automatic", are calculated together, we got 41 % for the "planning / forecasting system" and 47 % for the "order / delivery system". The "contract system" received the equivalent percentage of 13.

SME companies indicated to have controversial usage of planning / forecasting systems. Both the "mainly manual" and the "mainly automatic" answer options received 32,6 percent of the responses (14 / 43 responses). For the ISs used with contract issues 39,5 percent of responses where in the "I do not know" column while 30,2 percent indicated "fully manual" contract processes. According to the respondents the order / delivery system is used mainly manually (32,6%). However, the tendency here is not so clear as with the contract system. 30,2% of respondents indicated to have mainly automatic process for order / delivery issues.

From the large companies, when evaluated in a similar fashion, 45 percent of responses indicated "mainly manual" usage of planning / forecasting systems. The "mainly manual" processes were reported by 35 percent of the respondents. When the responses from question four are combined to the information from these responses, we can speculate a certain trend to be visible. Here the trend seems to be such that the companies who are not currently possessing information systems capable of establishing automatic processes are considering investing into such systems. Over half of the responses, 55 percent, indicated that their company possesses "mainly automatic" order / delivery system in use, while 32,5 percent indicated working in a company

having a "mainly automatic" order / delivery system. As with SMEs the large companies have the "mainly manual" (47,5%) or "fully manual" (30%) contract system. Only 15 percent of the respondents reported "mainly automatic" contract system to exist in the company they work in.

Overall, the hypothesis of number one claimed that larger companies have more automated processes than the SME companies, was proven correct, as the tables of frequencies show. With this analysis however, it must be remembered that in the pool of larger companies, both of the case-companies (A and B) and *software 1* are operating in IT-industry, affecting the results. The SME companies are from a more dispersed areas of business and their IT infrastructure understandably varies depending on their field of expertise. Another factor affecting results is that the larger companies typically have more resources to invest. Yet, another point is that in SME companies, e.g. an EDI system might not be a feasible solution, especially if the number of messages a company must transfer through an EDI system is low.

The categorisation of companies as 'large' and 'SMEs' might not be as adequate as necessary. Therefore, the following tables (TABLE 8, TABLE 9, TABLE 10) illustrates the responses for the same question, but now categorised according to company's status in the value net.

As illustrated in the following table (TABLE 8), the hub-companies reported to have the mainly automatic order / delivery systems in use. When the responses indicating even somewhat automated processes are calculated together, we achieve 87 % from which the majority is composed of the "mainly automated" responses. Thirteen percent of the responses indicated "mainly manual" processes. None of the hub companies reported to have the "fully manual" order / delivery systems in use. Additionally there were no "I do not know" answers.

Thirty-eight percent of the first-tier suppliers indicated to have even somewhat automated order / delivery systems in use (again, the "I do not know" responses were excluded from the analysis). The "mainly manual" order / delivery systems were

reported by 47 percent of the responses. Fifteen percent of responses reported the "fully manual order / delivery systems to be in use.

Fifty-two percent of the second-tier suppliers indicated to have even somewhat automated order / delivery systems in use. This was surprising as it indicates that the second-tier suppliers have more automated information systems in use for the order / delivery process than the first-tier suppliers, directly involved with the case-companies do. A more detailed analysis reveals that 48 % of second-tier suppliers' responses indicated "mainly automated" ISs to be used. Forty-eight percent implied somewhat manual systems to be used.

Table 8, is a representation of the responses divided by the respondents company's status in the value net.

Table 8. Order / delivery systems usage by status in the value net

Order / delivery system	Cross tabulation % = Within system	Hub	1st-tier	2nd-tier	3rd-tier	Total
I do not know	Count		4	2		6
	%		66,7%	33,3%		100%
Fully manual	Count		5	5	1	11
	%		45,5%	45,5%	9,1%	100%
Mainly manual	Count	2	16	5	4	27
	%	7,4%	59,3%	18,5%	14,8%	100%
Mainly automatic	Count	12	11	10	2	35
	%	34,3%	31,4%	28,6%	5,7%	100%
Fully automatic	Count	1	2	1		4
	%	25%	50%	25%		100%
Total:	Count	15	38	23	7	83
	%	18,1%	45,8%	27,7%	8,4%	100%

As much as seventy-nine percent of the hub-companies responses indicated a somewhat automated planning / forecasting systems to be in use, as illustrated in the following table (TABLE 9). This supports the creation of a value net, as the case-companies will form the 'backbone' for the system. Twenty-one percent of the responses indicated a somewhat manual planning / forecasting systems to be used. Fourteen percent indicated the "fully manual" systems usage for above-mentioned tasks.

Forty-one percent of the first-tier suppliers reported that the automated systems are in use. Thirty-eight percent indicated "mainly automated" systems. Sixty percent of total first-tier suppliers responses indicated somewhat manual planning / forecasting systems usage. Most of the responses, 50 %, were reported for the "mainly manual" usage of such a systems.

None of the second-tier suppliers indicated "fully automated" planning / forecasting systems to be used. However, fifty-three percent of the responses reported "mainly automated" of information systems, while forty-seven percent indicated "somewhat manual" systems usage.

Table 9, is a representation of the responses divided by the respondents company's status in the value net.

Table 9. Planning / forecasting systems usage by status in the value net

Planning / forecasting system	Cross tabulation					
	% Within system	Hub	1st-tier	2nd-tier	3rd-tier	Total:
I do not know	Count	1	6	4		11
	%	9,1%	54,5%	36,4%		100%
Fully manual	Count	2	3	3	2	10
	%	20%	30%	30%	20%	100%
Mainly manual	Count	1	16	6	5	28
	%	3,6%	57,1%	21,4%	17,9%	100%
Mainly automatic	Count	10	12	10		32
	%	31,3%	37,5	31,3%		100%
Fully automatic	Count	1	1			2
	%	50%	50%			100%
Total:	Count	15	38	23	7	83
	%	18,1%	45,8%	27,7%	8,4%	100%

Lastly, as illustrated in the following table (TABLE 10), thirty-six percent of hub companies indicated somewhat automated contract systems to be in use. Twenty-nine percent reported "mainly automated" contract systems usage. Sixty-four percent of responses indicated manual contract systems usage. A majority of the responses, forty-three percent, indicated "mainly manual" usage of ISs related to contract process.

From the first-tier suppliers fifteen percent of responses indicated "mainly automatic" ISs usage related to contract process. There were no responses indicating "fully automatic" contract systems. Most of the responses were in the "mainly manual" column, 48 %. Thirty-seven percent reported "fully manual" contract process to be in use, and as many as 41 % of the respondents indicated that they do not know what type of system there is in their company.

Thirteen percent of the second-tier suppliers, according to the survey, have somewhat automated ISs related to contract process in use. Both "mainly manual" and "fully manual" answering options received forty-four percent of the responses.

Due to these differences in the individual companies information system grades, it can be stated that the companies require a different approach when integrating the systems into a single value net.

Table 10, is a representation of the responses divided by the respondents company's status in the value net.

Table 10. Contract systems usage by status in the value net

Contract system	Cross tabulation					
	% Within system	Hub	1st-tier	2nd-tier	3rd-tier	Total:
I do not know	Count	1	11	7		19
	%	5,3%	57,9%	36,8%		100%
Fully manual	Count	3	10	7	5	25
	%	12%	40%	28%	20%	100%
Mainly manual	Count	6	13	7	2	28
	%	21,4%	46,4%	25%	7,1%	100%
Mainly automatic	Count	4	4	1		9
	%	44,4%	44,4%	11,1%		100%
Fully automatic	Count	1		1		2
	%	50%		50%		100%
Total:	Count	15	38	23	7	83
	%	18,1%	45,8%	27,7%	8,4%	100%

6.4 Towards supplier- and customer interface

In order to identify different views and expectations of the participating companies, the respondents were asked to evaluate how much money should be invested into their companies' information systems and their related functions. Two distinct perspectives of the information systems were given to the respondents: To consider the ISs that are used with the suppliers, and the ISs that are used with the customers. The time-period, in which the investments are incurring, is within the next two years. The goal for these investments is to enable a state, where the different data-transfer processes of companies' are performed mainly automatically.

The investment categories given were: Hardware / Software, training / education, and support functions. The spectrum in which the amount of required investments was to be evaluated was: No need to invest, thousands of Euros, tens of thousands of Euros, and hundreds of thousands of Euros. Following table (TABLE 11) illustrates the respondents view about the amount of money required by investments towards the supplier side.

Table 11, illustrates the respondents views regarding the amount of money to be invested in the information systems used with the suppliers (towards the 'supplier side').

Table 11. Investment needs towards the suppliers

Supplier side			Company size:				
Investment category:	Answering options:	%	Hub	1st-tier	2nd-tier	3rd-tier	Total:
Hardware / Software	I do not know	Count	5	14	8	2	29
		%	17,2%	48,3%	27,6%	6,9%	100%
	No need to invest	Count		1	1		2
		%		50%	50%		100%
	Thousands of Euros	Count		4	5	1	10
		%		40%	50%	10%	100%
	Tens of thousands of Euros	Count	5	16	8	2	31
		%	16,1%	51,6%	25,8%	6,5%	100%
	Hundreds of thousands of Euros	Count	5	3	1	2	11
		%	45,5%	27,3%	9,1%	18,2%	100%
Training / education	I do not know	Count	3	8	8	2	21
		%	14,3%	38,1%	38,1%	9,5%	100%
	No need to invest	Count		3	1		4
		%		75%	25%		100%
	Thousands of Euros	Count	4	14	11	3	32
		%	12,5%	43,8%	34,4%	9,4%	100%
	Tens of thousands of Euros	Count	7	12	3	2	24
		%	29,2%	50%	12,5%	8,3%	100%
	Hundreds of thousands of Euros	Count	1	1			2
		%	50%	50%			100%
Support functions	I do not know	Count	5	13	9	3	30
		%	16,7%	43,3%	30%	10%	100%
	No need to invest	Count			2		2
		%			100%		100%
	Thousands of Euros	Count	2	12	8	1	23
		%	8,7%	52,2%	34,8%	4,3%	100%
	Tens of thousands of Euros	Count	5	10	3	2	20
		%	25%	50%	15%	10%	100%
	Hundreds of thousands of Euros	Count	3	3	1	1	8
		%	37,5%	37,5%	12,5%	12,5%	100%
Total:		Count	15	38	23	7	83
		%	18,1%	45,8%	27,7 %	8,4%	100%

Again, when analysing the investment needs towards the supplier-side, the responses indicating, "I do not know" are excluded from the analysis. For *hardware / software*, none of the respondents of the hub-companies expected the required investment to be under tens of thousands of Euros. Both investment options, tens of thousands- and hundreds of thousands of Euros, received fifty-percent of the responses. When it came to *training / education*, the hub-companies estimated the required investment to be tens of thousands of Euros, 58 % of responses. Eight percent of the responses indicated the required amount to be hundreds of thousands, while 33% of responses indicated thousands of Euros to be sufficient. In the majority of responses, 50 %, estimated that the required amount of money for *support functions* would be tens of thousands of Euros. Thirty percent estimated the investment for support functions to require hundreds of thousands of Euros, while twenty percent of responses indicated thousands of Euros to be adequate.

The majority of first-tier suppliers expected investments towards *hardware / software* to require tens of thousands of Euros, 67%. Seventeen percent of the responses indicated thousands of Euros to be sufficient, and thirteen percent reported investments to require hundreds of thousands of Euros. *Training / education* was expected to require thousands of Euros by 47%. Forty percent of the responses estimated these activities to take tens of thousands of Euros. Ten percent of the responses reported that there is no need to invest in training / education. Forty-eight percent of the responses estimated support functions to require thousands of Euros, while forty-percent estimated the required investment to be measured in tens of thousands. Twelve percent evaluated the required investment to be hundreds of thousands of Euros. No one indicated "no need to invest" for support functions.

The majority of second-tier suppliers estimated *hardware / software* investments to require tens of thousands of Euros, 53%, while 33 percent of the responses evaluated thousands of Euros to be sufficient. Thousands of Euros was seen to be adequate investment for *training / education* by seventy-three percent of responses. Twenty-

percent of the responses estimated the investment need to be in tens of thousands of Euros. From second-tier suppliers, nobody evaluated the training / education to require hundreds of thousands of Euros. Fifty-seven percent evaluated thousands of Euros to be sufficient amount of investment for *support functions*. Twenty-one percent reported these activities to require tens of thousands of Euros, while fourteen percent of the responses indicated that there is no need to invest in support functions.

The following table (TABLE 12) illustrates the responses for the other investment category, towards customer-side. In addition, when analysing the investment needs towards the customer-side, the responses indicating, "I do not know" are excluded from the analysis.

The majority of the respondents from the hub-companies estimated the adequate investment to be in tens of thousands of Euros for the *hardware / software* used with the customers, 63%. Twenty-five percent reported the investments to require thousands of Euros. For *training / education* activities sixty-three percent of the respondents from the hub-companies reported tens of thousands to be required, while thirty-eight percent of responses reported these activities to take only thousands of Euros. There were no responses indicating required investments of hundreds of thousands of Euros. The majority, 50%, of the responses indicated *support functions* to require tens of thousands of Euros. As with training / education, thirty-eight percent of the responses anticipated thousands of Euros to be adequate amount for support functions. For any of the three investment areas, respondents from the hub-companies did not indicate "no need to invest".

Forty-one percent, a majority, of first-tier suppliers responses indicated *hardware / software* investments to require tens of thousands of Euros. Up to 37 percent of the responses estimated these investments to take hundreds of thousands of Euros. This does not necessarily mean that the first-tier suppliers are more willing to invest into IT-infrastructure than e.g. hub-companies. Merely that this could indicate that the first-tier suppliers have realized their needs of acquiring necessary hardware / software, and that the hub-companies already have them. Twenty-two percent of the responses also

indicated necessary investments to take thousands of Euros. Both the thousands- and tens of thousands of Euros answering options received forty-one percent of responses when it comes to investment needs in *training / education activities*. Ten percent of responses reported the investment need to be up to hundreds of thousand of Euros, and at the other side of the spectrum, seven percent of responses indicated that there is no investment need for such activities. The majority of responses (42%) estimated *support functions* to require tens of thousands of Euros. Thirty-eight percent indicated the same activities to require only thousands of Euros. Nineteen percent of responses estimated the investment need to be up to hundreds of thousands of Euros.

The majority of second-tier suppliers responses, 72%, indicated tens of thousands of Euros to be sufficient investment for *hardware / software*, while eighteen percent did not see any investment need to exist. Most of the responses for *the training / education* investment needs were in the thousands of Euros column, 54%. Twenty-three percent of responses indicated the investment need for these activities to be tens of thousands of Euros. Fifteen percent of responses indicated no need to invest at all. For the support functions, the investment requirement was estimated to be thousands of Euros by seventy percent of responses. Twenty percent of responses indicated the investment need for these activities to be in the tens of thousands of Euros. Nobody from this pool of respondents estimated the required sum to be either in "no need to invest", or investments up to "hundreds of thousands of Euros" column.

Table 12, illustrates the respondents views regarding the amount of money to be invested in the information systems used with the customers (towards the 'customer side').

Table 12, Investment needs towards the customers

Customer side			Company size:				
Investment category:	Answering options:	%	Hub	1st-tier	2nd-tier	3rd-tier	Total:
Hardware / software	I do not know	Count	6	10	12	2	30
		%	20%	33,3%	40%	6,7%	100%
	No need to invest	Count			2		2
		%			100%		100%
	Thousands of Euros	Count	2	6	1	1	10
		%	20%	60%	10%	10%	100%
	Tens of thousands of Euros	Count	5	11	8	2	26
		%	19,2%	42,3%	30,8%	7,7%	100%
	Hundreds of thousands of Euros	Count	1	10		2	13
		%	7,7%	76,9%		15,4%	100%
Training / education	I do not know	Count	6	9	10	2	27
		%	22,2%	33,3%	37%	7,4%	100%
	No need to invest	Count		2	2		4
		%		50%	50%		100%
	Thousands of Euros	Count	3	12	7	3	25
		%	12%	48%	28%	12%	100%
	Tens of thousands of Euros	Count	5	12	3	1	21
		%	23,8%	57,1%	14,3%	4,8%	100%
	Hundreds of thousands of Euros	Count		3	1	1	5
		%		60%	20%	20%	100%
Support functions	I do not know	Count	6	12	13	3	34
		%	17,6%	35,3%	38,2%	8,8%	100%
	No need to invest	Count			1		1
		%			100%		100%
	Thousands of Euros	Count	3	10	7	2	22
		%	13,6%	45,5%	31,8%	9,1%	100%
	Tens of thousands of Euros	Count	4	11	2		17
		%	23,5%	64,7%	11,8%		100%
	Hundreds of thousands of Euros	Count	1	5		2	8
		%	12,5%	62,5%		25%	100%
Total:		Count	14	38	23	7	82
		%	17,1%	46,3%	28%	8,5%	100%

6.5 Technical expertise and grade of IT equipment – a self-evaluation

The respondents were presented with an explorative question that asked the respondents to evaluate the general level of the technical expertise of their company's personnel and the technical grade of the IT equipment in that company. The spectrum in which the evaluation was to be given was as follows: Poor, satisfactory, good, excellent, and "I do not know".

With this question the differences in companies, between companies of different status and within employee positions affects the evaluation. The following figure (FIGURE 13) graphically illustrates the perceived results.

When the analysis is performed so that all the respondents, regardless of size and the tier they operate in, are included in the same pool of responses, the results are similar to the average. A clear majority of respondents evaluated both their companies' employees' technical expertise and the grade of their IT-equipment to be between "good" and "satisfactory". This obviously makes the introduction of the new information systems an easier task.

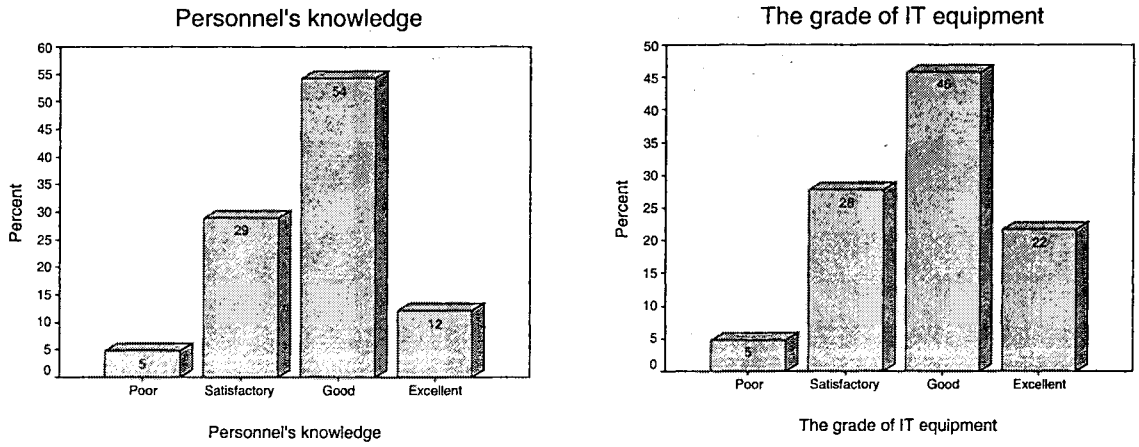


FIGURE 13, THE RESPONDENTS' PERCEPTION

Figure 13, represents the respondents' perception towards the personnel's technical expertise and the grade of the IT-equipment in his / her company, when the responses are all analyzed without assortment.

To evaluate how the perception of the personnel's knowledge and the grade of IT equipment in use vary depending on the size of the company and the position within the supply-web, the companies were again separated according to the sizes of the companies and their tier, and the analysis performed. Thus, the differences in separate groups of companies become visible. The following figure (FIGURE 14) illustrates the results. The hub-companies indicate the most clear-cut evaluation of their personnel's knowledge. Seventy-three percent of the respondents evaluated the personnel to posses "good" technical knowledge, and thirteen percent, the second largest block, even evaluated the technical knowledge to be excellent. Seven percent of the responses indicated "poor" and "satisfactory" evaluation for their personnel's knowledge.

None of the hub-company respondents evaluated their technical grade to be below "satisfactory". The majority evaluated it to be "good", 40%, followed by "excellent" by 33%. Twenty-seven percent reported the equipment to be "satisfactory", 27%.

Majority of first-tier suppliers also evaluated their personnel to posses "good" technical knowledge, 47%. The second largest evaluation block was "satisfactory" with 29% of responses, followed by "excellent" with sixteen percent. Eight percent evaluated the technical knowledge in their company to be "poor".

Thirty-nine percent of the first-tier suppliers evaluated the grade of their company's IT-equipment to be "good". The evaluation for "satisfactory" and "excellent" both received twenty-six percent of the responses. Overall, the evaluations for the grade of IT-equipment were very similar in both hub-companies and first-tier suppliers groups. However, in contrast to hub-companies, eight percent evaluated the technical knowledge to be "poor".

None of the second-tier suppliers evaluated their personnel's knowledge as "poor". The majority, 52%, stated it to be "good", making the evaluation of "good" the most common answering choice in all three groups for their personnel's knowledge. As with the first-tier suppliers the second most common evaluation turned out to be "satisfactory" with 39%. Nine percent of the respondents indicated "excellent" technical knowledge for their personnel.

The grade of IT-equipment was evaluated to be "good" by a majority of the second-tier suppliers, 48%. Again, "good" was the most common evaluation in all three groups of companies. Thirty-nine percent stated that the grade of their IT-equipment is "satisfactory". Nine percent thought it to be "excellent".

Summing up the results, it is evident that the hub-companies are most pleased with both, the personnel's knowledge and the grade of IT-equipment in their company. Overall, the charts indicate very similar evaluations in all three groups of companies.

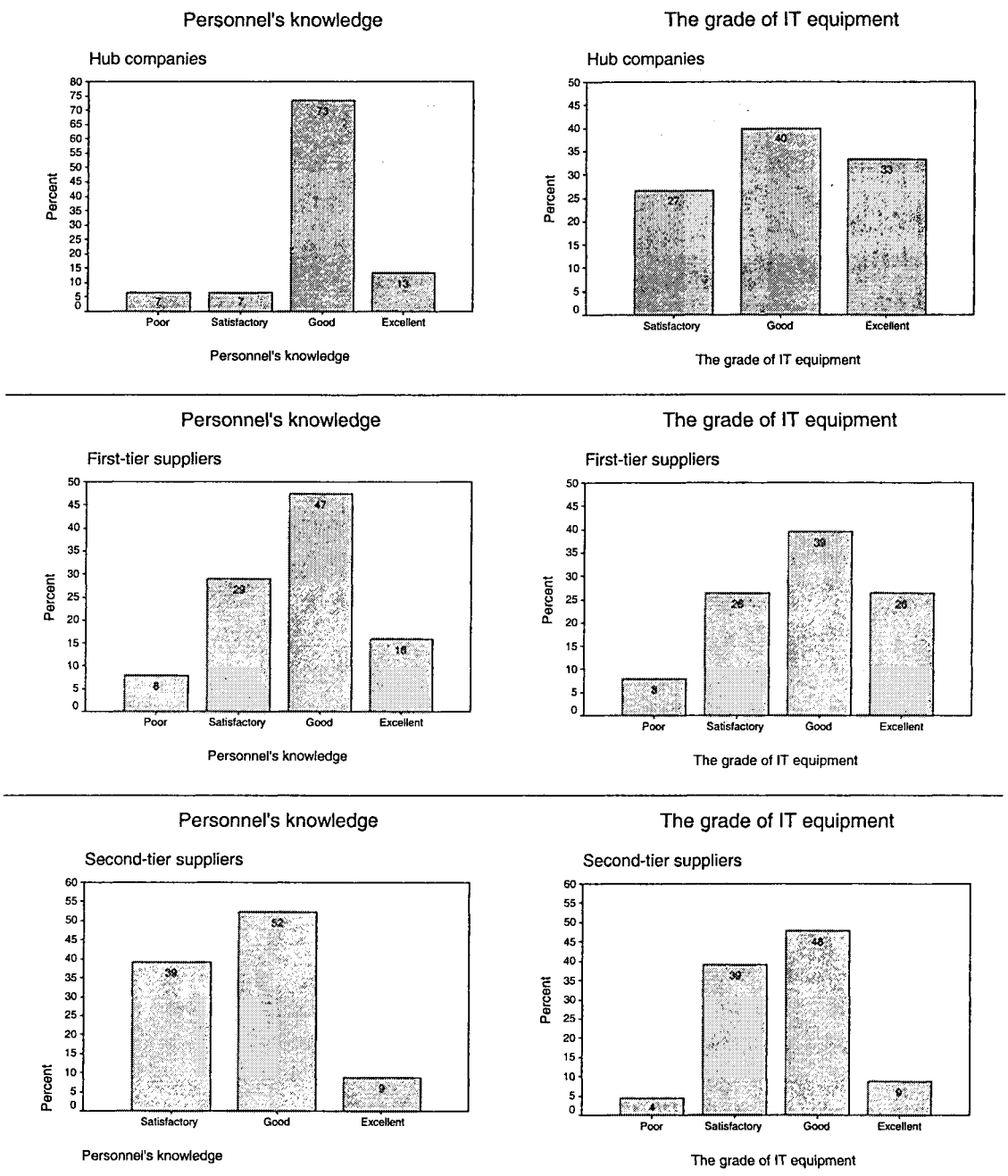


FIGURE 14, THE RESPONDENTS' PERCEPTION

Figure 14 represents the respondents' perception towards the personnel's technical expertise and the grade of the IT-equipment in his / her company, when assorted by the companies status in the value net.

6.6 IT and profitability

In order to evaluate how different people in the different companies feel about IT, the respondents were asked to evaluate the impact of IT towards their company's profitability and the ability to create profit. With this question it was also measured how the perception of different respondents, when their position was taken into consideration, varies. In addition, to gain a wider understanding of the perception towards IT, a time frame was again presented. The time frame was from 1999 to the current state, and again the near future, 2003-2004. The spectrum of evaluation was as follows: "Very positive impact", "positive impact", "negative impact", "very negative impact", and "I do not know". To illustrate the possible variance of responses depending on the respondents' status in the company hierarchy, the respondents were given three different classes of positions to identify themselves into. These given classes were "employee", "middle-management" and "top-management".

According to the responses, in the year 1999 the impact of IT towards company's profitability, and the ability to generate profit was experienced as positive. All three classes of respondents' charted out along a similar path for the year 1999. In the employee segment, five respondents out of thirty-nine, excluding eight respondents indicating their responses in the "I do not know" column, evaluated the impact of IT to have been either of "very negative impact" (1 respondent) or "Negative impact" (4 respondents). In the management segments (middle-management and top-management) only one respondent out of 18 for middle-management, and one out of 10 respondents for top-management, indicated IT: s impact to have been negative for the year 1999. In addition, from the management segment the "I do not know" answers; two responses out of the 30 responses were excluded.

In the year 2001, the impact of IT is evaluated to be very similar by the employee segment. Most responses indicated the impact of IT to be "positive", while the amount of "very positive" responses increased from 22% of responses of 1999 to 38% of responses for 2001. The management segment only indicated positive responses, and

the number of very positive responses grew in the top-management segment from 20% of responses in 1999 to 25% in 2001. Among middle managers, the percentage indicating very positive impact increased from 33% of 1999 to 53%.

For the years 2003-2004, either all responses indicated the expectations to be positive, very positive or then the responses were in the "I do not know" column. The majority of the employee segment estimated the impact of IT in the future to be very positive, 59%, while forty-one percent evaluated the impact to be positive. Eighty-four percent of the middle-management segments responses indicated the expectations to be very positive. Sixteen percent of that same pool estimated the impact as positive. The top-management estimated the impact to be very positive by 42 percent of the responses, and positive by fifty-eight percent.

6.7 Conclusion

The survey questionnaire clarified that the companies, regardless of size and status in the value net, use a variety of information systems. Additionally it became evident that the trend for ISs usage illustrates growth expectations. Especially the use of ISs dealing with 'invoicing', 'management of contract documents', and 'management of customer contracts' is expected to increase within the following two-year period. As a conclusion, the companies involved in this questionnaire indicated to have excellent capabilities for being a member of a value net.

According to the survey, the state of companies ISs used in purchasing / supply management activities vary from each other, resulting in a need for diverse approaches for systems integration.

Companies participating in a survey illustrated to have diverging opinions of the amount of money required to be invested in 'ISs enabling automation' towards the customer- and supplier- interface. In both instances, the responses varied the most for

the investment needs for the support functions. It seems that the importance of support functions is generally underestimated. Additionally, it would seem that the general opinion of the respondents varies according to a company's status in a value net, as the greatest variance can be seen to incur after between the first- and second- tier suppliers.

The respondents generally evaluate the personnel's expertise with information technology and the grade of IT-equipment in the companies to be 'good'. Thus, the introduction of new tasks, activities, and functions, and educational activities provided for the employees should not be very difficult.

The perception that the respondents had of the information technology's ability to create profit for the company, as well as its impact towards a company's profitability was evaluated as encouraging. This indicates the general attitude towards IT to be favourable.

7 SOCIO-TECHNICAL ISSUES

This chapter addresses the concept of the socio-technical factors related to the information systems and value nets. The understanding of these 'human factors' and their often undesired impact are crucial for the overall success of a project as these factors deal with e.g. employee motivation, commitment and decreasing the amount of resistance.

Closely related to socio-technical factors is the topic referred to as "change management" which, as stated in the name, examines the factors influencing change, and possibilities to overcome change related problems. Change management is a large topic in itself, and is not further examined in this thesis. However, the "human related" problems, considerations and expectations resulting from change issues in the area of information systems and value nets, are a part of this thesis scope.

7.1 Information Technology related socio-technical issues

In order to understand the socio-political issues affecting collaboration and co-operation three separate, yet intertwined, viewpoints must be distinguished. These viewpoints, as mentioned in chapter four, are technological-, economical- and socio-political viewpoint.

From a technological viewpoint, companies today with the increasing use of IT have the ability to lower the coordination costs without increasing the associated transactions risk (Clemons, Reddi and Row, 1993). In this particular article, the authors predicted this development to eventually lead towards more outsourcing and in a decreased number of vertically integrated firms. The authors named this hypothesis as "move to the middle"-hypothesis that states the companies to "move to more outsourcing, but from a reduced set of stable partnerships" (1993, 1). Consequently, the costs if IT-equipment has

decreased at the same time as the performance increases. Current evidence from the market structure and increasing interest of companies' towards B2B-ISs would seem to support this hypothesis.

Traditionally, inadequate monitoring- and controlling methods of companies has resulted in increased risk to the firms, prohibiting explicit coordination between business parties for a large part. In other words, the technological- and economical aspects enabling a shift towards "interorganizational value net creation" exists, but the socio-technical issues (human factors) hinder the development of these relationships.

Economically, what contributes towards this development into network-like operations is the lower relationship specificity of IT investments and better monitoring capabilities of firms. This "allows the firms a safer way to invest into IT for interfirm coordination [coordination between multiple organizations] than in traditional investments for explicit coordination such as facilities or specialized human resources" (Clemons et al., 1993, 1). As a result, the firms are more likely to coordinate with suppliers without requiring ownership to reduce their risk, as was also stated by Nurmilaakso (2000).

So far, we have mostly used economical- and technical issues in explaining why the companies are shifting from competitive- to collaborative stage between organizations. In the end, this is not sufficient as the third side of the equation, the socio-political issues such as personal chemistry and organizational cultures as well as strategic needs and the category of interorganizational interdependency ultimately determines the overall success of co-operation (Kumar & Van Dissel, 1996).

As was stated earlier in chapter four, the category of interorganizational interdependency determines the type and amount of probable socio-technical issues to be expected. The more complex the coordination mechanism required by the system, the more need for direct contact and human intervention is required. (Kumar & Van Dissel, 1996) As a rule of thumb, the greater the interdependency is, the more risks of conflict exists.

7.2 Value nets and socio-technical issues

Regardless of the technical grade or deployment of companies information systems, the 'human factors' are crucial for the success or failure of a project. Especially in the context of value nets that hold a quantity of information characterized by availability and visibility, the socio-technical issues are a key component to consider.

'Human factors' are often underestimated, resulting in unexpected drawbacks during projects, implementation tasks and change related issues. As a consequence, both human- and material resources are wasted.

In the light of the empirical survey data, it became evident to note how the respondent' attitudes, assumptions and understanding of information technology's significance and effect towards costs, possibilities, experienced benefits and impacts towards business and environment vary by tiers. More specifically, the distortion in the unity of responses increases tier by tier throughout the whole supply-web. The distortion growing systematically the further away from the hub-companies the responses were analyzed. In other words, these findings may be interpreted to signify that the respondents' do not share common goals or vision, and the need or understanding of the motivation behind value net creation was not adequately established among participants. All of these factors adversely affecting the co-operation of companies, influencing the working relationships of partners and the overall formation of partnerships.

Additional findings from the survey indicated an essential need for strengthening the cross-organizational relationships, more overly the relationships basing on trust. In accomplishing this, "contract management-" and "management of contract documents" enabling information systems for organizations multilateral relationships would be beneficial. Additionally, the need for founding common visions, strategies and code of conduct throughout the value net is a prerequisite for this chance-process to be done.

The socio-technical issues influencing the collaboration of companies may be roughly categorized as a sum of individual companies internal- and external human-related problems.

7.2.1 Barrier for adopting new equipment

The industry in which a company operates influences its' business processes, way of conduct and overall attitude towards the information systems. Consequently, it affects its' need of business process redesign, redesign of processes, IT-enabled automation and the need for using technical equipment. The employees of IT-industry are used to working with technology and the barrier for adopting new equipment is low. From the managerial point of view, it is easier to introduce new processes and implement the related IT-infrastructure in use when the employees, who are the ones actually using the systems, are familiar with technology.

Having user-friendly, and consistent, interfaces for information systems makes the adoption of new technology easier. Therefore, improving existing systems performance, when applicable, should be considered as the employees already have experience in using the system, and the interface is known.

During an interview with a HR-specialist who works for Buyer B stated that people are often afraid of automation, because they feel as though the improving technology and information systems used might make them obsolete for the firm. Related to this, are the differences between generations, which are also emphasized. Usually the tendency is that the older generation indicates higher levels of resistance to change than the younger technology-savvy generation. (HR-specialist [1], 2001)

Creation of a value net requires consolidation of some processes, which might require that new technology be implemented. Again, the establishment of common goals and

objectives as well as defining common rules and responsibilities for each participant must be emphasized, as otherwise some of the participants might not see the need for adjusting their own processes, thus resulting in resistance to change causing poor functionality throughout the network. Communication is in a key-position in overcoming these obstacles.

Based on the information acquired from a collective interview of three managers of separate departments of Component 1, "the employees of Component 1 rely and trust more on traditional means of communicating and operating than in using information systems for the same tasks." The company representatives emphasized that in a small company the information is accessible much quicker through personal contacts and methods than through IS usage. (Three managers, 2001)

7.2.2 Educational activities

Generally, the need for continuous learning is well understood by companies, but the required amount of time and money to be invested is often overlooked. Often after business process re-engineering or implementation of new technology, the companies begin to educate their employees. However, as soon as the committed resources run out, the process of educating employees ends, even if the process is not properly executed. As a result, the employees feel frustrated and might interpret the situation so that the management is not willing to invest enough resources into education, or that the management does not consider that particular process important enough. (Workshop, 2001)

Following figure (Figure 18) is an illustration that was drawn by Hannu Vahtera during the group-work session in the HANSKA-workshop. The figure illustrates one possible approach on how education-, development- and improvement processes of the employees and information systems could be implemented. The underlying idea is that

the above-mentioned processes must be continuous and based on actual user experiences instead of mere process definitions. The reason behind this argument is the fact that the employees are seldom aware of the particular process they are part of, even when by fulfilling their tasks the employees enable the overall process to happen.

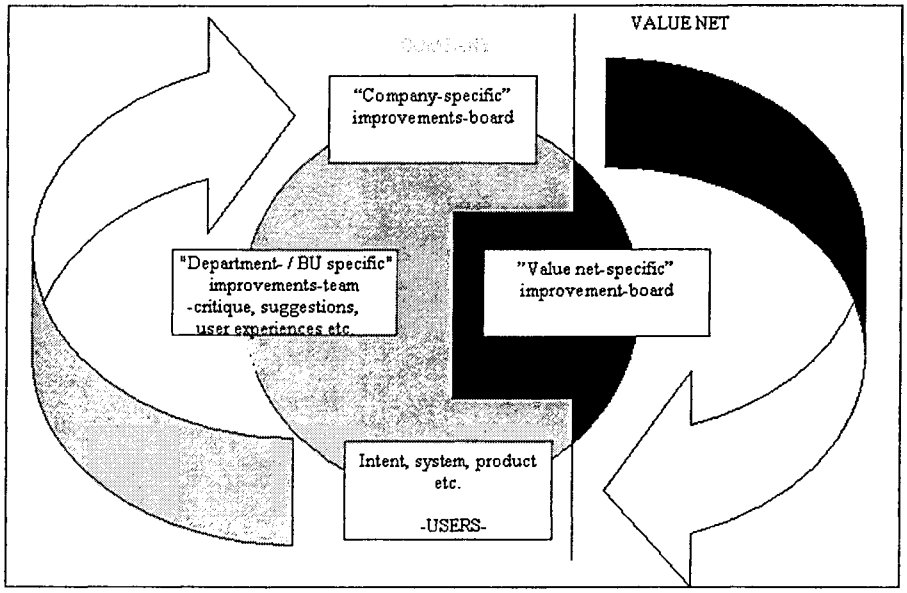


FIGURE 15, THE IMPROVEMENT AND EDUCATION PROCESS

According to figure 18, each department or business unit in an individual company, that has the implemented information system in use, e.g. required for / by the value net, has an "improvement-team". This team is responsible for collecting user feedback from employees. The feedback is then analyzed, formulated and processed to a form that is suitable for presenting it to the comparable "improvement-board", operating at company level. Again, this teams responsibility is to collect and filter separate inputs of the various departments, and to draw up a development plan that is adapted and consistent with the company's strategy. The process continues when the plan is presented to an "improvement board" operating at value net-level that assembles according to agreed time schedule. This board consists of representatives from each participating company, and openly discusses the issues brought up by the improvement-teams of multiple companies according to the strategy of a value net, and evaluates the feasibility, possibilities and approaches that could solve the problems. Additionally, the improvement board decides upon- and coordinates the resulting development- / improvement process, after which the "cycle" of figure 18 makes another spin.

An advantage of this scenario at managerial-level is that this continuous cycle "forces" the companies to regularly evaluate the overall state of the company, its' processes in use and the grade of companies technology and know-how of employees. As a result, the overall understanding of *who* the company is, *how* it operates and *how well* it operates is increased, and possible problem areas noted early on. At the employee-level, the cycle increases motivation and lessens resistance to change as the employees feel that the management is aware and interested in bettering the working conditions. The cycle increases the overall visibility within the value net and, in a way, creates a standard value net-wide procedure for the participants to express improvement ideas and influence the future development- / improvement processes. Additionally, the participants may find it feasible to arrange common educational activities.

During the previously mentioned interview with a HR-specialist working for Buyer B, the employees' perception towards educational activities, arranged by the company, was identified to be one of the current problem-areas in the education process. The example given by the HR-specialist goes as follows. A company offers a variety of training that is offered on a regular basis, arguably for this reason of regularity, the employees become too used to having training provided, and do not value them enough. Another possible reason for the problem could be that for some reason the employees evaluate the training as irrelevant to their work tasks. It seems that some of the employees take the arranged courses as given, resulting in decreased appreciation towards arranged education. The problem was first observed in high "no-show" numbers of employees participating the educational activity. "No-show" numbers meaning that the employees sign-up for the courses but then do not participate in them. As a result, the company faces increasing costs for the education process that is emphasized, as the company must also pay for those employees that neglected to cancel their registration for the course and did not participate. As another, slightly more amusing example the HR-specialist told an actual training experience that was faced with a course called "effective time management". There was a high "no-show" number for the training session, and when asked for a reason, some of the employees responded that they were too busy to participate. (HR-specialist [2], 2001)

Arguably, the cycle helps to improve the quality of educational activities provided as the problem areas are identified, and brought to "managerial attention", by the employees themselves. Additionally, the training should rather be workshop-like hands on training sessions instead of lecture-like classroom session. The concept of working by doing is therefore valid.

7.2.3 Employee turnaround

Trust issues arise when the employee turnaround is high, causing security issues to become a realistic threat. Even with various Non-Disclosure Agreements (NDA: s) between the company and employee, there is no reliable way of ensuring that the information acquired by the employee during the period of employment is, and will, not be used in the employees new place of work. There is basically no way of preventing employee turnaround from happening, except by making the company's own working atmosphere more attractive than the competitors', however, the fast turnaround of employees is a 'human factor', a problem, to be considered since educating new employees for the required tasks requires a vast amount of resources, both time and money.

7.2.4 Uncertainty of a business partner's ability to perform

Partner selection is an important process that involves certain risks. These risks being for example trust- and dependency related issues. Earlier in this thesis, when discussing about value creating systems, the importance of partner selection was emphasized, as poor choices can make the whole network a losing one.

In the supplier relations there is a risk resulting from the uncertainty that Buyer B feels towards the suppliers' ability to perform in a networked setting, in particular related to their ability to pass on information, so that Buyer B can be sure that the message intended for all of the members of a value net in fact reaches the recipients (Supply managers [2], 2001).

The need for real-time information increases when the suppliers are empowered. In a situation where the information doesn't reach the needed recipients, the results may be costly. As an example, the possible results could be excess demand or supply, companies acquiring wrong type- or quantity of inventory etc. Therefore, the need and value of predetermined roles and responsibilities of each participating member is emphasized for the value net to be both functional as well as operational.

The value of a successful working relationships for both companies and people behind them cannot be underestimated as often, personal relationships influence the nature of conducted business.

7.2.5 Multi-nationality

Easier access to technology as well as the opportunity to conduct real-time business across countries boundaries has resulted into observed socio-technical issues that must be considered when it comes to conducting business in multinational markets.

Language issues as well as cultural differences are the main 'human factors' to be considered when considering operating in global markets. Many larger companies use e.g. English as the so-called "concern-language", this however is not necessarily enough as the risk of misunderstanding remains. Usually the usage of foreign language in everyday business events and e.g. reporting and documenting is not controlled in anyway, resulting in problems with indexing, versioning and ultimately affecting the

concepts of visibility and availability in an organization and with its' business partners. An example of this was brought up in an interview where three of Software 1: s representatives stated that in their company, the concern-language used is English, but in practice, Finnish is widely used. The resulting problems are for example with the Intranet that holds large quantities of information in multiple languages. As a result, the interviewees reported to have "information overflow" in the company. Indexing the Intranet has helped in organizing the information, but enabling people to have the right information at the right time is difficult. In addition, the previously mentioned monitoring problems, such as ensuring that the correct version of the information in a correct format is available, indexed and read remains unsolved. (Three representatives, 2001)

7.2.5 Resistance to change

Business buyers', as well as people overall, are resistant to change their way of conducting business according to the requirements of Buyer A. Often change is expected to result in increased costs and weaker overall position in business relations. Accordingly, the change management has proved to be one of the most important factors influencing businesses today. For example, the implementation of new technology as well as business process redesign and strategies must be planned carefully and implemented thoughtfully in order to avoid needles frustration of business partners and employees. The change management issues are often overlooked, even as they are in a key position in ensuring smooth operations and successful redesign of business, processes and performance.

8 CONCLUSION AND FURTHER RESEARCH

Value nets are instances of value creating systems. Furthermore, in this study the concept of value nets is built upon the concept of 'traditional' supply-chains and further examined in the light of relevant theories and industry examples. Existing theories are introduced and commented, as well as the overall motives for creating such systems considered. The importance of differentiating two fundamentally different value net architectures, static- and dynamic architectures is emphasized, as both of these models have distinct characteristics that need to be considered prior to actual creation of a value net system. The actual pre-requisites, such as rules of participants' conduct, committing suppliers etc. for constructing a working value net are discovered. Additionally, suitable management activities for different types of value nets are presented.

The turbulent business environment of the ICT-industry, as well as the rapidly developing affordable technological advances, drives the change from vertical expansion to the creation of virtual organizations. Due to the environmental pressures and rapid changes, the companies are forced to concentrate on their core-competencies, to be successful in the global markets. In other words, the non-critical tasks are outsourced to be performed by another companies. Additionally, the customers have become more demanding and have access to global markets through e.g. The Internet. The SMEs on the other hand benefit from the larger companies resources and access to the global markets. Overall, the competition between organizations has become more of a competition of distinct value nets than individual firms.

As a result, the products life cycle has shortened, forcing companies' to switch their production typologies from Make-To-Stock and even Make-To-Order towards Assembly- and Engineer-To-Order. Therefore, the role of accurate market information as well as forecasts and having adequate production capability has increased. To face the challenge, it has become necessary for large companies to have a reliable and sufficient supplier-base. Furthermore, the various production typologies of companies'

within the supply-net affect the efficiency of networked operations and contribute towards the success of a whole value net.

Value nets may come in all shapes and sizes. Current technology allows for the use of the Internet as the primary media for communication, thus making permanent, and costly, EDI-connections unnecessary. Value nets do not require the participants information systems to be exactly similar. However, interorganizational processes must be synchronized for form, sequence, and content. The standards as well as commonly agreed rules may be used to accomplish this requirement.

As concretised instances of value creating systems, the value nets may be either static or dynamic. The difference being that a static value net (a value net with static architecture) is a long lasting virtual organization while a dynamic value net (a value net with dynamic architecture) is a temporary alignment of companies' come together for a specific business task or time. Obviously, these two architectures require different approaches for management-, coordination-, controlling-, and commitment activities and have their own architecture-specific problem areas, as well. Building trust and reducing the chance and occurrence of opportunism must be considered for both architectures. However, the chance of opportunism is smaller in a static value net, as the individual participants have too much at stake to be risked by opportunistic behaviour.

Interorganizational interdependencies as well as the structure and structurability of a business relationship affect the overall success of a value net. Three categories of interorganizational interdependencies are presented in this study. Importantly, any given company is not bound to be confined in any of the three categories presented, but may have characteristics of any, or all of them. However, each company needs to understand its' own categories prior to value net creation, as the characteristics of each category determines the types and amount of problems to be expected. The key to avoiding conflicts in IT-enabled co-operation is to characterize and understand the interorganizational relationships of collaborating companies. (Kumar & Van Dissel, 1996)

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APPENDIX 1 -THE SURVEY

Appendix 1 is mostly written by Tiina Ojala, and edited / modified by Hannu Vahtera. Tiina Ojala was one of the researchers for this project and her responsibility was to design and compile the web-based survey that combined the survey-questions of each researcher in one web-form. She was also the person accountable for the technical implementation of the survey.

About the survey

According to project plan the "as is" analysis of the case-companies was the main objective of the first half of the project "Information technology in business relationships". In order to chart the current state of all project companies as uniform as possible a survey was implemented.

Advantages of the web-based survey

An Internet survey was decided to be the most efficient and useful method for gathering information. This conclusion was reached as the two case-companies and their suppliers involved in the project account for thirteen different companies with dispersed locations. Therefore, individual interviewing would have been unfeasible. Furthermore, the three researchers[7] all had a different scope of research, which could have been a disadvantage for the companies, whose time would have been required for all the separate interviews to take place. Additionally, the anonymity of filling out the web-

[7] Huhtinen, Heli (Lappeenranta University of Technology); Ojala, Tiina (Lappeenranta University of Technology) and Vahtera, Hannu (University of Jyväskylä)

based survey was considered to be an important advantage for collecting reliable information.

The decision to use a web based information collecting method was also influenced by other obvious advantages of using the Internet including; low cost of the fieldwork, and a potentially quick response-rate and turn-around times. The Internet also enables the possibility of very large sample sizes. On the cost side, the benefits are lower costs of access to the respondents, the exclusion of the printing costs of the questionnaires and covering letters. Internet surveys do not require postages and saves a lot of time, as the survey is available to the respondents at the same cost and at the same time. The overall cost of this web survey consisted of the license of the statistical software and the time usage of the researchers, making it an inexpensive choice. Furthermore, the formation of the response data could continuously be monitored during the survey.

Disadvantages of the web-based survey

The companies involved in the project are from considerably different fields of business. The organizational structures are not identical or even similar in many cases and the grade of technical expertise and equipment vary greatly. These factors contributed largely to the designing- and the implementation of the survey.

The sample was planned to consist of 13 companies in which eight different territories were named (financial administration, purchasing / supply management, sales / marketing, production, data administration, research & development, general management and logistics). Distinct organizational structures however, made it impossible to have the same people (with same positions) from all of the companies to answer the same set of questions.

The obvious disadvantage of a web-based survey in accordance to individual interviews is the lack of personality and the loss of option to re-phrase questions according to the

situation. With individual interviews, the interviewee is also "forced" to concentrate on the discussion and possible misunderstanding of questions can be sorted out instantly. As a result it is impossible to know how many, if any, of the questions were not properly understood and therefore, yielded an "incorrect" answer.

The implementation of the web survey

This web survey had two objectives. First, the questions were composed to measure the current state of the case-companies. The questions were divided into three separate divisions due to the different scope of every researcher among the project. The second aim of the survey was to test how the Internet, and particularly the web, could be utilized for the collection of data.

The researchers prepared the questions separately according to scope and then the questions were combined into a single survey. At this stage, the researcher responsible for the survey, Tiina Ojala, performed an initial testing phase with managers representing some of the companies. After this, the survey was again modified and the final version prepared. The survey was built with SPSS Data Entry Builder. Other software available for data collection was e.g. Survissimo and QuestNet. The SPSS Data Entry Builder was chosen due to its direct suitability to the statistical software SPSS for Windows and additionally, due to its reputation as a scalable "drag and drop" tool for the web surveys.

Challenges related to the implementation of the web survey

Several challenges occurred during the implementation of the web survey. The main concerns were linked with the phrasing of the questions, information flows between the research group members, technical issues, and the overall use of the web instead of a

paper questionnaire. Additionally, some difficulties were realized when the main representatives of the case-companies were contacted, during the sample collection evaluation.

The phrasing of questions was complicated due to the research arrangement. The research group decided to use one general questionnaire form to collect the data from every respondent. Another alternative would have been to compile thirteen different forms, individually for each case company. For technical reasons, the general form was selected for this survey because thirteen individual questionnaires would have required as many individual forms and thus individual web addresses as there would have been different forms. Therefore, the research group decided that one universal web address was enough in order to avoid updating problems with the form and to avoid the confusion of having multiple forms.

Building the survey with SPSS

The assemblage of the questionnaire furthered as follows: First, the objects were drawn to the form. Then these objects were completed by setting the right variable properties to each of them, thus creating the questions. After all of the questions were created; revising the properties; and ascertaining all the variables, the questionnaire was exported into html-format for the network server. A few difficulties occurred during the export phase but after the software had been reinstalled, the export was managed to be and implemented without further problems.

The web-form was pre-tested using several various browsers and operating systems inside the University of Jyväskylä' and Lappeenranta University of Technology local area network. Different browsers displayed the form differently. The greatest problems were with the Netscape's' browser that displayed the lines partly overlapped. With Opera, the form was displayed- and functioned properly, as with Microsoft's Explorer of various versions. The problem with Netscape was resolved simply by increasing the

line spacing on the html-form. Additionally, a few test-respondents from the case-companies answered to the questions and commented on it. Based on the comments and findings during the test period, the web survey was once again revised before the final version.

The two main changes, which had to be done in order to improve the web-form and to make it more comfortable to answer was to decrease the amount of questions by three, from the original fifteen- to twelve questions. The second change was to insert a comment-field at the end of the questionnaire. The free comment field allowed the respondents to express their opinions to the research group as well as to inform about possible problems with the form. This comment fields idea was to collect valuable suggestions for improvements, in case another survey should be compiled during the project.

Research frame

Due to the objective of the survey, to collect descriptive data for the case study research, the sampling was done as judgment sampling. Judgement sampling concentrates on studying the case-companies, and the sample is based on named respondents, nor on random sampling. In the context of this study, the judgment sampling was implemented to describe the current use of communication tools in the case-companies, and therefore the results cannot be generalized to other companies or to other industries. If the results could have been generalized, the sampling should have been done as random sampling from Buyer A's and Buyer B's entire supplier networks.

However, the aim of this descriptive study was just to encapsulate the data of the current state into numeric form and therefore, allow for descriptive figures and tables to be made in order to describe the topic (the "as is" stage of case-companies) at hand.

Due to the lack of statistical implications by judgment sampling, reliability was achieved by selecting the essential and correct people as key informants. In fact, as high as possible reliability was approached by having personal contacts to the main representatives from the case-companies to whom the proceeding and the objective of the web survey were explained. Additionally, special attention was stressed to express that how important it is to name the right people to the respondent and thus enable the achievement of reliable and correct information.

The target group of this survey consisted of respondents from Buyer A and Buyer B, which are the hub-companies of this project. In addition to these companies some of Buyer A's first- and second tier suppliers, and some of Buyer B's first- up to third- tier suppliers were included into the target group. As a whole, the size of the target group was 13 companies.

The sample itself was formed according to the certain criteria: every respondent was to be linked to the other case-companies in one-way or another. For example, Buyer A's respondents had to have a connection to some of their named first- or second tier suppliers. Respondents from Buyer B also had to have something to do with their named suppliers. Additionally, the suppliers had to have connections to other companies, both upstream and downstream among the case-companies.

For this thesis, the case-companies were beforehand named and random sampling was therefore excluded. Buyer A's value net was based on representatives of Buyer A's separate sourcing categories. In fact, four of the seven possible sourcing categories were linked to the survey such as eight companies were included: two from the cable industry, two from the software industry, two from textile and two from component industry. Buyer B's value net was related to the Buyer B's main product.

After the case-companies were named, the remaining task was to search for key informants for the survey. The key informants are the people who represent all the employees in a blanket way within the company. For this survey, the selection of these people was quite clear because there were only a few people per case company that

fulfilled the selection criteria. Therefore, random sampling was not even considered. The selection criteria defined the key informants to have a connection to other case-companies in the case value net defined. Furthermore, the selection of the key informants was based on the beforehand made definition of the relevant functions, which were aimed to include the sample.

Nevertheless, some difficulties occurred during the collection of the judgment sample for this survey. The overall objective of the sample size was to be consisted of 416 (13*8*4) respondents. Additionally, the sample was planned to consist of 13 companies in which eight different business areas were named (financial administration, purchasing / supply management, sales / marketing, production, data administration, research & development, general management and logistics). From each of these eight business areas four respondents tried to be included in the survey, but it was found to be impossible due to the limitation of the research area.

The compilation of the questionnaire

The research group for the web survey consisted of three project researchers and some external researchers and assistants.[8] The project researchers started the compilation of the questions in March 2001 when the questions were divided into three different categories based on the scope of every researcher in the project. One of the researchers composed queries related to the communication tools, and the other researcher made questions related to the knowledge management in the value net. The third researcher compiled questions that were linked to the information systems.

The compilation of the questions started by drafting issues about the topics. When the first drafts were ready, the research group met a few times to refine the questions and

[8] Huhtinen, Heli (LUT); Ojala, Tiina (LUT) and Vahtera, Hannu (JYU) [project researchers], and Puumalainen, Kaisu (JYU) [external researcher] and Taalikka, Sanna (LUT) [researcher assistant]

during the final meeting it was decided one by one, which questions would remain as the final questionnaire. After the elimination phase there were 15 questions left and the programming of the web form started.

Examining the relationships of the value net participants requires equally as many aspects to be considered, as there are participants. In the value net the location of the company affects how the prevailing respondent answers and from what point of view he or she views the entire network. For example, in this case network, some companies are the first tier suppliers and they consider other companies as buyers or first tier suppliers of their company. In some other network, the same company can be situated as the buyer who has the same companies as its' own first and second tier suppliers. Consequently, it is very important to recognize the aspect and location of every case company in the value net.

How the information flows between researchers was the third challenge during the compilation of questions. Due to the geographical location of the researchers, face-to-face meetings were very rarely arranged. The decisions for modifying the survey were made on the phone, and therefore the comprehensive modifications to be implemented were complicated. Probably, the compilation of the questions could have been done quicker if the project researchers had met face-to-face more frequently.

Despite the above mentioned problems, above of all challenges arose from the technical problems. These experienced problems can be divided into two parts: 1) Problems linked to the SPSS Data Entry software, and 2) problems linked to the use of the Internet. Contributing towards the first problem, the SPSS Data Entry software is quite a new tool for making web surveys. For example, at the Lappeenranta University of Technology only, a couple of surveys have been previously made with this tool and the level of expertise related to the use of this software was therefore quite inexistent. Despite that fact, learning to use this tool was simply due to the researcher's [Tiina Ojala] previous use of different software tools. Without the basic knowledge of html-language and its behaviour within a browser, the compilation of the survey would have been much more difficult to implement.

Problems linked to the use of the web occurred during the so called the export phase. When the draft versions of the survey were exported into html-format, the rows and columns did not appear as they did in the design view of the software. Additionally, some of the textboxes were overlapped. Additionally, the software did not create the required folders for the network server, hindering the functionality of response to the questionnaire. These problems were not known beforehand and after a few experimental changes, the form operated properly. The solution was to reinstall the software by allowing full administrator privileges to the user. After this, the software began to operate properly, and the web form was transferred into the network server.

The form was by purpose designed to be used with different versions of Microsoft's Internet Explorer and Netscape's Navigator. Later, the browser called Opera was found to be one of the potential software allowing response to the survey. Despite a proper design of the survey's layout, various versions of these above-mentioned browsers caused problems. Experienced problem was that the layout varied a lot, depending on the browser version used. The simple solution for this problem was to leave additional empty spaces between separate questions, and to limit the width of the web form to be as narrow as possible. The layout itself, as well as the size of objects, required recognizing the variance of the respondent's; size of display, the speed of data-transfer and speed of the processor.

The limiting characteristics of the web became apparent when the sample of respondents was contacted. For example, the format of the covering letter had to be compatible with the most common software and environments. After considering possible alternatives, such as Word-document or an html-document, the PDF-document was chosen to be the most suitable software, due to its anti-virus characteristics and availability [e.g. Adobe Acrobat Reader cab be download free of charge from the Internet] for reading the document. Another challenge was to consider the respondents motivation to answer the survey [as well as enforcing the responding by strengthening motivation]. It was a known fact that the e-mail message informing about our survey,

with the attached covering letter, was quite easy to skip and be forgotten by the selected respondents.

The research group considered possible ways to provide incentives for the respondents in order to achieve a better response rate. Many possible incentives can be offered to encourage response. The incentive can be e.g. prize draws for respondents, credit units for students etc. However, in this case incentives were not implemented, as a suitable type of incentive was a difficult task to decide, and would have incurred additional costs. Additionally, the sample consisted of representatives from project-companies that voluntarily participated in the project. Thus, the key informants had a "duty" to respond. The research group concluded that the overall results derived from the survey would be an appropriate incentive.

Time schedule of the web survey

The web survey was implemented according to a tight planned time-schedule. The time-schedule was strict as the active phase of implementation started at the beginning of March and the data was already collected in June. As a whole, scheduling went fine and without any significant problems. The following figure (FIGURE 1) illustrates the proceeding of the web survey in weeks.

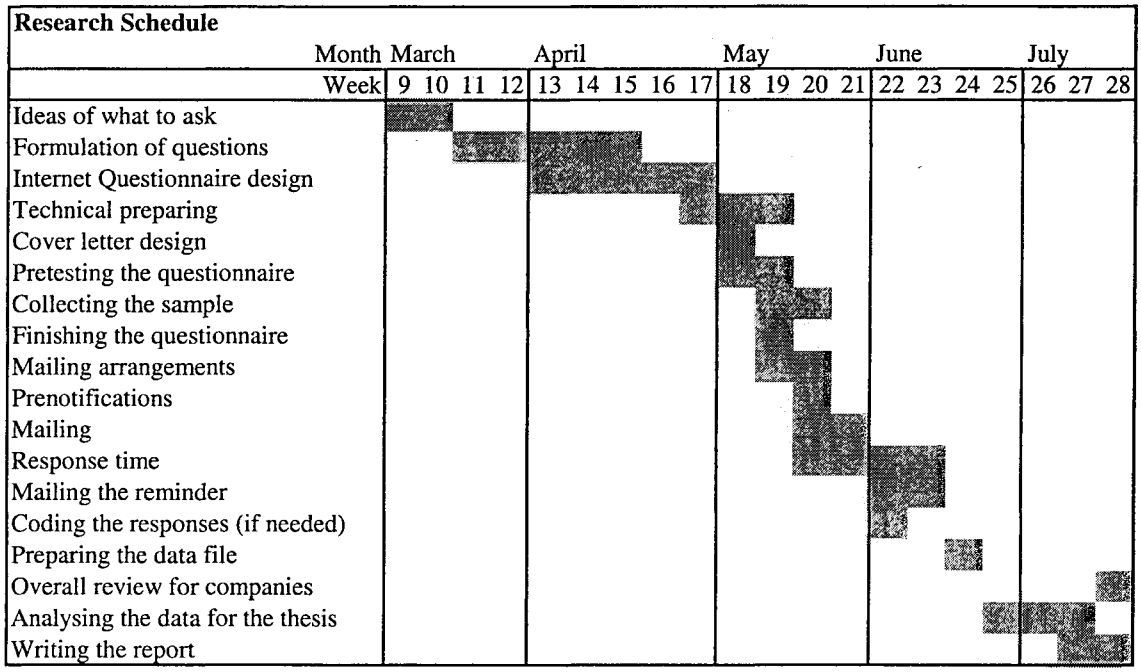

Figure one, the proceeding of the web survey

As can be seen from figure one, the process of implementing a web survey, altogether, took almost five months, by three separate researchers. The formulation of suitable questions and the creation of the form (the phase in figure 1: Internet Questionnaire Design) were the lengthiest phases in the survey-schedule. Despite these two lengthier periods during the implementation, the process of the web survey proceeded fluently and the time-schedule did not need modification.

As a whole, the implementation process required as much as one and half months work from one of the full-time researcher's [Tiina Ojala]. This phase mainly consisted of the formulation of the questionnaire and its' technical testing.

Results

One hundred and sixty eight (168) e-mails were sent to the respondents that were named beforehand, asking them to answer the survey on the Internet. Ninety-six respondents responded. After data checking however, the amount of acceptable responses fell to

eighty-four responses. The main reason for the decreased amount of acceptable answers was the elimination of duplicate answers (e.g. the web server had received data from the same form twice or more). Therefore, the response rate was confirmed as 50 percent. This is very satisfactory compared to the average of 20 – 30 percent response rate of similar studies.

The factors affecting the experienced good response rate might be that the respondents had personal or organizational interest towards responding, as well as encouragement provided for the respondents by their companies' managers. On the other hand, one motivating factor may have been the presence of two large companies' as principals of the survey. The small- and medium-sized companies may look up to the larger company, as well evaluate their business relationship important enough, and thus be eager to follow the large companies' projects.

The response rate could have been even higher if the survey would have been made available also in paper form. Then the respondents would have had the possibility to choose a preferred option between the web and paper-copy. In fact, some of the respondents did not have access to the web and for those respondents' the survey was sent in paper form (afterwards their responses were manually added into SPSS database).