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# Local software development in industry globalization

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# LOCAL SOFTWARE DEVELOPMENT IN INDUSTRY GLOBALIZATION

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## Abstract

*This paper presents the results of a research project, in which the situation of local software organizations operating with global industrial customers were examined. The prospects of locally operating software organizations have been lately dimmed by the processes of globalization, IT outsourcing, and offshore software development. The current situation of local software organizations is analyzed, and also trends and challenges that they face in the future are described. In the study, qualitative analysis with grounded theory was used as the research method. The analysis identified three types of local software organizations.Using business processes, technologies, and types of customer relationships and cooperation as the basis, these types can be labelled as Anticipator, Specializer and Collector. Local software organizations had recognized their inability to compete with globally operating software enterprises and they had difficulties in coping with changes in competition caused by outsourcing, mergers, and offshore development. The analysis of future trends produced three possible models of cooperation between asymmetrical partners, tailored solutions provider, software producer, and capacity provider.*

*Keywords: Software organizations, business asymmetry, qualitative research, future trends*

# 1 INTRODUCTION

One recent development in the field of information technology has been the outsourcing of information technology work (Dibbern et al. 2004). The trend has further expanded under the term offshore software development, which basically means outsourcing of software development work to lower costs countries. The main motivation behind the offshore development is to reduce software development costs (Gopal et al. 2002). With lower per capita labor costs, global industry customers benefit from moving parts of the development work offshore. Countries such as India and Russia have established a significant presence in this market. Software companies in high labour cost countries face a new situation in this kind of competition.

The forest industry is one example of a globally operating industry. Southeast Finland has one of the world's densest concentrations of forest industry, consisting of pulp, paper and paperboard mills, wood saws, surfacing and impregnation mills, and plywood factories. During its history, this concentration has also created a cluster of service organizations, including IT service providers, automation experts, and specialized software and systems organizations. These service organizations of various sizes must cooperate with the multinational and globally operating forest industry enterprises.

Paper consumption in the world can be characterized by a relatively strong growth and its emphasis in Southeast Asia and Latin America (Jaakko Pöyry Consulting 2004). This kind of development is about to lead to a situation where forest industry corporations must either globalize or concentrate on a particular geographical area (Siitonen 2004). The development has naturally its effects on their information systems needs in the future and in that way also on the success of the software organizations in Southeast Finland having forest corporations as their customers.

Although this concentration of forest industry in the area has created a group of IT and software organizations serving the industry, the situation among these IT and software organizations is far from perfect. Especially the competitive circumstances of the software organizations can be characterized as unique. Most of the local software suppliers to the forest industry are small, having less than ten employees. There is only one large, globally operating software organization in the region. The others are small by any standard and have hard times when trying to compete with the large globally operating software organization and with other global players operating from elsewhere.

Our study investigates and characterizes the situation and seeks ways to increase the awareness and improve the practices of local software and systems development organizations who wish to operate with global industrial customers. In a theoretical sense, the relationship between the local organizations and their global customers can be characterized as asymmetrical (Doz 1988; Blomqvist 2002), i.e. their resources and sizes are not equal. In this kind of a situation a global customer could easily replace its local software supplier in a way or another. We assume that this kind of a situation has effects on the cooperation and software development process between the two parties.

This study is a part of a larger research project focusing on the software industry in the geographical area. The project started with a general survey on all software organizations in the area (Nikula et al. 2005). Based on the results of this survey, the research question and target organizations of this study were selected. The general survey strengthened our view on the importance of the forest industry sector to the software organizations in the area. The objective of this study is to find out how this kind of asymmetrical, globalizing environment consisting of mainly small software organizations affects to the position and practices of local software organizations. Our purpose has been to analyze the current status of those organizations delivering software to forest industry, their problems and best practices, and estimate their future possibilities and challenges, and, finally, to suggest actions and further development to the participating organizations.

The data for this study was collected using theme-based interviews. We interviewed representatives of the software organizations and forest industry corporations in the area. The research process obeyed the qualitative grounded theory method (Strauss and Corbin 1990).

We start this paper by making some connections to existing research (Section 2). After that, we describe the research process in detail (Section 3). The results of this study are presented in Section 4 and 5, where we classify the local software organizations, present how their business and specialization can be characterized (Section 4) and describe some future possibilities for local software organizations from the viewpoint of a global industry (Section 5). These results and their effect on the possible paths of development of local software organizations are then discussed in Section 6, where we also present some implications of this research. Section 7 summarizes the results.

# 2 TYPES OF SOFTWARE ORGANIZATIONS IN LITERATURE

A typical Finnish software company is rather small in size. Based on recent national software survey 53% of Finnish software companies have one to ten employees (Jokinen et al. 2004). According to same survey, 80% of Finnish software companies have less than 50 employees. Small organizations prevail in software development globally as well. US Census Bureau reports that in United States 91 % of establishments in "Computer Systems Design and Related Services" have less than 20 employees (U.S. Census Bureau 2005).

Despite of this fact that most software organizations are small, customer organizations are becoming bigger. Globalization and consolidation of industries are changing the competitive landscape of software organizations. The relationships between small software organizations and their large customers have not attracted the attention of researchers much. The common problems and best practices in small software organizations may differ from those problems and best practices in bigger software enterprises (Fayad et al. 2000; Hofer 2002) .The studies focusing on the asymmetric relationship between a software supplier and its customers are very rare. Blomqvist (2002) has in her doctoral dissertation made a framework of asymmetric technology partnership formation. The study does not concentrate specifically on software organizations but in ICT companies overall.

Several studies concerning software companies, their typologies and their business models have been made during past few years. Hoch et al. (1999) have made a qualitative world wide survey of software enterprises. According to them three main types of software business are mass-market packaged software, enterprise solutions and professional services. Another coarse classification is done by Cusumano (2004). Cusumano divides software companies to product companies and service companies. Between these two categories Cusumano places his third category, hybrid solutions, which consists of software companies coping with both product and services business. Carmel and Sawyer (1998) have divided areas of software business as packaged software, custom information systems development and embedded software.

Several typologies concerning one country or one region have been made and they mostly consist of similar kind of categories than mentioned above (Boltramovich et al. 2005; Groves et al. 2000; de Fontenay and Carmel 2004; Arora et al. 1999; Tähtinen 2000; Sallinen 2002; Isaksen 2004; Nathan Associates Inc. 2003). The viewpoint and focus of these studies differ from each other but the software business is seen quite similarly regardless of the nation or the region. Rajala et al. (2001) have built a framework for analyzing business models in software industry and extracted from the model a set of possible types of software businesses. These kinds of classifications and typologies enable us to see the field of software development as a whole. However, they do not give us much when approaching small organizations, their problems and daily survival strategies and the asymmetry between a small software organization and its global customer. In addition, many of these studies are mostly focusing on bigger software enterprises. Therefore, it is our view that the situation and characteristics of small local software organizations require a thorough analysis.

# 3 RESEARCH PROCESS

The project (Figure 1) started with a general survey about all software organizations in the region of South-East Finland (Nikula, Jantunen et al. 2005). Our project partners visited all software organizations in the area and evaluated their practices with a survey (Nikula, Jantunen et al. 2005). The

results of this phase included for example the list of most important issues in software development and categories of businesses that are customers of the studied organizations. In addition, the phase produced all important statistics and key figures of the organizations in the area and information about the technologies and products used in each of the organizations.

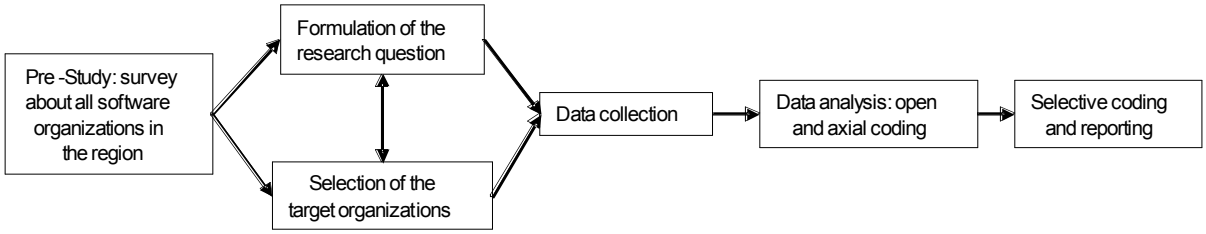


*Figure 1. Research process*

Using this information, we were able to put our concentration on the issues that seemed to cause most concern to the organizations. According to the study (Nikula, Jantunen et al. 2005), most important issues needing further development were related to the beginning of software development projects, like to project planning, requirements specification, and architecture design.

Another important piece of information from the first phase was the identification of customer clusters of the software organizations in the region. There were two major clusters that were important for the local software organizations, namely forest industry sector (20% of customerships) and IT industry sector (19% of customerships). Because we were not able to study in depth all the 99 software or IT companies in the area, we decided to concentrate on those organizations that are producing software for forest industry sector. In addition, we decided to take also the major forest industry corporations and their software acquisition processes into our focus. Our aim was to compare and analyze the views of both software organizations and their customers in forest industry

After this decision, we checked all the possible organizations in the area and selected 10 local software organizations, one globally operating software corporation, and four large forest industry locations as research targets. All in all, we had 15 organizations in our research population and because we visited in some organizations twice, we made in total 19 theme-based interviews in our study.

The research question was formed from the fact that according to the general survey, most perceived problems and tasks needing more support were situated in the project beginnings, in phases like project planning and requirements specification. Therefore, we decided to start data collection under the working title “Software project beginnings in small and middle-sized software organizations delivering software for the global forest industry”. We understood that one of the most important concepts will be the asymmetry between the organizations (Doz 1988; Blomqvist 2002) – in this case the software organizations were very small and local when compared to their global customers.

The data for this qualitative study was collected using theme-based interviews. All the 19 interviews lasting from 30 minutes to two hours were recorded and fully transcribed as text. The data was collected during October and November 2004.

The collected data was analyzed according to the grounded theory method (Strauss and Corbin 1990). Qualitative research requires an ability to interpret people’s actions and verbally expressed thoughts. In addition, these interpretations must be confirmed from the research data and from the experiences of other researchers and practitioners (cf. Klein and Myers 1999). Because our research included three researchers in a close cooperation, we were able to constantly confirm our interpretations from each other. The analysis started with open coding, where three researchers analyzed all the transcripts. In the beginning, each researcher had a different viewpoint to the data. In the first viewpoint we concentrated on observing problems and best practices in the cooperation between local software organizations and global industry customers. The second viewpoint focused on business partnerships between small and large organizations and their expectations of the future. In the third viewpoint we studied how the software projects are initialized in the observed software organizations. This way, we were able to

implement investigator triangulation (Denzin 1978) in our study and confirm our findings in weekly meetings between the researchers.

The open coding of each of the viewpoints started from the "seed categories" provided by the viewpoint. For example, in the second viewpoint, "how can the business partnerships between the local software organizations and their global customers be characterized and what are the expectations for the future?", we started open coding by searching for mentions from the interviews about the current relationships, weaknesses and strengths of the partnerships as well as future expectations between the local software organizations and their forest industry customers. The conceptual categories of "current relationship" and "future expectation" can thus be regarded as the high-level seed categories of the data analysis. This "open coding" phase (Strauss and Corbin 1990) proceeded iteratively in parallel with the "axial coding" phase, in which relationships (such as causes, is associated to) between the identified categories were built.

The analysis ended with "selective coding" in which the core of the research results was formed. In this phase, the three viewpoints were consolidated and a coherent story about the phenomenon was written. The first viewpoint concentrated on problems and good practices in the cooperation and described the current situation between local software organizations and global industry customers in the area. The second viewpoint that focused on the business relationships between small and large organizations clearly expressed the future possibilities of the local software organizations from the global industry point of view. Unfortunately, the third viewpoint, software project beginnings in forest industry, did not add much to the picture. The observed issues in project beginnings were much the same than reported commonly in software development projects.

With the first two viewpoints we were able to describe the situation, challenges and future possibilities that the local software organizations are facing when dealing with their global customers in the area. The following two sections describe the results of this analysis process.

# 4 OBSERVATIONS ON LOCAL SOFTWARE ORGANIZATIONS

Based on the gathered data from interviews we were able to recognize the best practices and common problems of studied small software organizations. This was one of the major points of view in this research phase. We were also able to characterize these small organizations and we identified three different types of software organizations and their typical features.

## 4.1 General observations on the relationships between the small and the large

According to the interviews, most of the small software organizations expressed themselves flexible, innovative and cost-effective. They considered themselves more productive than how they felt bigger software enterprises are.

Flexibility, cost-effectiveness, and innovativeness were also the features that forest industry enterprises considered the most important factors in the relationship between them and small software organizations. Some comments concerning flexibility and cost-effectiveness are included here:

> *"It is probably some level of flexibility. We are able to adapt to customer needs. Bigger enterprises are not so flexible because they tend to make software products that are not so easy to tailor according to customer needs. … another reason has probably been our cost-effectiveness"*
>
> *"Q: So …you see that your strength has been the ability to react quickly?*
>
> *A: Sure. That is definitely one reason. We are able to react fast to what a customer wants and wishes, at least we try our best and we are able to do it quickly."*

Based on the interviews, some software organizations had already cooperated with each other in some extent. Cooperation had so far mostly been related to the adoption of technology. Some small software organizations had also acted as subcontractors for bigger software enterprises. The extent and quality of the cooperation differed considerably. Some organizations had constant relationships with others and

some small organizations cooperated only in an ad-hoc basis. Still, most of the small software organizations were interested in networking. They considered themselves too small to act as a leader in a network and expressed the need for a bigger organization to lead the network. Despite of the fact that some organizations were suspicious towards the benefits of networking, most of the small organizations felt that networking will be become inevitable and the only way to survive in the competition with bigger software enterprises.

Small software organizations considered the market situation in the area challenging. They felt that big international software enterprises are expanding their market share and this will make the business opportunities of small organizations more difficult. Small software organizations considered that the requirements of the forest industry customer are becoming more and more demanding. According to small organization representatives, a forest industry customer tries to avoid risks and therefore they felt that it is difficult for small organizations to show enough credibility and liability. Some comments concerning liability and continuity are included here:

> *"Q: What does forest industry think about small software companies; your company is quite small?*
>
> *A: Yes, we are a small organization. We have heard from industry representatives that we are a business risk for them. They think that it is risky to operate with a small company, because they will never know when the business ends."*
>
> *"…continuity is an important issue. A company has to be alive still after 5 or 10 years. Another important issue is support, like helpdesk, which is definitely one problem for small software organizations."*

Some organizations felt that coping with a global forest industry enterprise is difficult because the big customer dominates the relationship. These small software organizations considered that the flexibility means to the customer a possibility to re-schedule projects or change their deadlines. In this kind of a relationship a small software organization has to follow these changed schedules and deadlines to keep the customer satisfied. According to some small organizations, a forest industry customer also requires the local software organizations to be more cost-effective than bigger software enterprises.

### 4.2 Three types of small software organizations

We identified three types of small software organizations. This classification was based on the business processes, the number of technologies, and the types of customer relationships and cooperation with other organizations. We named these types as *Anticipator*, *Specializer* and *Collector* (see Figure 3).

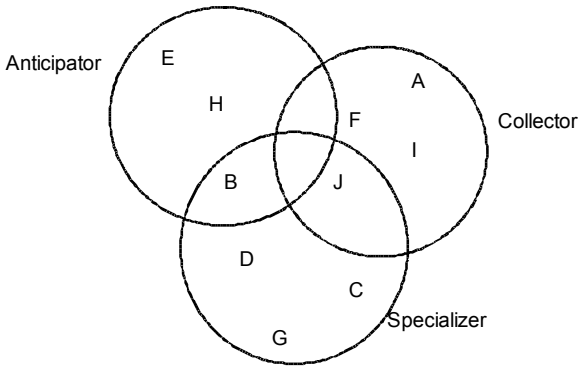


*Figure 3. Three identified types of software organizations*

An **anticipator** acts proactive and tries to recognize weak signals and emerging new technologies. It seeks new information system and product solutions for its customers constantly and tries to implement these solutions to add value to a customer's business. This type of an organization is interested in making long-term plans concerning the development of solutions with its customers. In the following, a comment describing the way of working of an anticipator is cited:

*"...the sooner we have a mutual view with the customer, the sooner we are able to test our solutions and bring a mature technology for our customer. Nobody wants to pilot themselves, it is always better to have a partner in the evaluation. "*

An anticipator usually has several long-term customer relationships. The cooperation is typically guaranteed with agreements. An anticipator tries to deepen its customer relationships by evaluating and making pilot projects together with its customer. It considers customer relationships as its most valuable asset and therefore it takes good care of its customer relationships.

An anticipator has usually several subcontractors, which are used when an anticipator is not able to supply a certain specific technology or solution to the customer.

A **specializer** has a strong competence in one or two technologies. It develops its technology competences proactively. A specializer does not have cooperation in its main technology areas. However, other software organizations and customers would be eager to cooperate with a specializer because of its strong technological competence. Therefore this type of an organization does not need much marketing or sales promotion actions. In the following, a comment describing a specializer's actions is shown:

*"...we had earlier contacts with our present customer so they already knew what we had earlier done and what we are able to do. This made our work much easier because that work was already partly done."*

A specializer may also have one or more products of its own. Usually specializers carry out tailored projects and in the same time they develop their products.

Typically a specializer has one or two big customers. This low number usually helps specializers to build their support processes. Customer relationships are typically long-lasting and strengthened with cooperation agreements. A strong technological competence makes specializer different from the other two types.

A typical characteristic of a **collector** is its fragmented business. A collector can be compared to a general store that sells and makes anything a customer is willing to pay for. A collector may develop a software product of its own and it can also act as a hardware reseller. A collector has many customers and different types of customer relationships that typically do not last for a long time.

A collector builds actively networks of different specialists that act as subcontractors in projects. A collector may also act as a broker trying to bring suppliers and customers together.

Some collectors see the processes of requirement specification and project management very important and they have also developed these processes. Other collectors consider process improvement as a waste of time and have not invested to it at all. The following example shows how a representative of a small software organization considers this issue:

*"...Our company is so small that we do not have time or resources to make lots of specifications. It is in my responsibility to think how our business can be profitable and how we can earn money. It is a shame that we are not able to close the doors for a while and do these things better. Surely, this would be better after all..."*

# 5 FUTURE POSSIBILITIES FOR LOCAL SOFTWARE ORGANIZATIONS – GLOBAL INDUSTRY VIEW

One of the most famous buzzwords of our time is the networked economy (Tapscott and Caston 1993) which emphasizes the role of information technology in forming business structures and networking between organizations. However, despite that they recognize the need, most of the small organizations do not have means and experience to form networks with others and in practice only rare occasions of networking between small organizations exist in the area.

The interviewees from the global forest industry expressed several possibilities for cooperation between small local software organizations and global industry enterprises. It became evident that small software organizations did not have much possibility to operate with global the forest industry in the area of

"operative business systems" (Figure 4). The forest industry wants to avoid risks and therefore it selects large organizations as their partners in this area. There is also a tendency in the industry to reduce the number of IT partners and standardize the technology infrastructure and information systems. This tendency is not favourable to small software organizations.

Global industry representatives suggested that small local software organizations could survive in a competition by concentrating on certain competence areas or dimensions. These dimensions were the level of technological 'sophistication'(Kaufman, Wood et al. 2000), resource providing (Imrie 1994), the industrial domain knowledge (Kaufman, Wood et al. 2000) and the level of software engineering knowledge (Carmel 1997; Alajoutsijärvi, Mannermaa et al. 2000). These four dimensions, when mapped onto one another, yielded three business models for local software organizations to cooperate with their global industry customers (see Figure 4).

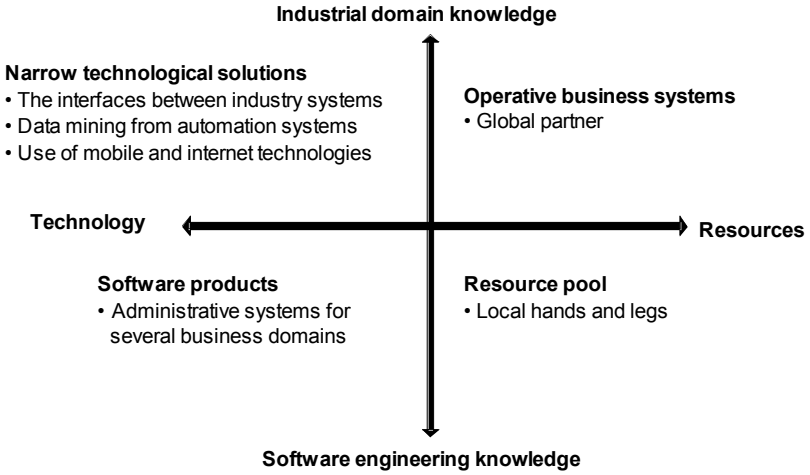


*Figure 4. Dimensions of cooperation between small software organizations and global industry*

These business models can be characterized as "narrow technological solutions", "resource pool" and "software products". As mentioned earlier, global industry representatives considered the business model "operative business systems" to be reserved for the big software companies. The following examples demonstrate this global industry view:

> *"We have formed a partnership agreement with the big software organization. According to this agreement, the big software organization maintains the template according to which we will do all the local implementations…It is an important agreement, which makes this big software organization our only partner in this business area …"*

> *"Small software organizations are also important but we cooperate with small ones in small business areas and with big ones in big business areas."*

Especially the forest industry emphasized the possibilities for small local organizations to cooperate with them in the area of *narrow technological solutions*. The mentioned technological areas included mobile and internet technologies, interfaces between forest industry systems, and data mining and information processing from automation systems. A business model based on expertise in any of these technological areas requires a close relationship with both the forest industry customer and also universities and other research institutions. In the following, examples of how a global industry representative considers this issue are shown.

> *"This kind of work needs industrial domain knowledge and knowledge of processes…"*

> *"To be able to provide tailored technology solutions the local small software organization should be innovative. This is more important than in other business models. It is more like research and development work, and this kind of an organization has to have the right attitude towards this kind of a work. It is a small but growing area…"*

Another important business area, a software organization acting as a *resource pool* or as one industry customer called it, "local hands and legs", was mentioned as an important way to cooperate. This kind of cooperation could exist mainly between a small software organization and a large software enterprise, but also between a small software organization and a forest industry customer. From the global organization point of view small software organizations could view agility to react as their strength. It is easy for a big customer to cope with a small organization, which will rapidly react to any change in customer needs. Also the local and personal presence in start-ups and maintenance was considered as an important factor explaining the success of local organizations. This excerpt clearly demonstrates how a global industry representative saw the importance of this business model:

> *"A local service is something that needs hands and legs […] This kind of relationship between big ones has the consequence that the local software business must provide more resources to the bigger enterprises…It is a resource bank. "*

The third mentioned way for cooperation between small local software organizations and the global forest industry was to *produce software products* for various business domains in the area of administrative business systems. In this area the competition is hard with many suppliers but this kind of an approach provides a possibility to sell products to customers in other business domains too.

> *"But then we have many different kinds of value added services, web- based services and extranet solutions, different kinds of administrative business systems and reporting systems. There is as much room for small software companies as in other industrial domains."*

# 6 DISCUSSION

Our results show that the picture of the types of small software organizations is far richer than most of the available analyses (e.g. Hoch, Roeding et al. 1999) recognize. The asymmetry between small organizations and their large industrial customers spices the soup even more. We asked from the representatives of large organizations their opinions about how small software organizations could continue their relationships with their large industrial customers. Our analysis led us to a view where each type of a small organization can be suggested a recipe for survival. In the following we will discuss the ways how small software organizations could continue their business relationships. We will also make some comments on the current trend of IT outsourcing, global software development and their implicit effects on systems development processes and small software organizations. We will also propose some important research topics that can be derived from our results and this trend.

## 6.1 How can small software organizations cope with a global industry?

According to our interviews, local software development has many challenges related to the industry globalization. Our study revealed that industrial customers are growing global through mergers and acquisitions while most of software organizations are not growing at the same pace. In our study, the small local software organizations recognized their inability to compete with the big software organization in the area. Small software organizations felt that the big software organization will expand its market share especially in the area of operative business systems. The global industry representatives saw the situation in the same way and gave reasons for the situation, like the reduction of the number of partners, standardization of technology infrastructure and information systems and avoidance of risks in business critical systems.

It came evident from our study that small software organizations feel that they do not have many possibilities to compete in the same business area as big software enterprises. As our study suggests, the small software organizations in the area can be classified as anticipators, collectors and specializers. Especially the global industry representatives considered that in the future, the small software organizations in the area should go further in specialization to be able to compete with big software enterprises. In the following we propose how this specialization could happen.

*Anticipators* seek to apply information systems and product solutions to improve their customers' business. Anticipators could specialize and focus in selected technology areas to be able to become

*tailored solutions providers* (Figure 5). In the interviews, the technology areas mentioned by the global industry representatives were mobile and internet technologies, data mining and interfaces from automation systems, and interfaces between various forest industry systems. They also suggested that to be able to specialize, this kind of an organization should network with universities and other research institutions as well as with the global industry customer.

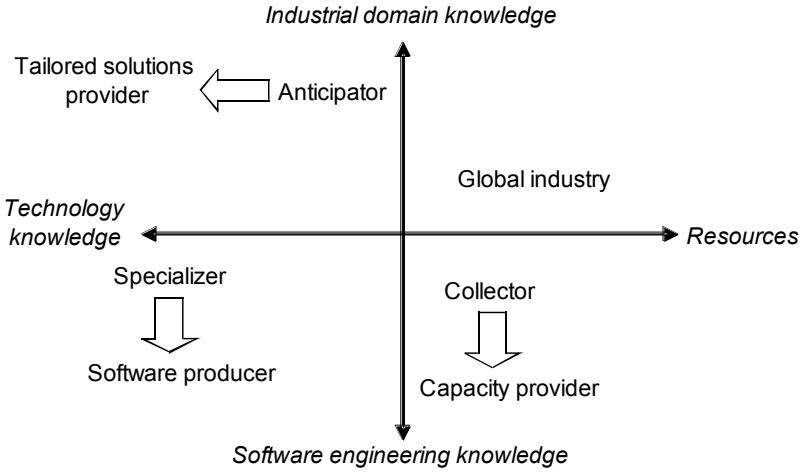


*Figure 5. Transitions from the current situation to the more competitive one*

*Specializers* develop their technology competence and have one or more own software products. This kind of organizations could specialize in software packaging to be able to produce software products more efficiently, also to the global markets. According to our study, this kind of a *software producer* (Figure 5) could concentrate on general and perhaps administrative business systems and their technologies and sell products to customers in other business domains as well. To be able to survive in hard competition in this area, this kind of an organization should network with other software producers to be able to provide broader products, services and business value for the customer.

*Collectors* that now act like general stores could specialize in software processes and methods to be able to act as *capacity providers* (Figure 5) for global software organizations. The collectors could network with other collectors providing a larger resource pool for various business domains.

### 6.2 The trend of outsourcing and small software organizations

Worries about the effects of IT outsourcing and offshore software development were frequently mentioned in our interviews. During the last ten years, IT outsourcing has provoked lots of discussion and research (Dibbern, Goles et al. 2004). In addition, the attention has more recently been paid on global software outsourcing (Heeks et al. 2001) or offshore software development (Gopal, Mukhopadhyay et al. 2002; Carmel and Agarwal 2002), where parts of the software development work has been transferred to lower cost countries, such as India or Russia. In our study, this trend had been recognized both by the small organizations, the forest industry customers, and the big global software enterprise although the small ones did not seem to emphasize this as much as the large organizations.

For small organizations this trend of globalization has many worrying effects. These outsourcing and offshoring processes do not benefit much small software organizations, because they do not have resources and skills to acquire and negotiate international partners. Most benefits will contribute to large organizations that can serve large customers and have resources for international cooperation. Large software organizations, such as the big software enterprise in the area, move their jobs and subcontracts increasingly to low labour cost countries and the position of small local organizations weakens. In addition, the decision processes of globalizing industrial customers are centralizing and shifting out of reach from small software organizations.

Altogether, these issues are not well studied from the perspective of small software organizations in high labour cost countries. Therefore, we need research that could analyze the situation widely and internationally. Small software organizations would greatly benefit from the awareness of the situation and especially from the actions taken based on the analysis of the situation. Possible research topics could include for example the collection of best practices related to the survival and success of small software organizations in increasing global competition. These best practices could be related to business strategies, networking with partners and especially to the processes of software development that fit to the globalizing operating environment. In the globalizing software industry, offshore production requires well-defined and plan-driven processes. In a way, it is a return to or enforcement of the traditional waterfall-style development. However, agile methods and processes (cf. Cockburn 2001) are widely emphasized by many practitioners and researchers. Small software organizations are very flexible and by nature use agile methods. Inevitably the question of why then large organizations and large customers prefer plan-driven offshore development instead of agile processes arises. Research should also analyze the tendencies of large organizations and show strengths and weaknesses of plan-driven offshore development compared to agile processes better suited to small software organizations.

# 7 SUMMARY

In this paper, we have introduced results of our research project investigating the relationship between small local software organizations and their global industrial customers. Using mainly interviews as the data acquisition method and grounded theory as the analysis method, we have characterized the current situation, the possibilities, and the future trends of small local software organizations in the co-operation with their global industry customers.

Our analysis identified three types of small software organizations in the area, which can be characterized as Anticipator, Specializer and Collector. These three types of organizations differ from each other in their business processes, number of technologies they provide, type of the customer relationships and type of co-operation with other organizations. An anticipator can be characterized by its ability to seek and apply information systems and product solutions to improve its customer's business. A specializer typically develops its technology competence and at the same time can have one or more own software products. A collector type of company is like a general store, which develops whatever customer wants.

Many small software organizations had recognized their inability to compete with the big global software organization in the area. Small organizations expressed their willingness to form networks around the global forest industry to be able to better meet their customer's global demands, but they did not know how to do it. Most of the small organizations felt that they do no have means and experience to form networks with each other. Our study suggests that the one possibility for a small local software organization to operate with a global industry customer is to act as a local subcontractor for a global software organization, mainly doing programming work related to operative business systems. Another possibility is to specialize in some new technology, like mobile or internet technology. In addition, the possibility to make software products for multiple business domains was mentioned. All these possibilities include many challenges for small local organizations.

Our study highlights the difficulties and challenges of small software organizations to cope with the globalization of industries. The current research in software engineering is not particularly useful for resolving problems of small organizations because it is mostly focused on large-scale software production and its problems. It is already noted that the field of software engineering is largely influenced by and based on the needs of large organizations like US Department of Defense (Fayad, Laitinen et al. 2000; Naur and Randell 1969) and military applications, whose problems are in many ways different from the problems of small organizations.

Based on the results of this study, we cannot answer unambiguously to the question how small software organizations can cope with a global industry. Therefore, more research is needed to analyze the situation more widely and internationally. However, the findings of our study suggest that small

software organizations do not have possibilities to compete in same business areas as big global software enterprises. Instead, small software organizations must specialize and network to become more competitive suppliers and partners. A deeper specialization in technology or in software processes and methods could give better tools for small software organizations to survive in the competition.

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