THE PROMISE OF INFORMATION TECHNOLOGY:

WHAT WENT AWRY IN THE SMALLTECH NETWORK?

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Jens Hultman

Abstract

This paper presents an exploratory case study on the adoption and diffusion of information technology in the case of SmallTech, a medium-sized Swedish firm. The purpose of this report is to present a description and analysis on how new applications of information technology were received in the case of SmallTech. The network approach, based on the work of the IMP-group will construct the theoretical frame of reference. The network model, with its basic elements of a network consisting of actors, activities and resources is applied. Two other important concepts that are applied in this paper are connectivity and embeddedness.

Through in-depth interviews, information has been collected to construct the empirical part of the report. The case account that is presented tells the story of the promise of information technology in the SmallTech network. The case study is divided into three major parts. First, the focal firm and the focal relationship are presented. The two firms forming the focal relationship are SmallTech and SigmaTool. SmallTech is a medium sized firm with an annual turnover of approximately 13 million EUR and approximately 95 employees. SigmaTool is a large Swedish supplier of tools and tooling systems to SmallTech. Second, the underlying

reasons to why information technology was interpreted as promising will be presented. In the focal relationship, the present communication processes, where several channels of communication were used (and sometimes misused), had at several occasions resulted in misunderstandings, loss of time and lack of overview by the actors that were not directly involved in the project team. To overcome the communication problems, a project where a collaboration platform was to be implemented was launched on the initiative of SigmaTool. When evaluating the implementation of the collaboration platform, the major finding was that the project and the functions of the collaboration platform were considered successful. All in all, however, the implementation at SmallTech was considered a failure.

Third, a systematic case analysis is provided. In the analysis it is concluded that even though the prerequisites and setting this case represents could be considered as ideal for ICT-enabled business collaboration, there are barriers to manage. The case analysis shows that connectedness play an important role in the fact that the reception of the information technology application went awry in the studied case of the SmallTech network. A proposed explanation to why the implementation went awry is found in the fact that SmallTech had to take their position towards their customers into account. To adopt the procurement systems that were offered by other firms in the network were prioritized. The paper is concluded with suggestions for further research on how to develop theory on diffusion of technology information technology with support of the IMP-approach.

Introduction

The purpose of this report is to present a study on how new applications of information technology were received in the case of SmallTech. The network approach, based on the work of the IMP-group (e.g., Håkansson, 1987; Håkansson & Snehota, 1995; Axelsson & Easton,

1992; Ford, 2002; Håkansson & Waluszewski, 2002), will construct the theoretical frame of reference. The underlying argument for applying the network approach to is that the study of conducts on business markets demands attention of some specific characteristics since the settings on business markets differ quite substantially from the settings on consumer markets. Focus on discrete transactions or arm's lengths relationships, as the unit of analysis, will not capture the inherent complexity of business markets.

The report has the following disposition. First, the theoretical framework that will be applied in the case analysis is presented. Second, the empirical findings are presented in the form of a single case study. Third, an analysis is made on the empirical findings and fourth and finally, conclusions and suggestions for further research are presented. The empirical findings in this report are obtained through a qualitative research approach. In-depth interviews with key informants were conducted during 2001 and 2002. The author attended several meetings between the two firms in the focal relationship, SigmaTool and SmallTech, regarding the project that the case study aims to describe. Documentation in the form of project plans and evaluation minutes have been studied.

The focal firm is the manufacturing firm SmallTech. This does not, however, mean that the suggestion of for example Wilson (1996), that studies of buyer-supplier relationships need to approach the dyad from both ends and collect data from both sides of the relationship, have been overlooked. The focal relationship is the relationship between SmallTech and SigmaTool, SmallTech's supplier of machining tools.

Theoretical framework of reference

As mentioned in the former section of this report, the study of conducts on business markets demands attention to some specific characteristics since the settings on business markets differ quite substantially from the settings on consumer markets. The underlying principle (Håkansson, 1982) is that, first, studies on business markets need to focus more on the relationship that exists between buyer and seller than on single purchases or business episodes. Second, and in contradiction to the more marketing-mix oriented approach to marketing, both the seller and the buying party should be considered as active parties and therefore the interaction between firms has to be studied. Third, since the relationships often are complex and involves large investments in adaptation, co-operation and infrastructure, the relationships often reach over a long-term period, industrial market structures are stressed to be stable. With these insights in mind, the IMP-group developed a new approach to the understanding of business markets. In the first study, the IMP-group demonstrated existence of stable and long-term dyadic relationships on business markets and develops the interaction model as an analytical framework (IMP-Group, 1982). In later work by the IMP-group, a shift from the study of the dyad towards a higher level of aggregation, namely the network, can be traced. Here, the objective is to expand the analytical framework from the dyadic relationships to the dyadic relationships in the context of other relationships (e.g. Håkansson, 1987; Axelsson & Easton, 1992; Håkansson & Snehota, 1995; Ford, 2002). Or, as put by Easton (1992) in his review of the development industrial network paradigm, that the network approach adds the knowledge that the focal firm cannot be managed, or studied successfully, without consideration of its relationships to other firms and that each firm represents a channel to other relationships.

In this report, the network is defined as *a set of connected relationships* (Johansson & Mattsson, 1992). There are, however, other interpretations of the somewhat ambiguous concept of the network. Those interpretations are, for example, to view networks as structures or processes (Easton, 1992). Before digging deeper into the concept of connected relationships, which are key parts of the definition applied in this report, there is a need to address the basic analytical elements within the network approach. The basic elements that form the structure of the network model are *actors, resources and activities* (Håkansson & Johansson, 1992). The model design suggests that different actors in the industrial system carry out activities and control resources. When actors perform activities, they use (change or exchange) resources. Activities are linked in activity chains and resources are tied to activities as means used by actors when they perform activities. To clarify the description of an actor, five general characteristics could be applied (Håkansson & Johansson, 1992). First, actors control resources. Second, actors develop relationships through resource exchange processes. Third, actors base their activities on control over resources. Fourth, actors are goal oriented in the sense that it aims to increase control over the network and. Fifth, actors have differential knowledge about activities, resources and actors in the network. Moreover, actors are connected and controlled through different kinds of bonds (Håkansson & Snehota, 1995). These bonds could for example be of social nature as they arise in a relationship between two companies working close together. Bond could also be of technical, legal or economic nature as two businesses close contracts with each other to co-operate.

Two important concepts within the network approach are the concepts *connectivity* and *embeddedness*. The two concepts are interrelated but still somewhat different. The credit of developing the theoretical concept of embeddedness is most often given to Granovetter in his

studies on social networks (Granovetter, 1973; Granovetter, 1985). The concept embeddedness seems to be one of the underlying arguments of studying networks instead of separate firms or relationships. The critique is that since reality does not consist of firms as atomistic islands, studies of firm behavior needs to take a contextual approach (e.g. Håkansson & Snehota, 1990) and that it is, for example, crucial to consider the embeddedness of specific business actors (Halinen & Törnroos, 1998) in order to understand the evolution of business networks. Embeddedness could be seen as a concept with several dimensions. The dimensions of embeddedness that have the highest degree of significance in this report are structural embeddedness (Uzzi, 1997), social embeddedness (Granovetter, 1985) and technical embeddedness (Ford, 1998).

If the concept of embeddedness is rather broad, the concept of connectedness, here seen as an extension to embeddedness and related to two or more embedded relationships, is more specific. Connectedness has been argued to be one of the most central characteristics of business networks (Halinen & Törnroos, 1998). To argue that two or more relationships are connected (Cook & Emerson, 1978), or to define a network as a set of connected relationships (Johansson & Mattsson, 1992), is to say that exchange in one relationship affects, positively or negatively, another relationship. Further on, connectedness can appear direct and indirect. Also, for each actor, the connectedness can be positive or negative. Thus, connectivity implies that what events in one relationship are dependent, for good or for bad, on events in other relationships, and vice versa. In line with this reasoning, Håkansson & Snehota (Håkansson & Snehota, 1995, p. 3, emphasis added) concludes that:

"[The explanation to] what is happening in a certain relationship can be searched for, to some extent, in factors 'external' to the relationship itself. Each relationship appears then as embedded in or connected to some other relationships, and its development and functions cannot be properly understood if these connections are disregarded"

In this report, the network approach, the analysis will follow the structure of the network model. In order to understand the promise of information technology as it was interpreted in the SmallTech case, and the reason why the reception of the application went awry, the network model and the concepts of embeddedness and connectedness will be applied.

The promise of information technology: an exploratory case study

In this section, an exploratory case study of the promise of information technology in the SmallTech network will be presented. First, the focal firm and the focal relationship will be presented. The two firms forming the focal relationship are SmallTech and SigmaTool. Second, the underlying reasons to why information technology was interpreted as promising will be presented. Third, the implementation process will be presented.

The focal firm of this empirical account is the medium sized machining firm SmallTech. Situated in Tidaholm, at the plains of Västergötland in mid-Sweden, the production site is strategically positioned close to Skövde and not that far from Göteborg. Even though a detailed history of the firm will not be provided in this account, it could be mentioned that the firm has its antecedents in the conglomerate that today is called Swedish Match. In 1868, the mechanical shop, today named SmallTech, had its core business in machines for the light match industry. The core business is different today as the main customers to SmallTech can

be found in the automotive industry. By the definition of OECD and the European Community, SmallTech could be categorized as a medium sized firm with an annual turnover of approximately 13 million EUR and approximately 95 employees working on two different production sites. One of the production sites is situated in Tidaholm and the other in Liatorp. In the role as supplier to relatively larger businesses within for example the automotive industry, SmallTech produces a range of different products, as for example tailpipes and branches, in competition with other actual and potential suppliers both within and outside Sweden.

From SmallTech's viewpoint, day-to-day conducts with increased pressure from their customers has made it important for the management to achieve a higher level of productivity in their production processes. The production is mainly to machine details in metal, i.e. to drill, mould, cut and mill details later assembled in cars, trucks or other end products. Apart from the subcontracting, SmallTech has also developed own products. They have, for example, developed their own solution for an adjustable steering wheel system, which they are marketing to the automotive industry. During the last years, SmallTech's customers have expressed an aim to concentrate the supply base and to migrate towards more collaborative relationships. This, as a consequence of the customer's aims, has of course affected the way the management at SmallTech approach customers. Even though the partnership approach entails additional competition, SmallTech has all in all reacted positively the development.

The relationships that SmallTech has with relatively large customers like RoboTech, AlphaTech and BetaTech are of course important. All three are firms that purchase details from SmallTech and all three are important actors and in the Swedish manufacturing industry.

All three are international firms with tenth of thousands employees. To handle the progress towards closer relationships with their customers, and also with their suppliers for that matter, the exploitation of information technology has been considered by SmallTech as the enabler of closer integration and cooperation. To be competitive, the lead-time from a request from one of SmallTech's customers to production and delivery need to be shortened. The production manager at SmallTech even argued that the need for information was so pressing that they often needed the to decide on appropriate tools and machines even before they got the order.

One of the suppliers of SmallTech is the tooling firm SigmaTool. Since 1996, SigmaTool, a large Swedish supplier of tools and tooling systems, has developed its business activities by using information technology applications. At first, the development was towards electronic commerce with the purpose of automation of transactions and to create an efficient order process. From around 1998, as new applications were available, the development turned towards more complex electronic business applications. By adding an electronic service offer within an extranet, SigmaTool intended to exploit more of the benefits that information technology could make possible. During the summer of 2001, a project with the objective to develop and test a business collaboration platform as a part of an electronic business offer was launched at the headquarters at SigmaTool. Some months before the launch, during the spring of 2001, the field agent at SigmaTool responsible for the SmallTech account invited the production manager and his staff to participate in the project.

The two companies that form the focal relationship in this case study has a long history of business with each other. To capture the business atmosphere, affecting the business

relationship, some characteristics can be accentuated. First, SmallTech and SigmaTool, on the initiative of SigmaTool, had agreed on signing a partnership agreement. Thereby SigmaTool was considered the preferred supplier and an important actor within SmallTech's various productivity projects. Second, in 2001, SigmaTool had, a result of several years of close cooperation and interaction, a 95 per cent share of all metal cutting tools purchased by SmallTech. Third, SmallTech and SigmaTool had, for some years, working on the implementation of different and separate information technology supported systems, mainly for automation of purchasing processes and supply management. Fourth, SigmaTool was also the supplier of tools to most of the important customers of SmallTech.

From SigmaTool's viewpoint, and with focus on information technology exploitation in customer relations, increased pressure from both competitors and, also, new and competing transaction oriented market channels, with the focus more on price than on relationship, was stressed as elements of concern in the current business environment. The development of new and open marketplaces where price and smooth transactions were competitive advantages was seen as a threat to the present interaction between SigmaTool and its customers. In line with general trends in supply management, work is made on establishing partnership agreements with selected customers. New technologies have an important role in this development.

The collaboration platform that was developed by SigmaTool had the characteristics of an extranet. The main function of the extranet is to extend the access to former internally used systems to customers, suppliers and other collaborators (Vlosky et al, 2000; Chaffey, 2001). As an attempt to identify the context in which the anticipated benefits and the willingness to become a pilot for the collaboration platform, it could be mentioned that the relationship

between SigmaTool and SmallTech had some specific characteristics. Some of these characteristics had led to problems in communication, creating concerns for by both parties. The bulk of the activities within the business relation were connected to different projects with the purpose of optimizing SmallTech's production. Within these projects that were carried out, several participants involved where working with a spatial distance. The communication within the projects was conduced over a plethora of communication channels as for example mail, e-mail, telephone, fax and separate and fully or partly web based systems. The present communication processes, where several channels of communication were used (and sometimes misused), had at several occasions resulted in misunderstandings, loss of time and lack of overview by the actors that were not directly involved in the project team.

When searching for appropriate applications, the supplier of the corporate communication system that was used by SigmaTool had an inbuilt application that was suitable for the purpose. The supplier, the software firm SoftTech, provided a solution that had many advantages and that attracted the project manager at SigmaTool. SoftTech was a web-based solution for creating team workspaces for collaboration. The major advantage was that non-technical professionals could, without much assistance, create an electronically shared workspace to support a project. Further on, the solution had the advantage of being accessible through the Internet. Authorized project members could thus easily access the workspace to communicate, maintain a project calendar and organize project information. When the field agent responsible for the SmallTech account at SigmaTool invited the production manager and his staff to participate in the project, the response was quite positive. SmallTech was one of three proposed pilots for the collaboration platform. All three pilots were established

business partners to SigmaTool. They were, however, different in terms of size and in terms of what business they were in. SmallTech was the smallest of the three pilots and, also, the only one of the pilots that did not assembly the end product of their supply chain.

Several earlier attempts to implement ITC systems had been done. The result of these attempts was expected to have impact on the implementation and on the commitment affecting the implementation. Moreover, the actual output was questioned. However, even though former attempts had failed, the production engineers and the management team at SmallTech decided to participate as a pilot. The projects at SmallTech were driven by the objective to improve productivity, and, clearly, time in projects was an important concern in their day-to-day activities.

The collaboration platform that this report concerns was implemented among the pilot firms during the spring of 2002. At SmallTech, actors involved in a handful of projects already initiated or about to be initiated were instructed in how the new application functioned. One specific project was particularly interesting. During a period of years, SmallTech had been machining a detail for RoboTech. The machining was troublesome due to quality fluctuations in the material supplied to SmallTech. The detail was a robot stand in cast steel supplied by a Swiss foundry. The idea was to use the project platform as the communication arena for actors involved in trying to overcome the problems. Since the details supplied from SwissTech had fluctuations in quality, the machining turned costly for SmallTech due to, for example, heavy wear on tools and interruptions in production. Actors from Robotech, SwissTech, SmallTech and SigmaTool were invited do deal with the problem.

For several projects and their documentation, the collaboration platform was used. However, the project experienced problems to get the actors involved in the project committed to use the platform for communication and collaboration. In September 2002, the plug was pulled on the collaboration platform and the project was evaluated. We could summarize the network under study by structuring SmallTech and the firms related to the development of the extranet service in the following manner (Figure 1).

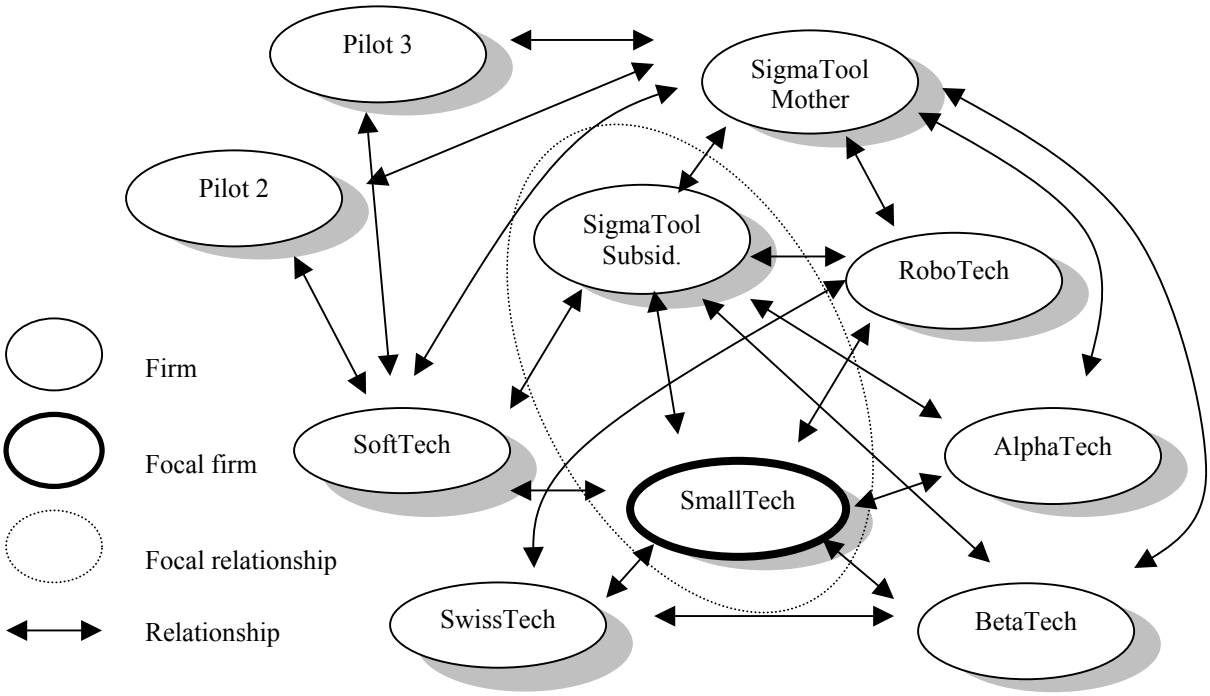

Figure 1. Important actors in the studied network with SmallTech as the focal firm and the relationship between SigmaTool and SmallTech as the focal relationship.

The major findings of the project management group at SigmaTool, who evaluated the project, was, first that the project and the functions of the collaboration platform were considered successful. All in all, however, the implementation at SmallTech was considered a failure. For the other two pilot firms, the project was considered a success. Second, the need for improved information sharing in projects was considered critical for the firms to secure competitive advantage for the future. Part of this was due to the fact that SigmaTool realized

that the follow-up of projects, both within SigmaTool and with SigmaTool and its customers in cooperation, could be improved if information was shared to a larger extent. Third, the response from the customers was that they clearly saw the advantages of the collaboration platform concept. One of the critical factors, however, considered being to get the persons at the two firms to continuously use the system, both within SigmaTool and among the customers. It was concluded that the system is useless if not both parties are committed to use it. In the following section the network approach and the concepts of actors, activities and resources will be applied in the analysis.

Case analysis

Even though the prerequisites and setting this case represents could be considered as ideal for ICT-enabled business collaboration, there are barriers to manage. In the case of SmallTech, the implementation was considered a failure. If a case like the relationship between SmallTech and SigmaTool, where environmental factors drives the businesses to integration and closer interaction, where the business relation embedded in a competitive environment shows closeness and trust, and where the interaction shows need for better overview and increased efficiency in running project, still shows impediments to adoption, it is no surprise, as Dutta and Segev (1999) concludes in their article on business transformation on the Internet, that rather few firms have actively transformed their business activities, in a way that could be described as a change from currently used business models into something ICT-enabled different.

The project that was launched aimed at creating a higher degree of integration. The activities related to specific projects carried out needed coordination. An analysis of the situation before

the implementation showed a situation where individual actor representatives, for example the field agent a purchasing officer or a production engineer, could (and did) communicate through several channels of communication to either one (or several) actor/s representative/s in the relationship. The expected output could very much be related to what scholars have described as a collaborative approach in supply management (e.g., Stank et al., 2001). The idea was to bring together the communication on a single platform. This, in turn, was expected to enhance the efficiency in the relationship. Through the gathering of information and documentation created in specific projects or activities, mistakes and costs related to these were to be avoided.

The case account reveals quite a lot of information about the activity structure in the network, and, in particular, in the relationship between SigmaTool and SmallTech. Even though close social bonds and technical bonds were established and, further on, that both firms made it clear that they could benefit from implementation, something went awry in the implementation. The two actors had a history together, and, in addition, they had a shared context that affected them.

For several years, the activity links had been shaped to fit a project-based work approach. In fact, some answers to why the project was initiated in the first place can be found in the activity structure that had been created. Over the years, increased use of different communication applications disrupted traditional channels of information and the activities carried out. This, in turn, led to costs and complications. To gather all information related to a specific project in one single database, accessible to all actors involved, was expected to solve some of the problems. A closer look, however, on the activity structure as a whole showed, in

retrospect, showed that the production of SmallTech was relatively stable over time. They had large customers in, for example, the automotive industry that usually over a long period of time ordered large batches of products with only minor changes. Thus, if SmallTech experienced business as usual with no large changes in production, the execution of large projects were rather few. As it showed, during the time of the pilot project, only minor projects were carried out. Smaller project did not seem to have the same intrinsic need for coordination as larger projects and therefore, communication was handled without using the collaboration platform.

SmallTech, being a rather small actor in its immediate network, were quite dependent on its counterparts in terms of the development of new technical applications enabling them to achieve efficiency in the supply chain. Some year before SigmaTool initiated their project to exploit information technology in customer relationships, some of the customers of SmallTech launched similar projects. AlphaTech in particular is known as a firm that takes advantage of its position as a large actor using its relative power to pressure small suppliers to adopt their applications when it comes to electronic procurement. The message from AlphaTech and firms alike was quite clear. Either a supplier goes by the demands of the large firm, or they are out of question as suppliers. Large actors, of course, have the resources to develop their own procurement applications. SmallTech, however, had no such resources. Further on, SmallTech were not in position to oppose their customers. Today, SmallTech has one single purchasing officer who in charge of SmallTech's procurement. In this light, assuming that the production engineers and purchasing officers at SmallTech needed to prioritize among the systems they were to adopt due to limited resources to educate

purchasing officer and other persons authorized to deal with inter-firm relations, the question of which systems that were the most important for them had a simple answer.

In conclusion, this case gives support to the statement that connectedness play an important role in the fact that the reception of the information technology application went awry in the studied case of the SmallTech network. The fact that the implementation went awry could have its explanation in the fact that SmallTech had to take their position towards their customers into account. To adopt the procurement systems that were offered by AlphaTech and firms alike were prioritized. The efforts of SigmaTool were indirectly affected by indirect connectedness by AlphaTech and firms alike, through the structures and position that the actors embedded in the network had. Here, we could come back to what was mentioned in the theoretical framework (e.g. Håkansson & Snehota, 1995) where connectedness was stressed as important when trying to understand the developments and functions of business relationships. SmallTech's dependency on large actors in their immediate network were more important than the fact that there where environmental factors that drove SmallTech and SigmaTool to initiate a project to increase integration and achieve closer interaction. Even though the relation showed closeness and trust, the implementation resulted in failure.

Concluding discussion

The empirical accounts presented in this report are probably not unique in any sense. There are probably numerous small business managers that are dealing with similar questions in terms of information technology adoption. A look around among Swedish firms will probably show that more or less every firm tries to exploit technology to achieve the benefits of efficiency that information technology is told to promise. Somewhere in the middle of the

pandemonium of new application we will find managers like the ones at SmallTech. Should they accept to implement all the different systems that all the different large actors in the network offer them? Or, should they deny and try to manage without information technology as they have done before? Do they have any choice but to give in and accept the changes? Further research will hopefully expand the perspective of information technology diffusion from the dyad to another aggregation level, the network, and to study what happens when new information and communication technology is used to handle co-ordination in an industrial setting. In contrast to the traditional voluntaristic approach in diffusion research (e.g. Rogers, 1995), this research suggests that dependencies, power, connectedness and embeddedness are important key features that need to be taken into account when trying to understand the spread of new applications of information technology in industrial networks. Several interesting research questions could be proposed for further research. For example, and with the aim to develop theory on diffusion of technology information technology with support of the IMP-approach, the question could be stated as:

- What explanatory power does the network approach, as an alternative to other explanatory frameworks in diffusion research, have, to shed light to the understanding of the spread of new information technologies in industrial networks?

For a thesis project, a proposed purpose that includes both the contextual influence on information technology diffusion and, also, the effects of information technology diffusion, could be stated as:

- To study the effects of, and the contextual influence on, information technology diffusion in industrial networks.

For such an enterprise, an analytical framework for understanding information technology diffusion is needed. As this report shows that there is a lot to gain from adopting a network approach when studying implementation of new technologies, the attempts hitherto made by the author could be seen as a call for such an analytical framework. Since information technology has been argued to be one of the most important current concerns among managers and purchasing and supply executives (Carter et al., 2000), information technology diffusion in a network context can further on reveal insights with important practical relevance.

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About the author

Jens Hultman is a PhD Candidate in Business Administration with emphasis on Industrial Marketing at the Department of Entrepreneurship, Marketing and Management, Jönköping International Business School, Sweden; P.O. Box 1026, SE- 551 11 Jönköping, Sweden; Phone: +46 36 15 77 00; E-mail: jens.hultman@jibs.hj.se