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Finnish Software Product Business: Results from the National Software Industry Survey 2003

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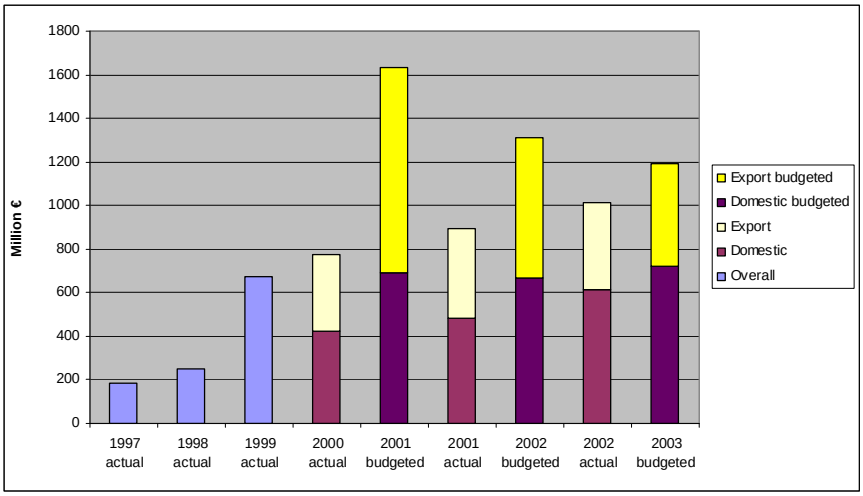
SUMMARY

In 2002, the Finnish software product industry generated an overall revenue of 1 000 M Euros – of which 400 M Euros came from exports – and employed 10 000 professionals. The revenue of the industry grew by 13 %, which is a higher growth rate than the one in the world markets that grew 7.6 % in 2002 (IDC 2003a). The revenue from international business remained at the 2001 level and the growth was gained from the domestic markets. The future expectations of the companies are not as optimistic as a few years ago, nevertheless, the industry is expecting to continue its growth in 2003. The profitability of the industry weakened during 2002 and 25 % of the companies made losses – majority of the companies made close-to-zero profits. Development of the industry revenue is presented in the figure below.



This report contains the findings of the sixth national software industry survey, which was jointly performed by the Software Business and Engineering Institute and the Institute of Strategy and International Business at Helsinki University of Technology in March - May 2003. Laurea-Polytechnic assisted in the collection of the data. The main objective of the study was to provide basic information about the Finnish software product industry. The research was commissioned by the Centre of Expertise for Software Product Business, and financed by the Ministry of Trade and Industry, the Economic Development Centre for Uusimaa and National Technology Agency.

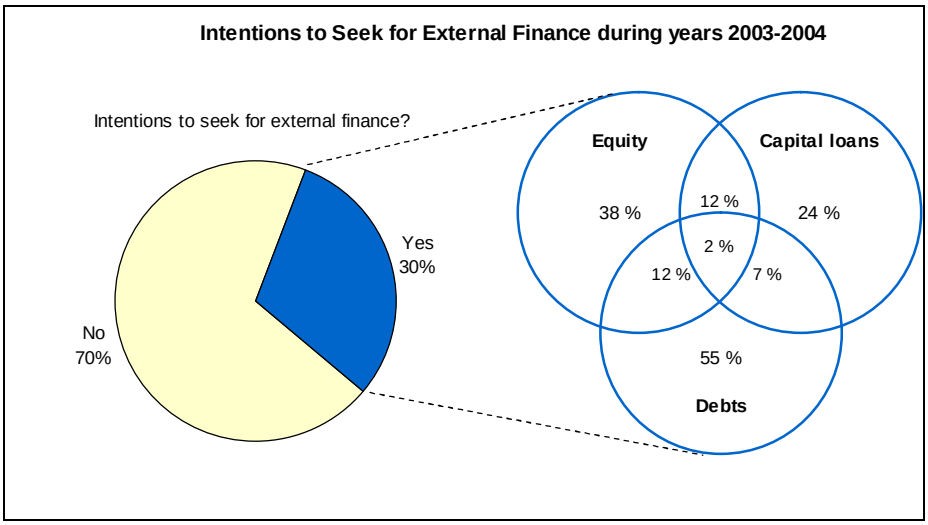
The focus of the survey was on *software product companies*, i.e., companies that sell software products they themselves design, implement, and maintain. The survey was carried out as a mail questionnaire, and reached 166 software product companies, which represents about 17 % of the estimated 1000 existing Finnish software product companies. As the largest companies were systematically approached, the responding companies generated over 60 % of the total sales and over 80 % of the total exports of the industry.

The industry is fairly young and most companies are small – 61 % of the respondents had revenue from software product business below 1 M Euros in 2002. Only 31 companies generated revenue over 3 M Euros from the software product business. The youth of the industry is evidenced by the low degree of productization, the high product development costs and the moderate profitability.

The companies were owned mainly by their founders and their family members, with only minor foreign and external ownership. Lack of risk capital was seen as a major barrier for the emergence of new, especially by the young companies with 71 % of the 0-2 year-old companies indicating so. The weakened venture capital situation has decreased the product development investments of the young companies in particular. In the

current financial situation, an increasing number of young companies have financed their R&D by operations and customer projects. This can put the productization aims in jeopardy. This emphasizes the role of public funding in the role of financing companies in the early product development phase.

The share of software ventures planning to seek external finance within the next two years came down to 30 % from 43 % in 2001, and 47 % in 2000. Challenges in achieving international growth, risk adversity of both entrepreneurs and investors, and challenges in getting venture capital finance have lead to a decreasing share of software companies even trying to raise external finance. Difficult financing situation is reducing the emergence of new companies and slowing productization aims and internationalization efforts of the existing companies. Intentions to seek external finance during 2003 and 2004 is presented in the figure below.



46 % of the respondents had some international operations. The most important export countries were Sweden, USA, and Germany. As many as 31 % of the internationally operating companies had started their export operations only 0-2 years after the founding of the company. Even though there are many international companies in the sector, there is a gap between initial foreign sales and full internationalization, as the median value of export sales was only 800 000 € per firm. However, there has been growth in terms of geographic coverage: on average, the surveyed companies exported to 8,1 countries in 2003 (as compared to 4,3 countries in 1999).

Despite the challenging economic situation, Finnish software product companies have been able to adjust to the weakened economic situation. As companies are rather small, their capability to modify business operations in a short-term in order to keep the business running is relatively good. As the downturn of the economy makes growth intentions more difficult, it also forces companies to improve their processes and efficiency. However, as majority of the companies are young and do not have resources compared to companies in more traditional industries, many companies have been forced to diversify their operations in order to continue their operations. Therefore, increased public support would be needed so that promising software product companies could focus on their core business instead of struggling with custom projects.

The study brought up some issues that are critical in developing the industry. These central topics are raising the degree of productization and mastering product management, financing, networking, business understanding and internationalization.

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1 INTRODUCTION

1.1 Background

The worldwide packaged software market is expected to reach 250 billion Euros in 2003. It is the fastest growing market of the IT sector, and it is estimated to account for nearly a quarter of all IT spending by 2006 (IDC 2003a). The U.S. software market is the largest market for the software, responsible for almost 60 % of the world markets. The U.S. is also the largest country to produce packaged software and generated a total revenue of over 105 billion Euros in 2002 (BSA 2003).

According to BSA (2002), the Western European packaged software market will grow substantially faster than the general economy despite the general economic outlook and the global impact of the events of September 11, 2001. Western Europe's software industry is forecasted to grow significantly, from a 2000 level of 56.7 billion Euros to 109.3 billion in 2005. This represents an aggregate yearly growth of nearly 14 %. The Western European packaged software market also employed approximately 1.1 million people through direct employment, upstream operations (manufacturing and logistics), and downstream operations (reselling, training, and consulting).

According to EITO's report in October 2002, the Western European IT markets are suffering from the general economic recession. However, the software product markets grew by 0.9 % in 2002 and are expected to grow by 2.6 % and 4.4 % annually in 2003 and 2004 (EITO 2003). Software products have a 10 % share of the whole ICT market, with a market value of 641 billion Euros in 2002. The overall growth for the ICT market has been just 4.1 % in 2001 and growth has nearly stopped in 2002 (growth 1.1 %). In an earlier forecast from February 2002, EITO predicted that the growth rate of the software products would outperform other ICT segments. However, as can be seen in Figure 1, software product markets are outperformed by IT and carrier services in 2001-2003.

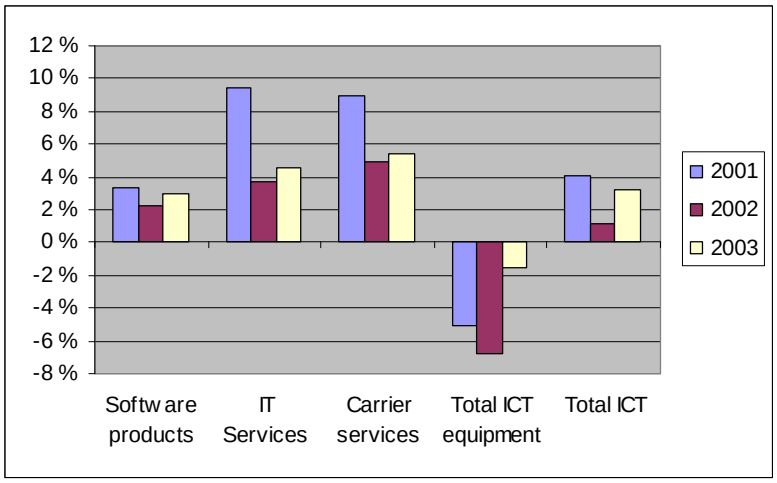

Figure 1. Western European ICT Market Growth by Segment in 2001-2003 (Overall Market Value 641 billion Euros in 2002) (EITO 2002)

In Finland, the software industry is still relatively small, although it has grown rapidly during the 1990's. The total revenue for 1999 has been estimated at 1.6 billion Euros (Nukari and Forsell 1999). European companies have lagged behind the U.S. firms in the packaged software segment, due, e.g., to small and diverse home markets, low degree

of productization and internationalization, and weak links to universities (Malerba and Torrisi 1996). This seems to be true also for Finnish companies. The trend, however, seems to be towards greater degrees of both productization and internationalization, i.e., from custom software developed for local markets towards mass-market software intended for international distribution.

The Finnish software product industry does not have any industrial classification code of its own, making even basic statistics unavailable. To alleviate this problem, the Center of Expertise for Software Product Business located in Innopoli, Espoo, has initiated a series of national software industry surveys. Previous studies have been carried out in 1997, 1999, 2000, 2001, and 2002. This report contains the findings of the sixth national software business survey, conducted by the Software Business and Engineering Institute and the Institute for Strategy and International Business at the Helsinki University of Technology. Laurea-Polytechnic assisted in the collection of the data. The research was commissioned by the Center of Expertise for Software Product Business, and financed by the Ministry of Trade and Industry and Employment, the Economic Development Centre for Uusimaa, and the National Technology Agency Tekes.

1.2 Software Products and Software Product Business

The offerings of the software industry can be roughly divided into three categories: software products, customer tailored software (or customized software), and embedded software, as shown in Figure 2 below (Nukari and Forsell 1999). In this study, we are interested in *software products* as a product category that is distinct from embedded or integrated software, on the one hand, and customer tailored software, on the other. We do this by examining the *object of trade* and the *degree of customization*.

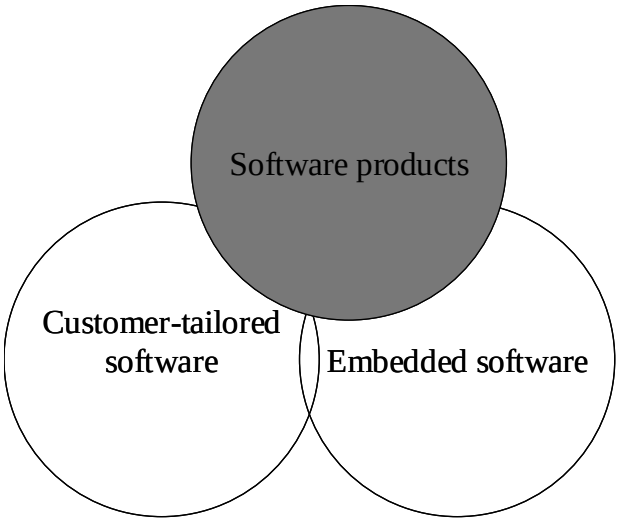

Figure 2. Types of Software Products (Nukari and Forsell 1999)

1.2.1 Object of Trade

Software products are traded on their own, not as part of other products. Although software product business often includes other things, such as installation, training, and even customization, the main object being traded is software.

Embedded software, on the other hand, consists of software that is built into other products, such as cellular phones, refrigerators, paper machines, or television sets, and not sold separately. Though embedded software has several characteristics of pure

software products (developed once, sold in many identical copies, high development costs, and low manufacturing costs), it is excluded from this study.

1.2.2 Degree of Productization

Software can be prefabricated, developed specifically to the needs of each customer, or both. This dimension, the degree of productization, is crucial for differentiating between software product and project business. The spectrum of productization ranges from standard "packaged" software products that are delivered "as is", i.e. without any changes to a large number of customers, to customer tailored software, i.e. software that is developed according to the needs and specifications of individual customers. Figure 3 illustrates this spectrum and shows the positioning of software products within it.

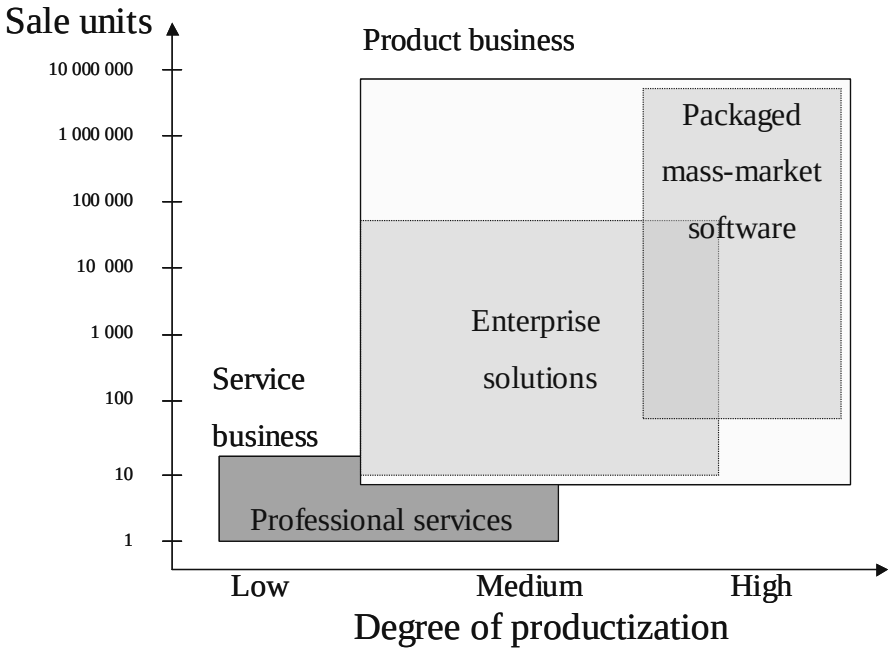

Figure 3. Software Product and Service Business (Hoch et al. 1999)

Productization means standardization of the elements in the offering. The term productization includes several technological elements from the very early stages of designing a product (i.e., managing requirements, selection of technological platforms, design of product architecture etc.) to the commercials elements of selling and distributing the product (i.e. delivery channels, positioning of the product / company and after sales activities). Some of the key elements influencing the degree of productization are product market, concepts, benefits, positioning, requirements, features, specifications, delivery channel, marketing, selling, and packaging (adapted from Cooper 2000).

Pure software products are highly productized and often referred to as packed, mass-market, or shrink-wrap software. These kinds of products are delivered to a large number of customers in exactly the same format – without any customer tailoring. In this case, the product development and order-delivery processes are completely separated. Software products of this kind can be sold to millions of customers because of close to zero marginal costs – there are hardly any traditional production costs. For example, the costs of the first CD containing the Microsoft Windows 95 operating system were above $1 billion. The cost of the second CD was less than $3 (Hoch et al. 1999). Typical examples of packaged software products include word processing packages, spreadsheets, some business software, and operating systems.

In the enterprise solutions business, there is almost certainly at least some customization needed in order to integrate the software to the customers' other information systems, and infrastructure. This also puts certain limits to the number of customers; the number of customers is in the hundreds or thousands rather than in millions. Installation projects take months or years, instead of hours or minutes required by mass-market products. Still, the business is based on pre-developed software products, making it a highly productized business. In many cases, the customization is made by changing program parameters, requiring no changes to the actual product.

At the low end of the productization spectrum, still belonging to software product business, we have situations in which the customization is done by changing the code of the software product on a customer specific basis. Here, the distinguishing feature is that the amount of work going into customer-specific tailoring is small compared to the whole effort of developing the product.

Customized software consists of software developed to the specifications and needs of single customers. This business is often based on selling projects, not software, and has many characteristics of a service industry. Although synergies exist between product and service businesses, extending the business beyond company's dominant position is very challenging as these sectors differ significantly. There is strong evidence that majority of the service companies have failed their product business initiatives. Main differences between the product and service businesses are listed in Table 1 (Nambisan 2001).

Table 1. Comparing Product and Service Business Companies on Five Key Issues (Nambisan 2001)

Key issue	Software product companies	Software service companies
Intellectual property rights	Very important	Less Important
Product complementarity	Very important	Less Important
Returns from scale	A fixed-cost structure allows for higher returns from scale	A variable-cost structure makes increased returns from scale rare
Abstracting knowledge and integrating technology	The company must be able to gather generic product knowledge so that the product can be used in a variety of contexts. Architecture level technology integration is important for the smooth running of the end product	Knowing clients' idiosyncrasies is more important than the knowledge abstraction. Companies rely upon data-interface-based technology integration: the primary emphasis is on development efficiency
Connections with users	Companies have long-term relationships: typically the users are technologically sophisticated	Companies have project-driven relationships: typically, the users are technologically unsophisticated

2 THE FINNISH SOFTWARE PRODUCT INDUSTRY: CURRENT SITUATION AND FUTURE PROSPECT

2.1 Review of the Research on the Finnish Software Product Industry

The Finnish software product industry has not been thoroughly studied, as is the case in many other countries, including the U.S. Seppänen et al. (2001) studied software industry research in the U.S. and suggested two main reasons for lack of research in this area. First, software product industry was found to be so complex that defining and setting the frames for the industry is extremely hard, if not impossible. Second, it could be argued that there is no such industry as a software product industry. The second argument assumes that software does not differ from other information products and, therefore, there is no need to study software separately from. Consequently, the number of studies related directly on software product industry is very limited.

The two main analyses of the Finnish software product industry that have been conducted are Autere et al. (1999) and Nukari & Forssell (1999). Autere et al. analyzed the state and growth potential of the Finnish software product industry and the problems it faces. They listed financing as a major problem in addition to commercial services such as PR, marketing, law, and education of professionals in the fields of software engineers, product management specialists, and international sales experts. They also pointed out the importance of clustering and networking between the companies in the industry. In addition, Autere et al. pointed out that companies should have a standardized software product or components that can be copied and reproduced with low, close-to-zero marginal costs.

Information about the fundamentals of the industry has been provided by software industry surveys between 1997 and 2002. However, already in the late 1980's ATK-kustannuksen vuosikirja (Tiihonen, 1988) provided statistical information about the whole software and hardware cluster in Finland. Moreover, the software product industry has been included as part of the whole software or IT industry in several studies (e.g. Toivonen 2002).

Rajala et al. (2001) carried out a study on the business models of the software industry. They identified four different elements of the business model: the product development approach, the revenue logic, the marketing and sales model, and the service and implementation model.

Sallinen (2002) studied different supplier types and the development of supplier firms in the context of the Finnish ICT cluster. She identified firms of five different types: resource firms, resource firm with supporting projects and products, software product firm, software product firm with supporting projects and a system house.

The empirical studies in Finland focusing specifically on the size and demographics of software products business started 1995. A Finnish venture capital company SFK collected information about software exports among the Finnish software companies through a questionnaire survey. SFK reported that the exports then were about 75 million Euros. More systematic approach to collect data from the industry started in 1997 when Culminatum Oy (Helsinki Centre of Expertise), Tietotekniikan liitto and Helsinki University of Technology conducted their first study in the field.

In 1997 it was found that the exports of the industry were 83 million Euros and the revenue from software products were 185 million Euros. The reason why the reported exports grew annually below 5% 1995-1997 might have been because ICL/Fujitsu reorganized their operations during that time and reduced software exports from Finland. Since 1997, Helsinki University of Technology and Centres of Expertise have produced the survey annually. The financing has mainly come from the National Technology Agency Tekes and the Ministry of Trade and Industry.

According to IDC report (2003b), the Finnish software market outperformed other Nordic countries in 2002. While the Finnish software market slowed down to 6.6 % growth, it was still substantially higher growth rate than in other Nordic countries. According to IDC study, the value of the Finnish packaged software market was some 950 million Euros in 2002. However, this report has been taken out of the market because of some methodological errors not revealed by the company (Ylä-Mononen 2003).

There is a currently ongoing research performed jointly by the Universities of Oulu and Jyväskylä focusing on the strategic development evaluation of the entire software industry. The final report of the research is coming out in 2004 (Tyrväinen et. al., forthcoming in 2004).

2.2 Implementation of the Survey

The data was gathered by a questionnaire, which was sent to 1971 companies in March – May 2003. We received a total of 261 responses, of which 166 were in software product business. This gives a response rate of 13.2 %. According to professional estimates, there were approximately 1 000 software product companies in Finland in the year 2000. Thus, we reached 17 % of the industry with the survey. Therefore, we believe, that the results represent fairly well the whole industry. However, we did not reach young companies as well as expected. In addition, we systematically approached larger companies in order to estimate volumes at the industry level. Methods of the survey are more briefly explained in the appendix.

2.3 Regional Distribution of the Companies

Over half of the companies (54 %) were located in the Uusimaa province. Pirkanmaa, Varsinais-Suomi and Keski-Suomi were other provinces that were home for at least ten companies. Together these four provinces hosted 75 % of the responding companies. Regional distribution could indicate the reasons for centralization of companies: five provinces of highest amount of companies have both a university providing high-level technological education and technology centers in the population centre. Major relative change in the amount of companies compared to the year 2001 was in the Pohjois-Savo province, where the amount of companies answering to the survey was only 5 and it was 14 in 2001. The location of the companies is presented in Table 2.

Table 2. Location of Software Product Companies by Provinces Answering the Survey (n=166)

Province	Amount of companies
Uusimaa	90
Pirkanmaa	13
Varsinais-Suomi	11
Keski-Suomi	10
Pohjois-Pohjanmaa	7
Etelä-Pohjanmaa	6
Pohjois-Savo	5
Kanta-Häme	4
Kymenlaakso	4
Pohjanmaa	4
Päijät-Häme	3
Ahvenanmaa	2
Itä-Uusimaa	2
Satakunta	2
Etelä-Karjala	1
Kainuu	1
Pohjois-Karjala	1
Etelä-Savo	0
Keski-Pohjanmaa	0
Lappi	0
Total	166

The company revenue from their own software product business and the distribution of provinces is depicted in Table 3. The difference in the amount of companies to the previous table is due to 34 companies did not revealing their revenue for the year 2002. It is also noticeable that 74 % of the companies with a revenue exceeding 3 million Euros from their own software product business are located in the Uusimaa area. The relatively large amount companies with over 3 million Euros revenue companies is explained by the fact that these companies were systematically contacted if they had not responded to the mail questionnaire. This was done to estimate the industry volumes more precisely.

Table 3. Provinces of the Software Product Companies by Software Product Business Revenue (n=132)

Province	Revenue from companies 'own software product business in 2002 (million Euros)					
	<0.2	0.2-0.99	1-1.99	2-2.99	3-	Total
Uusimaa	26	17	6	7	23	79
Pirkanmaa	3	3	2		2	10
Keski-Suomi	5	2	2		1	10
Pohjois-Pohjanmaa	2				3	5
Varsinais-Suomi	2	2			1	5
Etelä-Pohjanmaa	3			1		4
Pohjois-Savo	1	3				4
Pohjanmaa	1		1	1		3
Itä-Uusimaa	2					2
Kanta-Häme		2				2
Kymenlaakso	1		1			2
Päijät-Häme		2				2
Ahvenanmaa	1					1
Etelä-Karjala					1	1
Kainuu	1					1
Satakunta	1					1
Etelä-Savo						0
Keski-Pohjanmaa						0
Lappi						0
Pohjois-Karjala						0
Total	49	31	12	9	31	132

When analyzing the location of the respondents, it is noticeable that software companies are located very close to technology centers. Even despite good infrastructure for telecommuting – thanks to well working communication networks – software product companies are still mostly located in the largest cities. The 8 most popular cities, listed in Table 4, hosted 118 companies, which is 71 % of all respondents. Most popular cities were same as in the previous year's survey.

Table 4. Most Popular Software Business Cities

City	Number of companies
Helsinki	49
Espoo	25
Tampere	12
Jyväskylä	10
Oulu	6
Turku	6
Vantaa	6
Kuopio	4
Total	118

Table 5 presents the software product business revenue in these eight most popular cities. Table also shows that larger companies are mostly located in technology centers and in major cities. The differences in company numbers compared to Table 5 are because of the companies with unknown revenue.

Table 5. Location of the Companies by City and Software Business Revenue

City	Revenue from companies' own software product business in 2002 (million Euros)					
	<0.2	0.2-0.99	1-1.99	2-2.99	3-	Total
Helsinki	12	9	3	4	16	44
Espoo	10	4	1	2	5	22
Jyväskylä	5	2	2		2	10
Tampere	2	3	2		2	9
Vantaa	2			1	2	5
Oulu	2				2	4
Turku	1	2			1	4
Kuopio	1	2				3
Total	35	22	8	7	29	101

A possible explanation for the concentrated location of the companies is that the importance of technology centers and universities, which often enable networking and supporting services, is high for the software product companies.

2.4 Age of the Software Product Companies

The age of the software product companies varies a lot. Even though the Finnish software product industry is regarded as a relatively new industry, the oldest companies in the business are more than three decades old. On the other hand, there is a large number of companies founded in the late 1980's - early 1990's and also several companies that have been founded after 1995. The average company age was 12.2 years (10.4 in 2001), and the median age was 11 years (10 in 2001). However, according to industry experts, the distribution of the companies in this sample is probably biased. There are at least two explanations for this. First, the targeted focus on the largest companies (that often are old) skews the distribution. Moreover, in this survey, the start-up companies were not very well reached for reasons not well known. One reason is that it is likely that start-up companies can be classified after numerous industry classifications, especially if they are spin-offs of a parent company. Nevertheless, according to the industry experts, the number of young companies should be larger. Regardless of possible bias in the companies' age distribution, it is interesting to compare this distribution to the previous year's distribution. The share of young companies (age under 3 years) is only 4%, whereas it was 13% in 2001. This is most likely due to smaller number of new start-ups in the last years (Toivonen 2003). Age distribution of software companies is depicted in Figure 4.

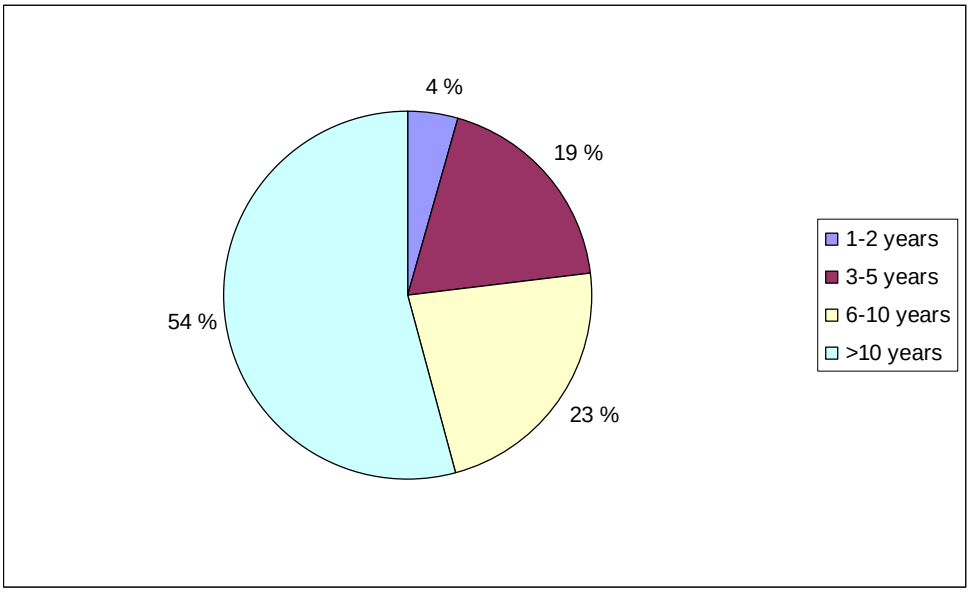

Figure 4. Age Distribution of Software Product Companies (n=161)

As can be seen in Figure 5, 11 % (21 % in 2001) of the companies have been in the software product business for less than three years. Despite the relatively large amount of young companies, 64 % of companies had been in the software product business for more than five years. The average age of the software product business was 9.6 years and the median was 8 years. According to industry experts, this distribution does not accurately represent the whole industry – according to the experts, the proportion of young companies should be larger.

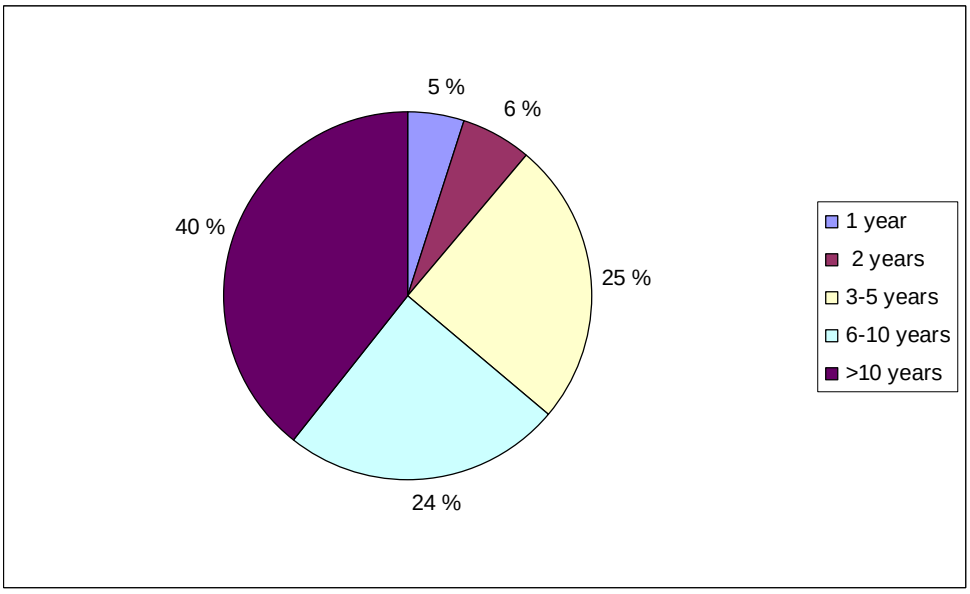

Figure 5. Age of the Software Product Business (n=143)

As Figure 5 shows, despite the fact that the Finnish software product industry is rather immature, there is a large number of companies that have been in business for more than a decade. Looking at the largest companies, which are mainly publicly listed companies, these companies were mostly founded in the early 1990s –some of them dating back to even earlier.

2.5 Revenue

Companies were asked about their revenue in the year 2002, their budgeted revenue for the year 2003, and a revenue estimate for the year 2005. In addition, we asked how the software product business revenue is divided between domestic and international markets.

The software product companies had an average total revenue of 16.9 million Euros (16.1 million Euros in 2001) and a median revenue of 0.7 million Euros in 2002 (0.6 million Euros in 2001). The average software product business revenue was 4.6 million Euros (4.1 million Euros in 2001) and median revenue 0.4 million (0.5 million Euros in 2001). The significant difference between averages and medians is explained with large companies that bring the average up. As can be seen by studying the medians, most companies are relatively small. Distribution of the responding companies' software product business revenue in 2002 is presented in Figure 6.

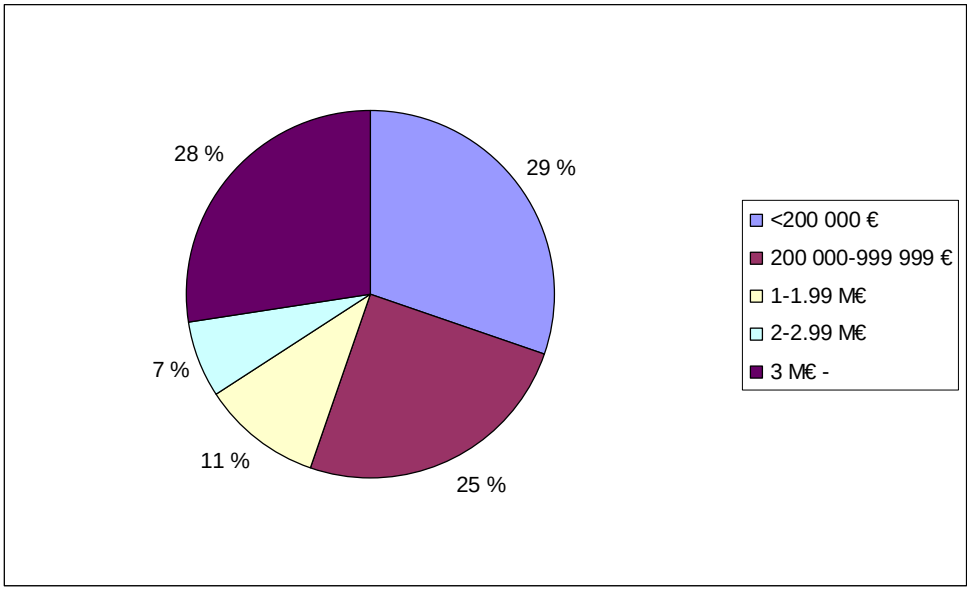

Figure 6. Responding Companies' Distribution of Total Revenue in 2002 (n=152)

The total revenue tends to grow when companies mature, evidenced by a positive correlation between the total revenue and the age of the company (Pearson correlation 0.276). The total revenue's (M Euros) regression against the age of the company reveals that the coefficient of the age of the company is 3.45. Pearson correlation between the software product business revenue and the age of software product business is 0.382 and the respective regression coefficient of the age of the software product business is 0.607. Both correlations are significant at the 0.01 level.

In order to gain knowledge regarding the business focus of the respondent companies, Figure 7 shows the percentage of the own software product business revenue from the overall company revenue. On average, the respondents had 60 % (64 % in 2001) of their total revenue acquired from their own software product business and the median was 70 % (80 % in 2001). Small decrease in the share of software product business revenue can indicate that some companies have increased their project business in order to generate revenue as product business has suffered from the economic situation. As Figure 7 shows, companies reached in the survey had quite often software product business as their core business. This is quite logical, since these companies are probably most eager to improve the conditions in the Finnish business environment and

participate in the survey. However, a relatively large amount (38 %) of companies with the total revenue ranging from 0.2 to 0.99 M Euros acquired less than 26 % of their total revenue acquired from software product business. This could indicate that the companies of this size may not have set a clear strategy whether to focus merely on product or project / consulting business or they are in current economic situation not able to focus on product business even if it was their desire.

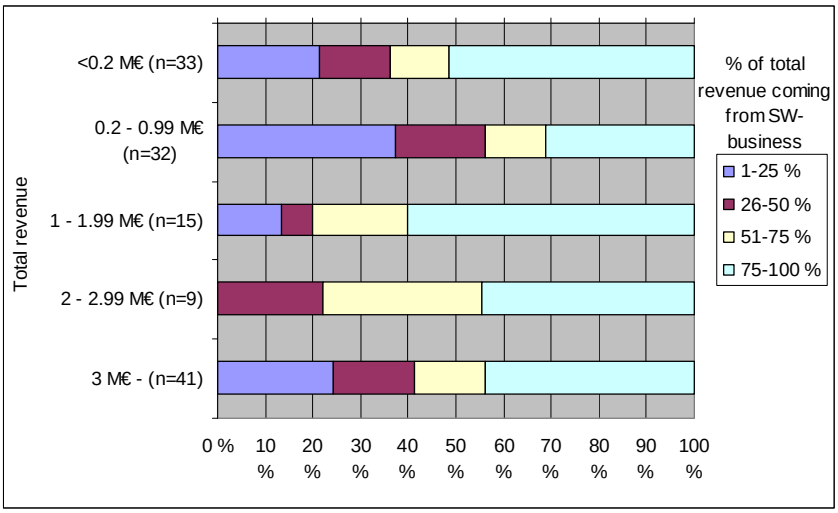

Figure 7. Percentage of Companies' Total Revenue Acquired from Company's Own Software Product Business in 2002 (n=130)

Figure 8 shows the distribution of companies based on their revenue from companies' own software product business. We can see that majority of the responding companies are rather small as 61 % of the responding companies had software product business revenue not exceeding 1 M Euros in 2002.

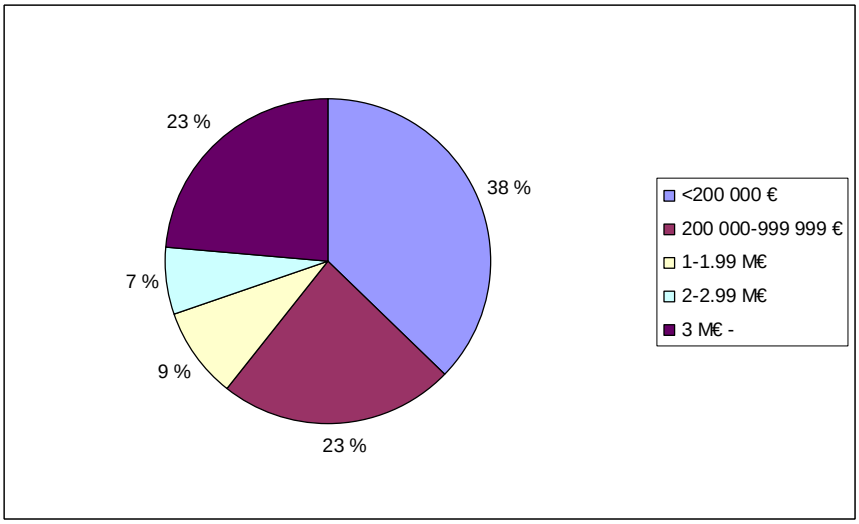

Figure 8. Respondents' Distribution of Companies' Software Product Business Revenue in 2002 (n=132)

We used the following approach to extrapolate the overall value of the industry: First, we systematically checked with industry experts that we have reached all the companies whose software product business revenue exceeded 3 million Euros in 2002 – there were 31 such companies. After that, we calculated a "rough" coefficient by dividing 969 (1 000 is the total number of companies in the industry – the 31 largest companies

= 969) by 101 (the number of companies participating the survey whose software product business revenue in 2002 was known and not exceeding 3 million Euros), which equaled 9.59. Taking into consideration that our sample had an overrepresentation of large companies, we rounded the coefficient down to 8. By using this method the overall calculated value of the industry is 1011 million Euros and the value of exports is 400 million Euros. It is worth mentioning, that the value of the 31 largest companies alone was 572 million Euros, of which 323 million Euros came from exports. Thus, over 80 % of the export came from the 31 largest companies.

The value of the industry had increased 13 % from the year 2001 (892 million Euros). On the other hand, the value of exports decreased 3 %, from 408 million Euros in 2001 to 394 million Euros. The development of the industry revenue is presented in Figure 9. Since figures before 2000 were calculated by using a different estimation approach, they are not directly comparable to those from the year 2000 – 2002. The budgeted figures are the estimated values of the industry given in the software industry survey in the previous year. We can clearly see from Figure 9 that the changes in the economic situation have also made companies more cautious in estimating their growth prospects in the recent years.

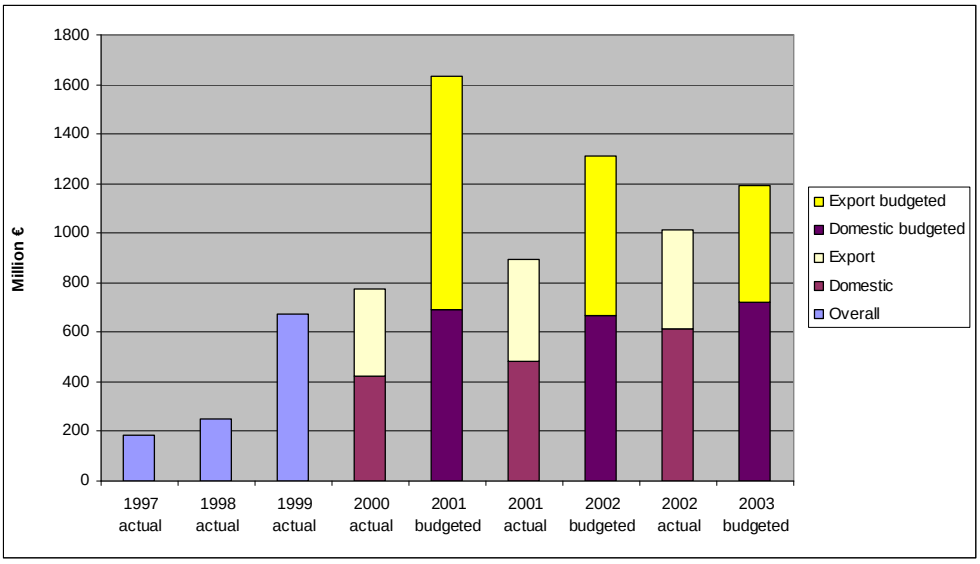

Figure 9. Development of the Revenue at the Industry Level in 1997-2002

The total revenue and the amount of employees working for the companies responding in the survey was summed up, which made the revenue per employee 107 000 Euros (105 000 Euros in 2001). However, the number of large companies strongly influences this ratio. When calculating the revenue per employee ratio as an average of single companies mean ratios, the ratio is 87 000 Euros per employee (84 000 Euros in 2001). When we studied the development of the ratio based on the time the companies had been in the business we found out that the ratio was essentially higher for those companies who had been in the business for more than five years. This indicates that it can take up to five years before the first product is successfully launched into the markets. An interesting phenomenon can be seen in Figure 10: revenue per employee rate is larger for companies that have been in business for 6 to 10 years than for those that have been in business for more than 10 years. There can be many explanations for this. Some of the successful Finnish software product companies are in the 6-10 years age rate, which can dramatically improve the average. In addition, since these companies were of smaller size (a total revenue in median 0.93 M Euros versus 1.65 M Euros;

overall personnel in median 5 versus 6.5; R&D expenditure of the total revenue in median 20 % versus 25 %), short-term cost savings (employee layoffs, e.g. in R&D department) can have a significant effect on the revenue per employee ratio.

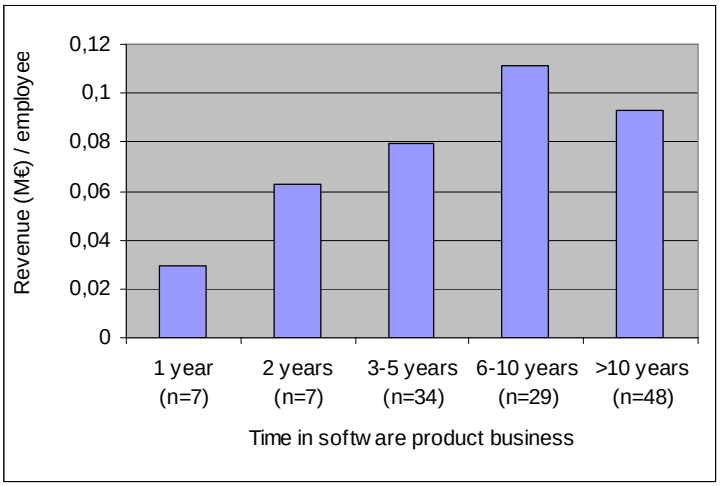

Figure 10. Development of Revenue per Employee in 2002 According to the Maturity of the Software Product Business

When studying how the software product business revenue affects the revenue per employee ratio, we can see that companies with software product business revenue exceeding 1 M Euros reach the ratio of over 100 000 Euros / employee. Companies smaller than this are most likely still in a product development phase, which can be seen in moderate rates (under 80 000 Euros / employee) as can be seen in Figure 11.

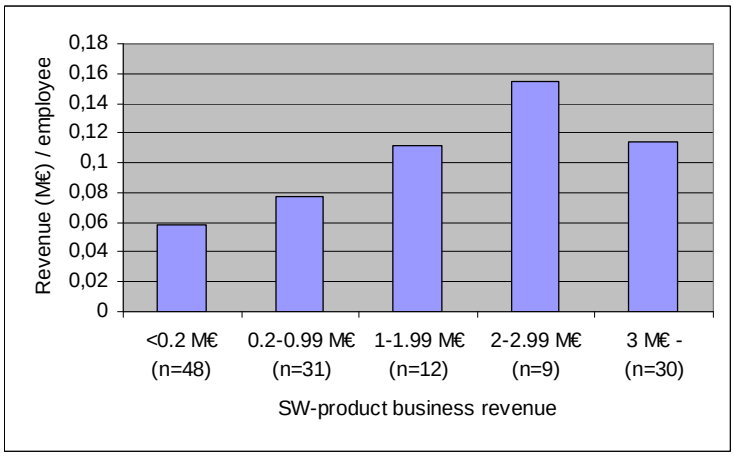

Figure 11. Development of Revenue per Employee by the Revenue of the Software Product Business

Smaller companies expect the fastest growth in the software product business revenue for the year 2003. Some of these companies are just launching their products to the markets and this can cause a substantial increase in sales. In addition, it is often more difficult for small companies to estimate their future sales. It is worth noticing that a relatively small amount of companies responded to the questions about their future expectations. It could be argued that the companies with positive views were more eager to answer these questions compared to those who did not regard the near future so positive. Therefore, the figures in Table 6 should be interpreted cautiously.

Table 6. Expected Annual Growth of Software Product Business for the Year 2003 (n=78)

	Revenue from companies 'own software product business in 2002 (million Euros)				
Annual growth expectation	<0.2	0.2-0.99	1-1.99	2-2.99	3-
<0 %	2	4			1
0-10 %	3	5	2	1	3
10.1 - 20 %	1	4	5	1	0
20.1 - 40 %	2	2	1	2	1
40.1 - 100 %	9	4	1	1	1
>100 %	14	6	1		1
Amount of companies	31	25	10	5	7
Mean	1501%	50 %	34 %	24 %	48 %
Median	67 %	18 %	18 %	25 %	7 %

We studied also how companies have actually grown from the year 2001 compared to their growth estimates for the year 2002. However, the amount of companies for which the comparison could be made is relatively small (n=32) and the economic situation worldwide has naturally affected their businesses. On average, companies had expected an annual growth of 92 % (439 % in 2001) but the actual growth was 285 % (226 % in 2001). The expected median growth was 25 % (106 % in 2001) and the actual growth 0 % (38 % in 2001). The differences in the averages and medians mean that some of the companies have been able to increase their revenue significantly, but, on the other hand, some companies have suffered from the decline in the revenue. As differences to the previous year's expectations show, companies were far more cautious in their growth expectations for the year 2002 than a year before, which reflects to the weakening economic situation. The expected and achieved medians and averages are presented in Table 7.

Table 7. Expected and Achieved Growth in Software Product Business in 2002 (n=32)

	Revenue from companies 'own software product business in 2002 (million Euros)					
	<0.2 (n=10)		0.2-0.99 (n=7)		1- (n=15)	
Annual growth in 2002	Mean	Median	Mean	Median	Mean	Median
Expected (in 2001)	196 %	93 %	76 %	17 %	30 %	23 %
Actual	134 %	-5 %	64 %	-20 %	489 %	6 %

2.6 Personnel

The companies responding to the survey employed a total of 23 120 people working in 157 companies in 2002 (22 600 people working in 214 companies in 2001). Most of the employees, approximately 91 %, work in companies with a revenue of at least 3 million Euros from their own software product business. Out of these 23 120 employees, some 6 000 worked in software product business. When this is extrapolated to the industry level, the amount of employees working in software product business was about 10 000 in the year 2002. This extrapolation was made in the same way as the extrapolation for the revenue. On average, there were 146 employees per firm (median 9 employees) and 41 people working in software product business (median 5 employees).

When looking at the distribution of personnel in the software product firms that responded to the questionnaire, it can be seen that 34 % of the companies have less than six employees (35 % in 2001). On the other hand, only 15 % (11.7 % in 2001) of the firms employ more than 100 people. As mentioned before, large companies are over-represented in our sample. Figure 12 presents the distribution of companies 'personnel.

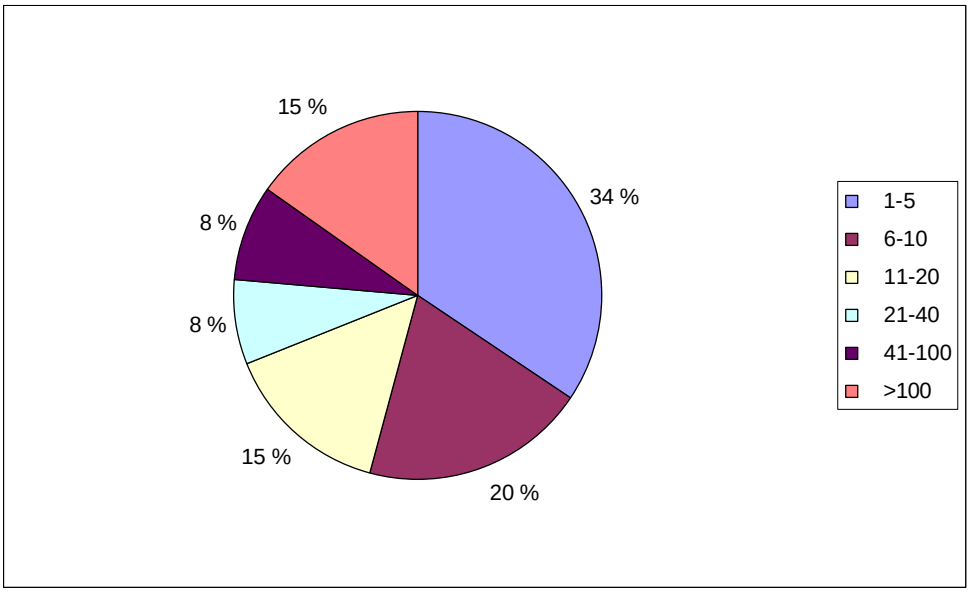

Figure 12. Distribution of Overall Personnel in Software Product Companies in 2002 (n=157)

Figure 13 shows the distribution of companies 'software product business personnel. There is a strong correlation between the software product business revenue and software personnel (Pearson correlation 0.973). Regression analysis reveals that the coefficient of software personnel is 0.098. This means that, on average, the software product business revenue grows 98 000 euros by each additional software worker. This can be interpreted as an indication of the immaturity of the industry, since mature software product business should be able to grow its revenue without significantly adding personnel.

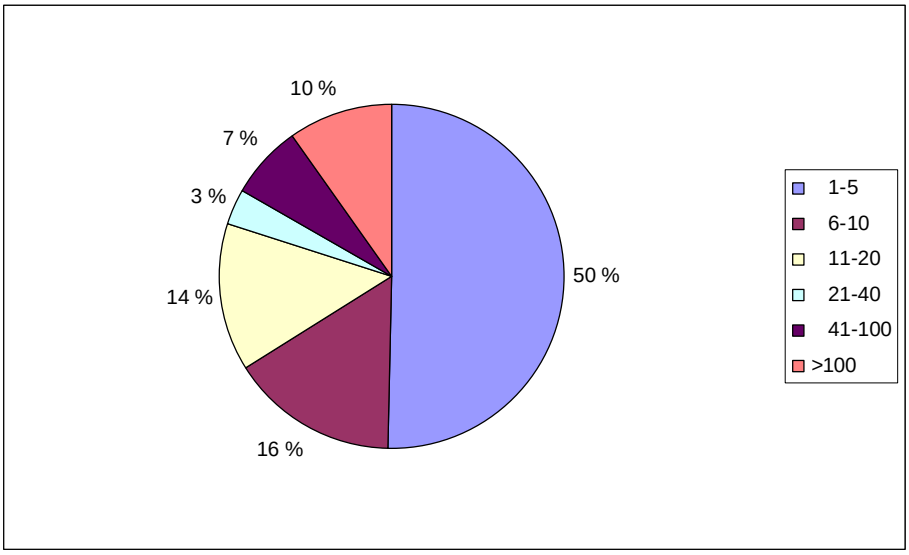

Figure 13. Distribution of Software Personnel in Software Product Companies (n=145)

Figure 14 shows how personnel are allocated to various functions. Over one third (34 %) of the employees work in product development (35 % in 2001). The share of personnel providing product services and delivery has slightly increased from the last year — 23 % of the personnel were allocated to this area (20 % in 2001). The share of personnel in customer service has increased to 15 % from 13 % in 2001. 17 % of the employees work in sales and marketing (20 % in 2001). Management and administration staffs share also decreased to 9 % from 12 % in 2001.

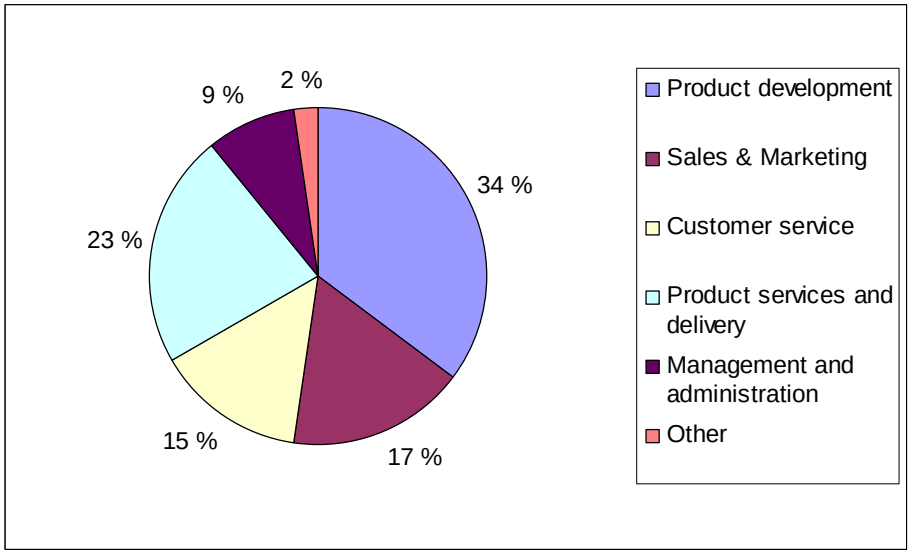

Figure 14. The Allocation of Personnel (n=133)

At the industry level, the total number of software professionals has not changed from the year 2001. The extrapolation was done using the same approach as when calculating the revenue of the industry. Even though no actual growth has happened, there have been headlines about layoffs in software product companies and other IT companies. However, smaller companies not making the headlines have grown and increased their personnel. Development of the software product business personnel between 1999-2002 and budgeted estimates for 2002 and 2003 are presented in Figure 15.

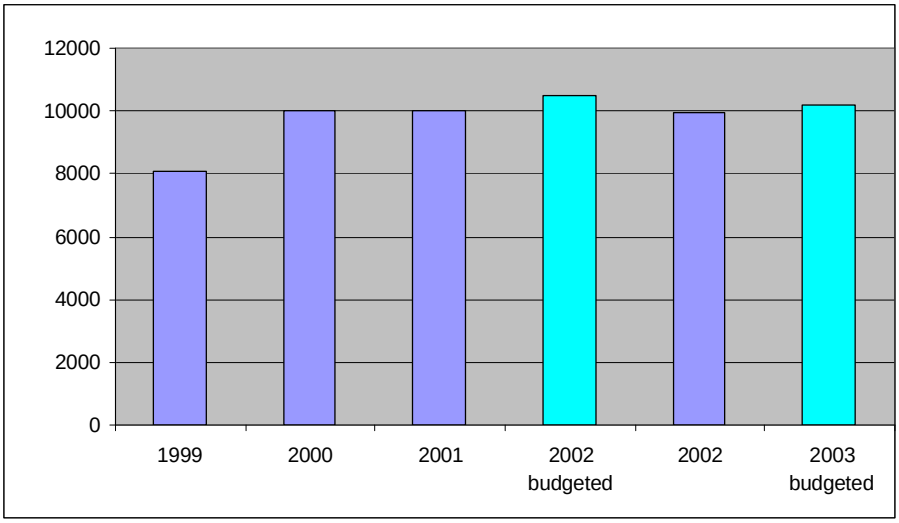

Figure 15. Development of the Software Personnel at the Industry Level in 1999-2003

As Figure 15 shows, companies have not recruited personnel as much as they expected in 2002. Only 61 companies reported the number of personnel in the software product business both in 2001 and 2002. These 61 companies employed 4 576 software professionals in 2002 (4 256 in 2001), with an average of 75 (70 in 2001) and a median of 5 people (6 in 2001). Actually, 51 % had decreased or kept the same amount of software employees, 18 % had increased the software personnel from 1 to 40 % and 31 % had increased the amount by more than 40 %. The changes in the number of software product business personnel are presented in Figure 16.

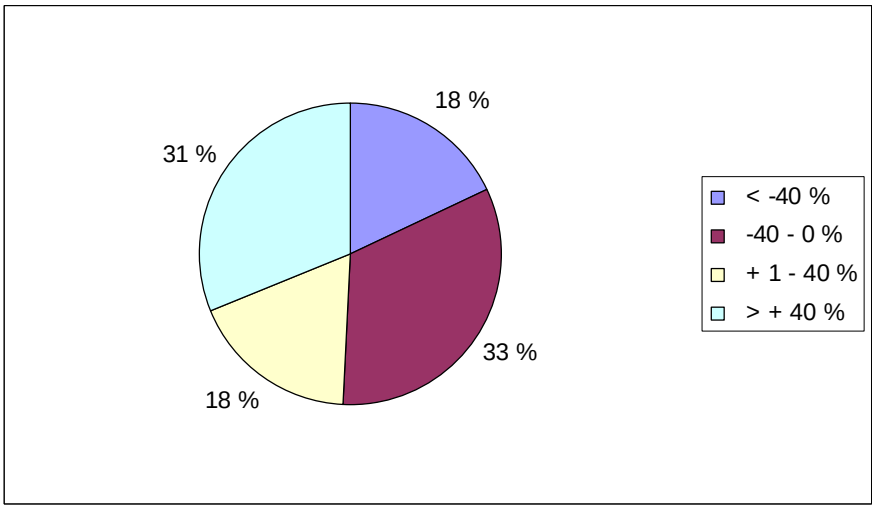

Figure 16. Percentage Change in Software Personnel from 2001 to 2002 (n=61)

The changes in software product personnel indicate that despite the current economic downturn, companies are able to adapt to the changing situation and there are even companies that are able to increase their personnel. It is worth mentioning that companies are more eager to report positive development and thus these results are probably more positive than the situation is in the entire industry.

2.7 Profitability

Year 2002 was quite challenging for the companies because of the global economic situation. Among the responding companies, it can be seen in Table 8 that year 2002 was generally profitable. On the other hand, half of companies with a revenue less than 0.2 million Euros from software product business have made a negative result, but on average small companies have been also profitable.

Table 8. Companies' Average Profits in the Year 2002

Revenue from companies 'own software product business in 2002 (million Euros)	Mean	Median	Sum	n
Unknown	0.01	0	0.03	6
< 0.2	0.04	0	1.6	43
0.2-0.99	0.09	0.01	2.27	25
1-1.99	0.08	0.09	0.91	12
2-2.99	0.29	0.23	2.6	9
3 -	0.63	0.87	15.85	25
Total	0.19	0.01	23.26	120

Altogether, companies responding to the survey generated profits of 23.26 million Euros (180 million Euros in 2001). Companies with software product business revenue less than 3 million Euros generated profits of 7.4 million Euros (12 million Euros in 2001). In addition, it is noticeable that only 120 out of 166 companies reported their profits for the year 2002. There is a tendency that companies doing relatively well are more eager to report their profits. Therefore, the actual situation is likely to be worse than the sample indicates.

Just 10.3% of the companies generated larger losses than 0.5 million Euros in the year 2002. Almost two thirds (60.3 %) of the companies were in the range of from 0.5 million Euros losses to 0.1 million Euros profits. Some 29 % of the companies generated larger profits than 0.1 million Euros as can be seen in Table 9.

Table 9. Companies' Profits in the Year 2002

Profit (million Euros)	Frequency	Valid Percent	Cumulative Percent
<-0.5	12	10.3 %	10.3 %
-0.5 - 0	42	36.2 %	46.6 %
0.01 - 0.1	28	24.1 %	70.7 %
0.11 - 1	21	18.1 %	88.8 %
>1	13	11.2 %	100.0 %
Total	116	100.0 %	

Figure 17 presents the company's profit in proposition to its revenue in the year 2002. There are no significant differences in the profitability based on the company size. It is noticeable that majority of the companies, despite the current economic situation, remained profitable.

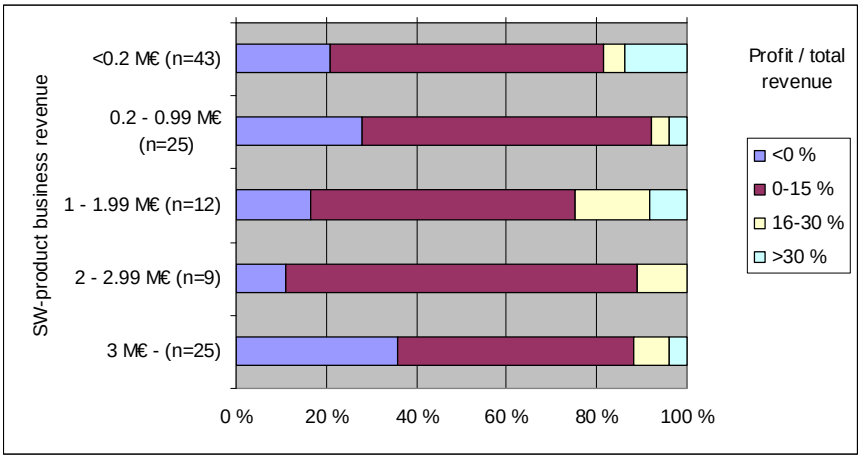

Figure 17. Company Profit / Revenue in the Year 2002 (n=114)

2.8 Recruiting

We asked the companies how the skills of the workforce recruited meet the practical needs of the company. Only 20 % of the companies felt that the skills of the workforce did not meet the demands of the company (23 % in 2002 survey). This is understandable as in the current economical downturn there are highly competent employees available at reasonable expenses.

The most common problem areas in finding competent personnel were in sales and marketing, especially for international markets. In addition, quite often sales and marketing personnel had inadequate knowledge of the problem domain from a technological perspective. In general, it can be concluded that problems in finding competent personnel were most often in business and administrative tasks, not in technological. Compared to results from 2002 survey, the study indicated that acquiring competent technological people has become easier. This might be caused by layoffs of some large IT-companies and increased competence of the current workforce. However, the results put more focus in improving the technical competence of the business people. Summaries of the listed competence problems in different categories are listed in

Table 10,

Table 11, and Table 12.

Table 10. Managerial Competence Problem Areas in Recruiting

Leadership and management	Frequency
(International) sales and marketing	12
Problem domain knowledge of business personnel	5
General management skills	3
Project management	2
Business process consultants	1
Managing a start-up company	1
Productization	1
Starting international operations	1

Table 11. Technical Competence Problem Areas in Recruiting

Technical knowledge	Frequency
Advanced programming skills	1
Designing enterprise systems	1
Theoretical computer science competence	1

Table 12. General Competence Problem Areas in Recruiting

General knowledge	Frequency
Professional competence	1
Efficiency and quality	1

The size of the company does not seem to affect how respondents felt about the suitability of the workforce knowledge. However, it is interesting to notice that despite the economic situation, approximately 20 % of the companies of all sizes are not satisfied with their recruited personnel. The suitability of the recruited personnel is depicted in Figure 18.

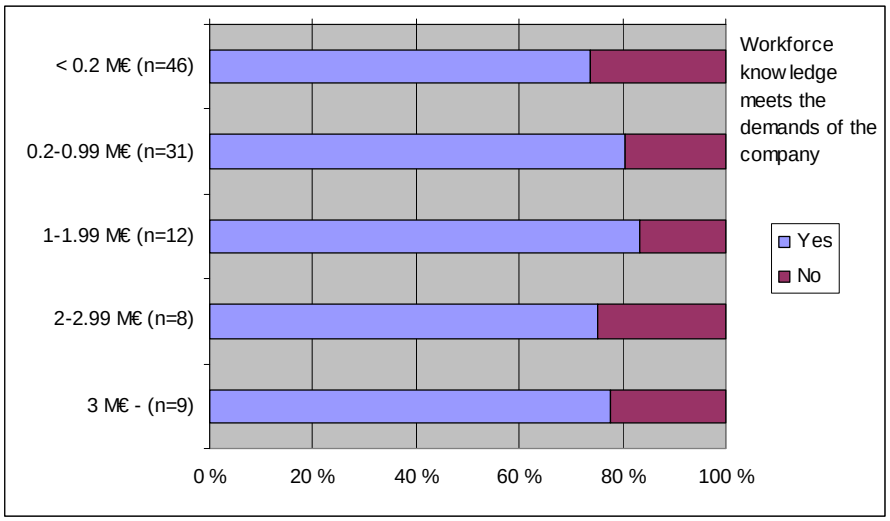

Figure 18. Recruited Workforce Knowledge Meets the Company Demands Based on the Software Product Business Revenue (n=116)

2.9 Improvement Areas

We defined eight possible improvement areas in the survey, as presented in Figure 19, that companies are focusing in 2003-2005. The companies were asked to value their two most important improvement areas with numbers 1 and 2, where one was the most important and two the second most important improvement area in the next three years.

The companies were also asked to value their two least important improvement areas with numbers 7 and 8, where 8 was the least important improvement area and 7 was the second least important improvement area. 56 % of the companies rated product development or productization as the most important or the second most important improvement area. It is worth to mention that only 2.4 % of the companies rated product development or productization as the least important or the second least important improvement area. Improvement of personnel knowledge and networking and cooperation were also quite often ranked as important improvement areas as can be seen from Figure 19.

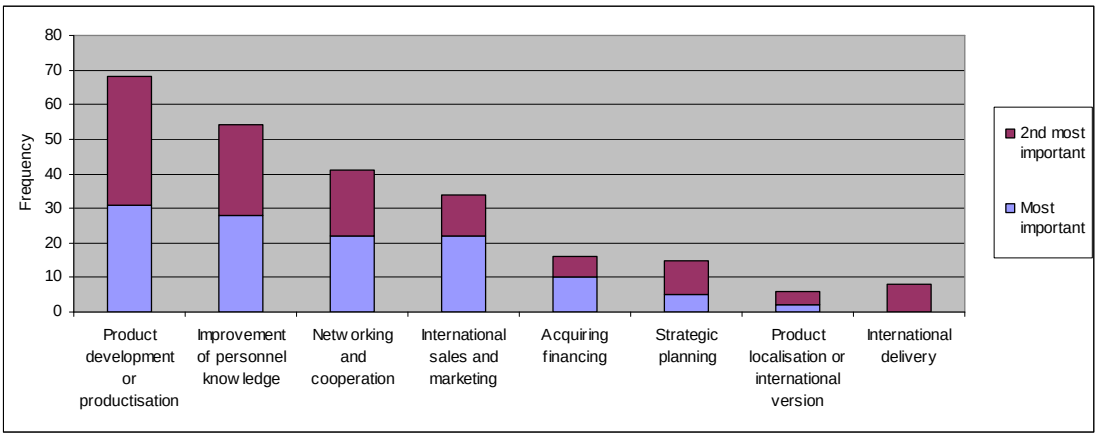

Figure 19. The Most Important Improvement Areas within 2003-2005 (n=122)

We studied how the size of the company, defined by revenue, affects the improvement areas. Small companies (revenue 0-2 M Euros) selected most often product development or productization as the most important improvement area. Interestingly, larger companies ranked most often improvement of personnel knowledge as the most important improvement. Smallest companies seemed to find networking and co-operation as very important improvement areas whereas largest companies seemed to manage this area rather well. Despite the size of the company in general, most important improvement areas seemed to relate to very fundamentals of business, i.e., product development, networking and improving personnel knowledge. Most and second most important improvement areas by the size of the company are presented in Figure 20.

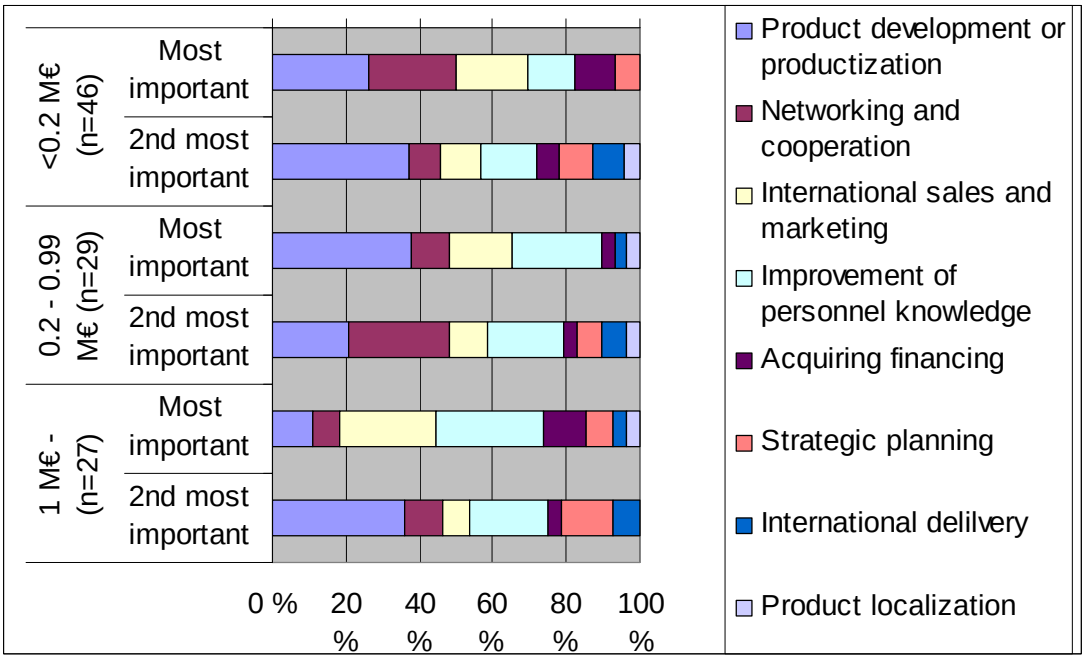

Figure 20. Distribution of the Most Important Improvement Areas within 2003-2005 by the Software Business Revenue (n=102)

We also studied how a company's age affects to the improvement areas. It is worth to mention that older companies (age > 10 years) selected most often improvement of personnel knowledge as the most important improvement area as can be seen from Figure 21. This together with the finding that older companies revenue/employee-rate is lower than companies with age between 6 to 10 years (see Figure 10) could indicate that

older companies have strong commitment to the personnel, because they see improvement of personnel knowledge such an important improvement area. Therefore, they are not necessarily so willing to give notice on economically bad times and this can cause temporarily lower revenue/employee-rate. An interesting finding is that youngest companies saw networking and co-operation as the most important improvement area, followed by product development. This could indicate that companies are still unsettled in their ways of operating business and try to position themselves in the business environment.

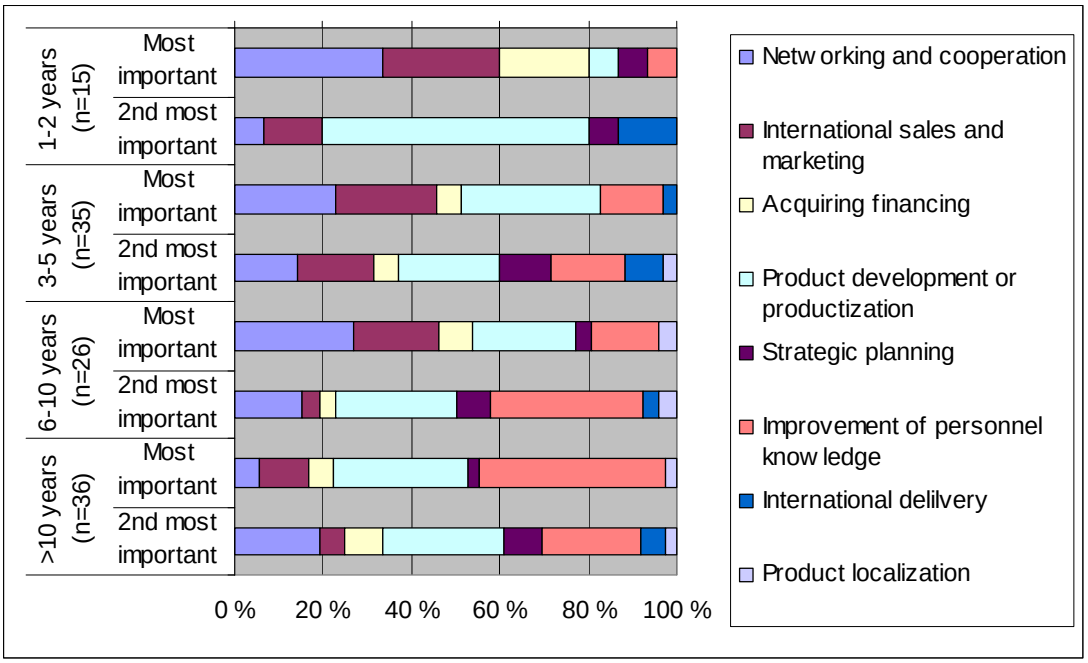

Figure 21. Distribution of the Most Important Improvement Areas within 2003-2005 Based on the Age of the Software Product Business (n=112)

3 CHARACTERISTICS OF THE BUSINESS

3.1 Main Product

In order to get a deeper understanding of the business models used by the Finnish software product companies, we asked them various questions related to the development, sales and delivery of their main product. The following sections discuss our findings regarding the sales composition, the sales channel used, and the method of delivery.

3.1.1 Sale Composition

The companies were asked about the composition of their main product's delivery. We asked about the cash flow during the entire life cycle of the product. The categories were:

- Sales and rentals of the user licenses
- Customer specific projects and tailoring
- Customer installations
- User training
- Maintenance, service and help desk
- Other

Figure 22 shows an average customer sales distribution into categories mentioned above, for all respondents. It can be seen that on average 51 % (48 % in 2001) of the sales revenue came from licenses. Customer projects and tailoring accounted for 19 % (22 % in 2001) and installations 15% of the whole price.

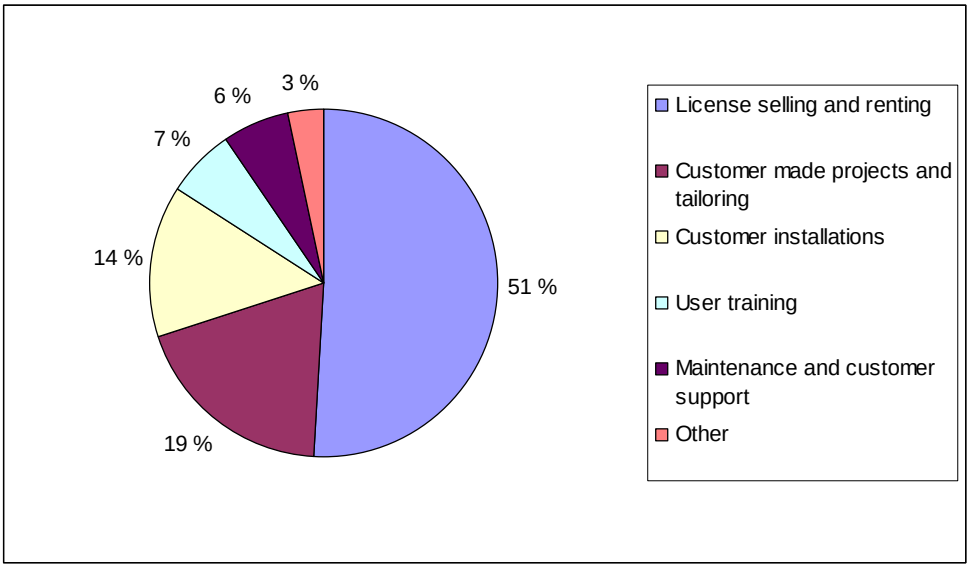

Figure 22. Composition of a Typical Delivery of the Main Product (n=140)

Figure 23 shows the main product's sale composition sorted by revenue from software product business in 2002. There were no significant differences between companies of different sizes.

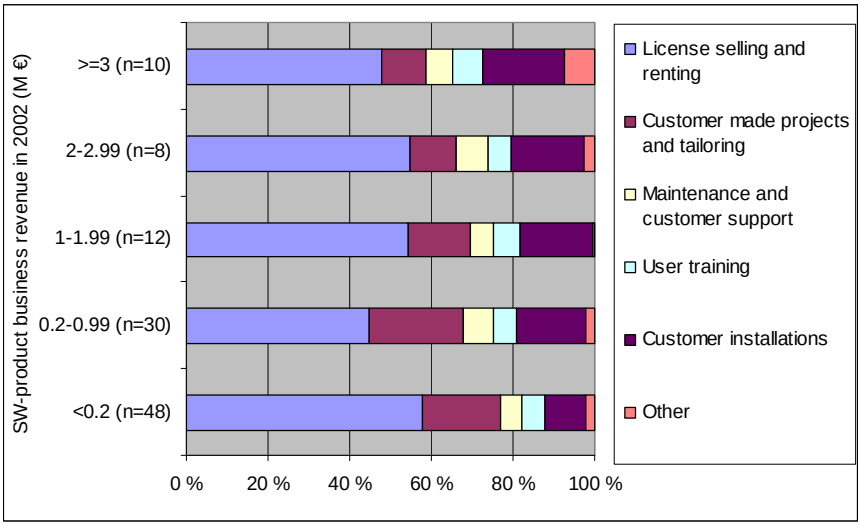

Figure 23. Composition of a Typical Delivery of the Main Product by Software Product Business Revenue

There is one factor causing some error in the distribution. For some of the companies, it is quite difficult to distinguish between license selling and maintenance. For example, a company might receive maintenance revenue, which partly include the updates or new versions of the product. This part could qualify as license selling as well.

Generally, companies paid only marginal shares of their main product's revenue to third parties, on average just 7.2 % (median 0 %). The size of the company did not seem to affect the percentage paid to third parties.

The average selling price of the sample companies 'main product was 197 448 Euros, but this number is heavily influenced by a few system suppliers, whose delivery price is measured in tens of millions. The median delivery price was 10 000 Euros (n=134). The median delivery price by the size of the company is depicted in Figure 24.

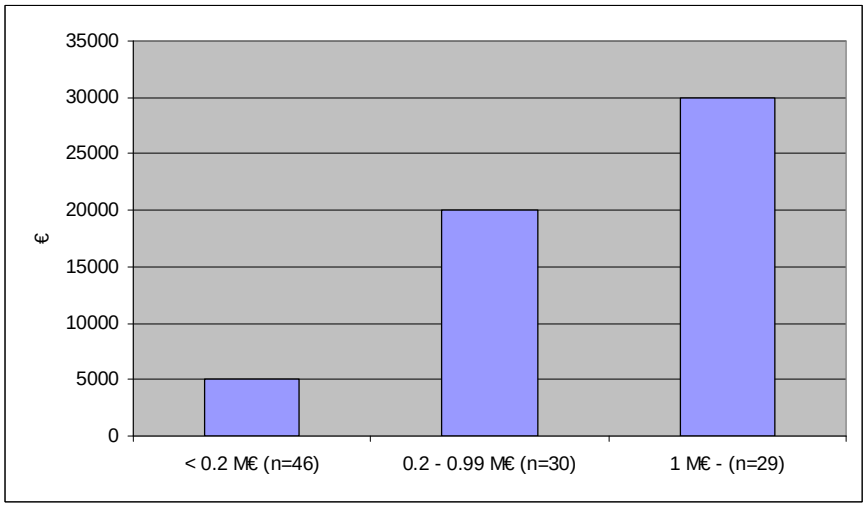

Figure 24. Median Delivery Price of the Main Product by Software Product Business Revenue

3.1.2 Sale Channel and Product Delivery

We asked the companies about the sales channel of the main product and how the product is being delivered. We listed various sales and delivery channels and asked the companies to rate how much they used the various channels on a Likert scale from 1 to 7, where 1 meant "hardly at all" and 7 "very much". The most common way of reaching the customer was through direct selling. Resellers and agents were also used, more often by larger companies. Other approaches were very narrowly used, as shown in Figure 25.

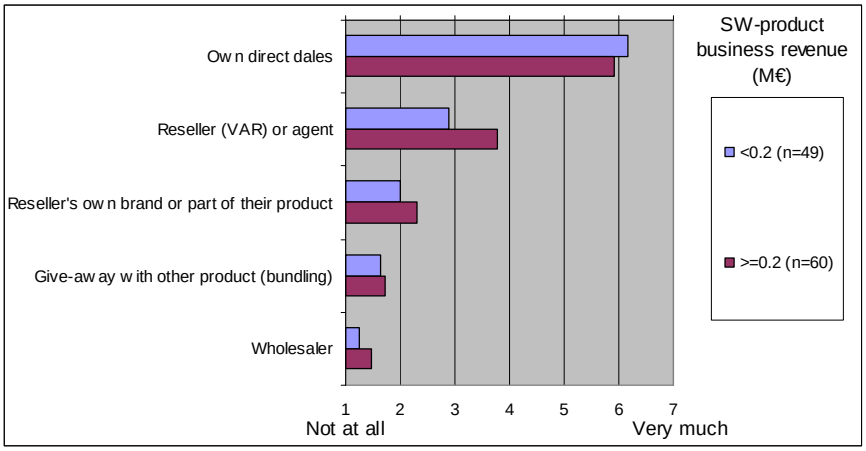

Figure 25. Sale Channels Used with the Main Software Product

Smaller companies (sw product business revenue <0.2 M Euros) rely more on electronic delivery (the Internet) than using physical delivery. Larger companies use electronic delivery as much as physical delivery, as illustrated in Figure 26.

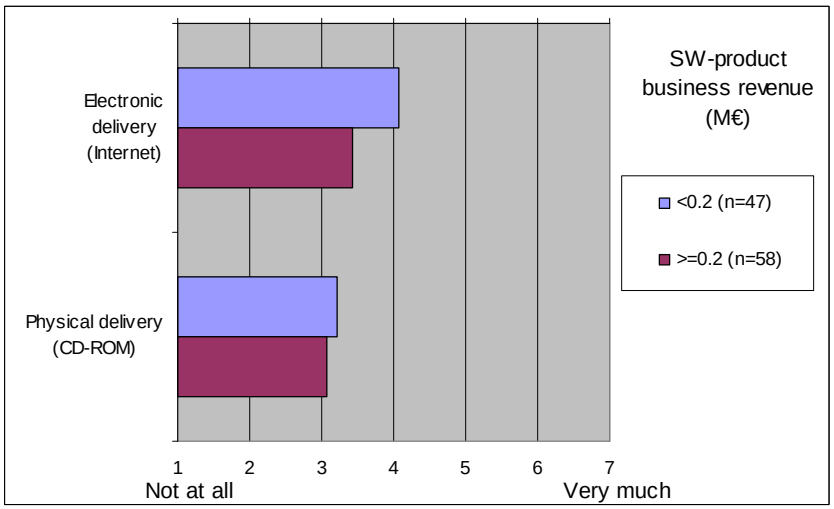

Figure 26. Delivery Channels Used with the Main Software Product

3.1.3 End Users and Market Segments

We asked the companies to identify their main product's end user. The majority of Finnish software products are sold to other organizations and public administration, and only rarely to consumers. Only among the smallest companies, with software product business revenue less than 0.2 million Euros, some 14 % of the companies had private consumers as their customers. Because one company can have customer in more than one segment (dichotomy label), the overall percentages can be above 100 % in Table 13..

Table 13. End Users

Dichotomy Label	Revenue from companies 'own software product business in 2002 (million Euros)				
End user	< 0.2	0.2-0.99	1-1.99	2-2.99	3 -
SM Enterprise	71 %	55 %	67 %	43 %	22 %
Large Enterprise	39 %	42 %	42 %	71 %	89 %
Public Administration	16 %	36 %	50 %	14 %	22 %
Private consumer	14 %	3 %	0 %	0 %	0 %
Total	140 %	136 %	159 %	128 %	133 %
Number of cases	49	31	12	7	9

Out of the 140 responding companies, 68 indicated (49 %) that their main product is focused on industry-independent markets as the rest 72 (51 %) had industry-specific markets, as Figure 27 shows. There were no dramatic changes in the foci based on the size of the software product business, but the number of responding companies in some categories was also relatively small.

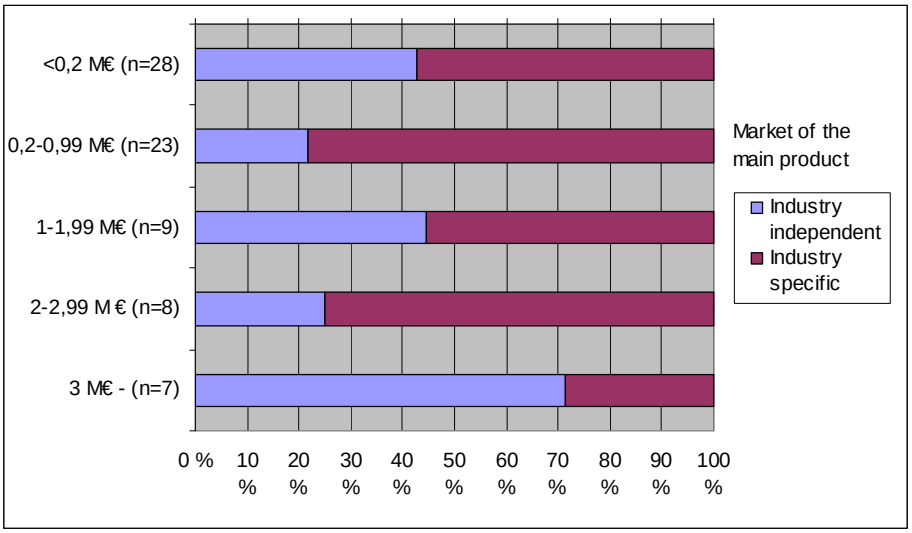

Figure 27. Target Market of the Main Product by the Size of the Software Product Business

We also asked the companies in which markets the main product was offered and if there was an industry-specific market. Most common fields of industries were industry, transport, warehousing and telecommunications, public administration, and business support, as can be seen from Figure 28.

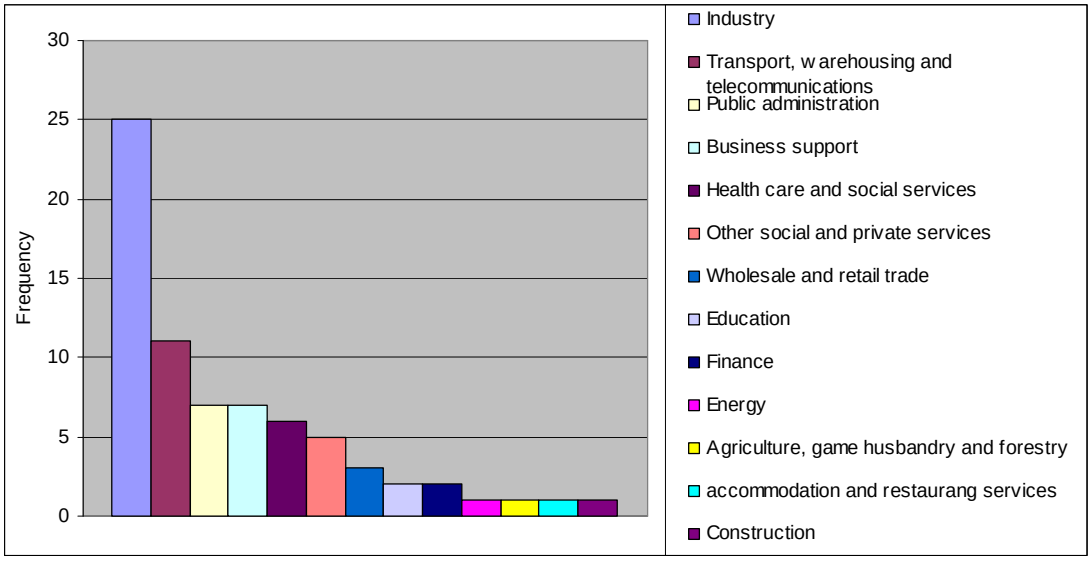

Figure 28. Frequencies of the Industry-Specific Markets of the Main Product

3.1.4 Versioning

We also asked the companies on which basis they release a new version of their main product. With smaller companies, with software product business revenue not exceeding 0.2 million Euros, 51 % of them release a new version without a pre-defined cycle (56 % in 2001). In companies having software product business revenue over 0.2 million Euros, 60 % of the companies indicated that their version releasing is not based on a pre-defined cycle (41.3 % in 2001). An interesting finding was also the decrease in basing the releasing on a fixed schedule as only 30 % of the larger companies indicated so (46.7 % in 2001). The version release basis is presented in Table 14.

Table 14. Basis of the Releasing a New Version of the Main Product

Dichotomy Label	Revenue from companies 'own software product business in 2002 (million Euros)			
Release basis	< 0.2 (n=49)		0.2 –(n=60)	
	% of responses	% of cases	% of responses	% of cases
In every customer delivery	1.7 %	2.0 %	5.0 %	6.7 %
Without pre-defined cycle	42.4 %	51.0 %	45.0 %	60.0 %
Based on the customer need	40.7 %	49.0 %	27.5 %	36.7 %
On a fixed schedule	15.3 %	18.4 %	22.5 %	30.0 %
Total	100.0 %	120.4 %	100.0 %	133.3 %

There were no actual changes in how many versions a year companies released a new version of their main product compared to 2001. Both small (software product business not exceeding 0.2 M Euros) and companies having software product business revenue over 0.2 M Euros released on average two new versions of their main product a year. Surprisingly, the differences in release frequency between companies with revenue below and over 0.2 million Euros were not significant as Table 15 indicates.

Table 15. Version Release Interval of the Main Product

	Revenue from companies 'own software product business in 2002 (million Euros)	
Version release interval	< 0.2 (n=49)	0.2 –(n=57)
Weekly	2.0 %	0 %
Monthly	8.2 %	1.8 %
Every second month	8.2 %	7.0 %
3-4 times a year	20.4 %	26.3 %
2 times a year	16.3 %	26.3 %
Annually	32.7 %	31.6 %
Less frequently	12.2 %	7.0 %
Total	100.0 %	100.0 %

We also studied how the maturity of the software development processes affects version release intervals. Surprisingly, we found no actual correlations. Naturally, the type of software produced affects among many other factors to the need for releasing new versions. For instance, in security business (i.e., virus protection) version release is critical when a new virus appears but in game industry there are rarely many versions released of the same game (minor patches and updates excluded). Companies that identified themselves as innovative and in leading technological position had a more frequent version release than companies that identified themselves as "market followers" (Pearson correlation 0.230, significant at the 0.01 level).

3.2 Research and Development

On average, software product companies invested 31.4 % (63 % in 2001) of their revenue on R&D. The average is significantly smaller than in 2001 but can be partly explained by smaller number of young firms whose R&D investments can easily outnumber their revenue. There was also a significant decrease in small companies' R&D investments even though the median investment 20 % of all the companies (n=107) had not changed from the previous year. Table 16 presents the average and median product development investment (% of the revenue) for the year 2001 for those companies, whose software product business revenue is known.

Table 16. Product Development Investments in 2002 in Relation to (% of Total Revenue)

Revenue from companies 'own software product business in 2002 (million Euros)	Mean	Median	n
< 0.2	39.4 %	20.0 %	44
0.2–0.99	20.7 %	16.0 %	27
1 -	29.9 %	25.8 %	36
Total	31.4 %	20.0 %	107

Table 17 presents the product development investments based on the time the company has been in the software product business. There was a dramatic decrease in young companies' R&D investments. In 2001, on average one-year-old companies invested 169 % and 2 year-old-companies invested 215 % of their revenue on R&D. The investments in 2002 were 31 % and 22 % respectively. Despite the fact that the number of young companies in the sample is small, this can indicate that in the current economic situation young companies finance their R&D merely by operations compared to the situation, where more young companies could finance their R&D by venture capital. This is an important finding and means that companies face increased challenge in their

productization aims as R&D is influenced by customer projects and tailoring. Older companies R&D investments did not change significantly from 2001.

Table 17. Product Development Investments in 2002 in Relation to the Age of Software Product Business

Time company has been in software product business (years)	Mean	Median	n
1	31.4 %	20.0 %	7
2	22.0 %	16.0 %	6
3–5	43.7 %	20.0 %	29
6 –10	21.6 %	20.0 %	26
> 10	29.0 %	25.0 %	36
Overall	31.0 %	20.0 %	104

Figure 29 depicts the R&D mean and median investments according to the maturity of the software product business. This clearly points out the fact that in the current economic situation despite the phase of the company's life cycle majority of the companies are investing some 20-30 % of their revenue on R&D where as in 2001 youngest companies invested essentially larger amount in their R&D.

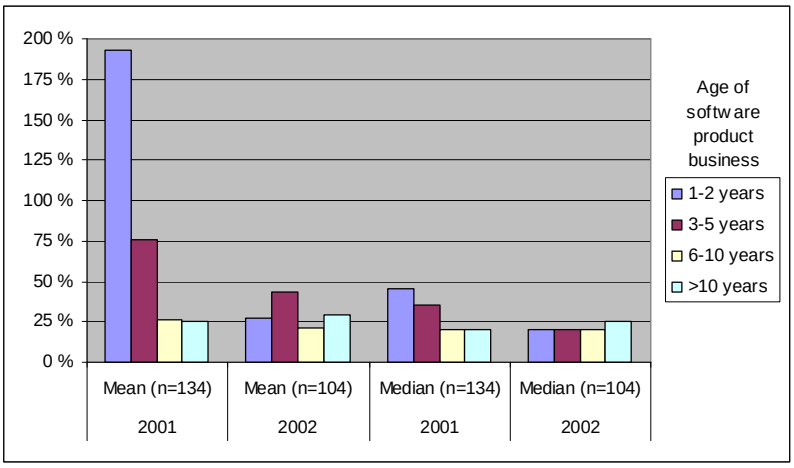

Figure 29. R&D Investment (% of Total Revenue) According to the Maturity of the Software Product Business in 2001 and 2002

We also studied how the focus of the product development has changed in the company sample from 2001 to 2002. For smaller companies there were not many changes, in both years most emphasis had been put on increasing the degree of productization and in creating value-adding services. However, in 2002 smaller companies (software product business revenue not exceeding 0.2 M Euros) seemed to put also more emphasis in improving their R&D and delivery processes. Companies that generated less than 1 million Euros in revenue from software product business emphasize increasing the degree of productization and value-adding services in their product development efforts in both 2001 and 2002. Interestingly, for larger companies the averages fell in every category when compared to situation in 2001. Despite the size of the company, the emphasis of R&D put in creating new products had significantly decreased as Figure 30n indicates. This could indicate that in current economic situation companies try to avoid risky R&D projects and focus merely on less risky, i.e. in improving the current products and creating services around it.

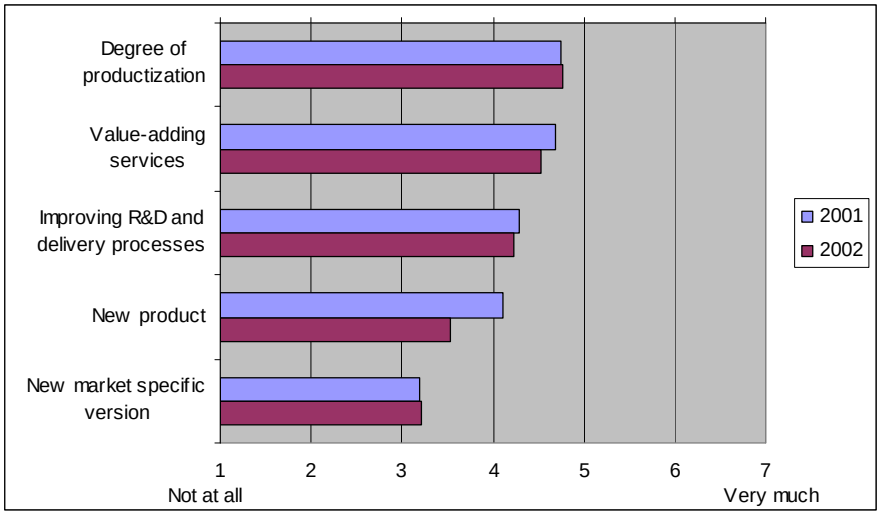

Figure 30. Product Development Emphasis in 2001 and 2002

Similarly to 2001, in 2002, companies that have been in the software product business for less than six years emphasize most leveraging the degree of productization and youngest companies are still creating their first products. Companies that have been in business for at least six years emphasized most creating value-adding services around their main product. Product development emphasis by the age of software product business can be seen in Figure 31.

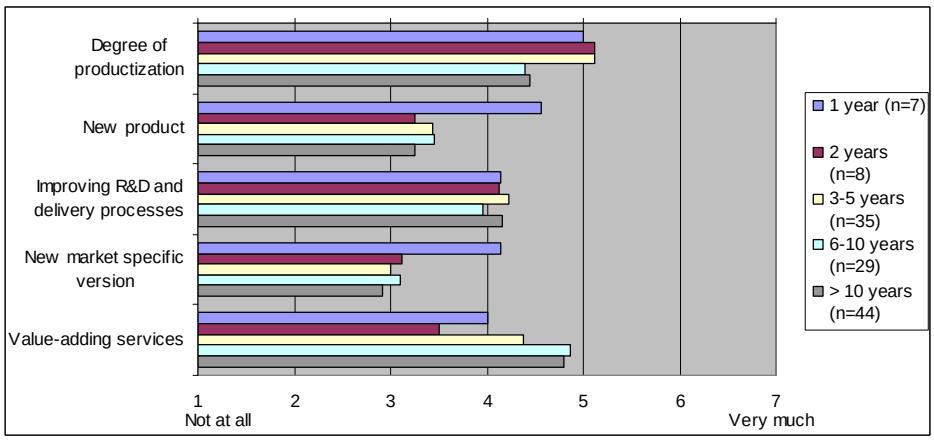

Figure 31. Product Development Emphasis Based on the Age of Software Product Business (n=123)

3.3 Product Development Processes[1]

We also asked companies about their product development processes. 61 % of the responding companies indicated that they have at least a relatively specific description of the features and requirements of their products (given at least value of 5 on a 7-scale Likert). We also asked if a company always has a pilot customer before making a

[1] There is an ongoing research project performed by Helsinki University of Technology (Software Business and Engineering Institute) on software engineering management system for small and medium-sized enterprises. More info available at http://www.soberit.hut.fi/sems/

decision of new product development. 40 % of the companies indicated, that there is a pilot almost always (given at least a value of 6 on a 7-scale Likert). However, 29 % of the companies indicated that they only rarely have a pilot (given no more than a value of 3 on a 7-scale Likert). Over half (55 %) of the companies did not systematically set several milestones for their product development projects (given no more than a value of 4 on a 7-scale Likert). 59 % of the companies disagreed at least quite strongly (given no more than a value of 3 on a 7-scale Likert) with the statement that talking about product releases is not essential to them. The averages of the used approaches in product development are depicted in Figure 32.

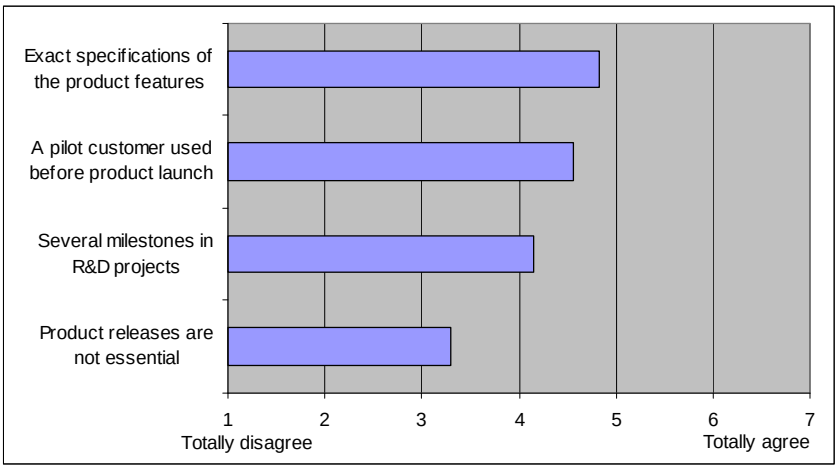

Figure 32. Describing Factors of the Product Development Process

Interestingly, the previous methods used in product development process did not dramatically seem to affect the degree of productization. However, small correlation was found between the using milestones in product development and occurrence of a customer-specific version of the product (Spearman correlation -0.168, significant at the 0.05-level). This indicates that companies using milestones operate more systematically in their product releasing and, therefore, do not release a customer-tailored versions. In addition, companies indicating that they knew their markets thoroughly also had more detailed specifications of their products (Spearman correlation 0.236, significant at the 0.05-level).

We also asked companies to estimate their product development process by some statements, where the far-ends were not necessarily opposites, but describe i.e. how information for products is primarily gathered. Majority of the companies indicated that new product development projects are at least partly based on understanding the market needs, instead of basing decisions merely on their own technological competences (given at least a value of 5 on a 7-scale Likert). Releasing a new product was by 34 % of the companies quite clearly based on a fixed time schedule (given no more than a value of 3 on a 7-scale Likert) where as 43 % of the companies were including almost all the wished features despite delays in releasing (given at least a value of 5 on a 7-scale Likert). Majority of the companies gathered requirement and feature needs from their customers where as using market research was quite seldom used, as only 22 % of the companies indicated so (given at least a value of 5 on a 7-scale Likert). Majority of the companies have prioritized their list of features to be made as only 15 % indicated that features are not prioritized (given at least a value of 6 on a 7-scale Likert).

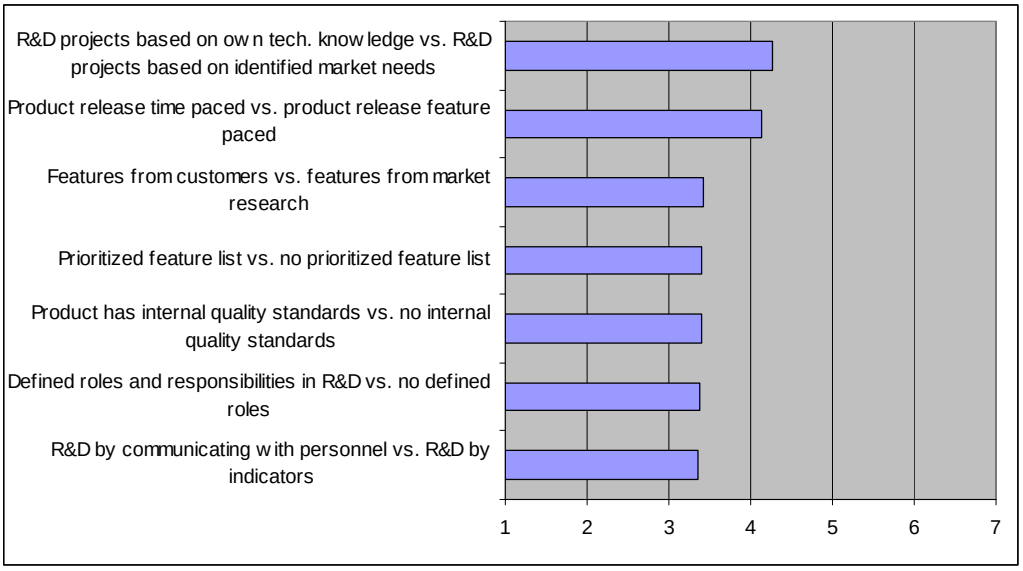

Figure 33. Characterizing Factors of the Product Development Process

Interestingly, no significant correlations were found between the process describing variables and the degree of productization. However, it seems that companies producing enterprise systems are quite advanced in their processes. Companies announcing that they produce enterprise systems (i.e. CRM, ERP or SCM) had significant correlation with having R&D followed by indicators (Spearman correlation 0.202, significant at the 0.05-level). In addition, these companies seemed to create new products based on the market need (Spearman correlation 0.304, significant at the 0.01-level) instead of the their own technological competence. This is quite logical as enterprise systems are often designed to fill a specific need of a market. In addition, many small companies provide add-ons to gigantic enterprise systems (i.e. SAP).

3.4 Subcontracting and Distributed Software Development [2]

We asked companies to indicate to what degree they use different forms of subcontracting in their software development. Figure 34 shows the importance of seven central forms of subcontracting for the studied companies. The importance of subcontracting in the company's product development was measured on a seven-point Likert scale. The most important form of subcontracting was programming, followed by program and architecture planning and testing. Subcontracting of programming was of moderate to extreme importance to 30 % of the respondents, and 51 % did at least some subcontracting of programming. Subcontracting of program and architecture planning was of moderate to extreme importance to 26 %, and subcontracting of testing was of moderate to extreme importance to 20 %. However, when looking at the other forms of subcontracting, at least 80 % of the respondents reported that they do not use other forms of subcontracting at all or only in small volume.

[2] There is an ongoing research project on subcontracting and distributed software development performed by Helsinki University of Technology (Software Business and Engineering Institute). More info available at http://www.soberit.hut.fi/veto/

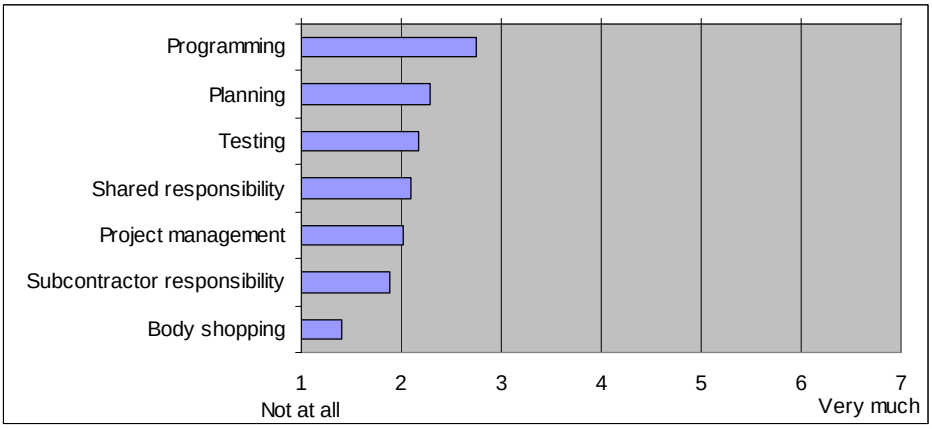

Figure 34. Importance of the Central Forms of Subcontracting (n=133)

We also asked the companies, what kinds of factors restrict their use of subcontracting. The opinions on six restrictive factors were measured on a seven-point Likert scale, where value 1 means absence of restricting impact and value 7 extreme restricting impact. As shown in Figure 35, the most restrictive factor is the difficulty to identify suitable modules from the product to be subcontracted. Nearly 55 % of the respondents reported that this difficulty restricts their decisions to subcontract quite much, much or extremely. The second biggest obstacle is the difficulty to give sufficiently detailed specifications to the subcontractor. Nearly 45 % reported that this difficulty with specifications restricts their subcontracting quite much, much or extremely. The rest four factors – unsuitability of the available services, lack of in-house project management resources, lack of practices in distributed subcontracting and low quality of the subcontracted work – were all reported to have a mild restricting impact on the decisions to subcontract software.

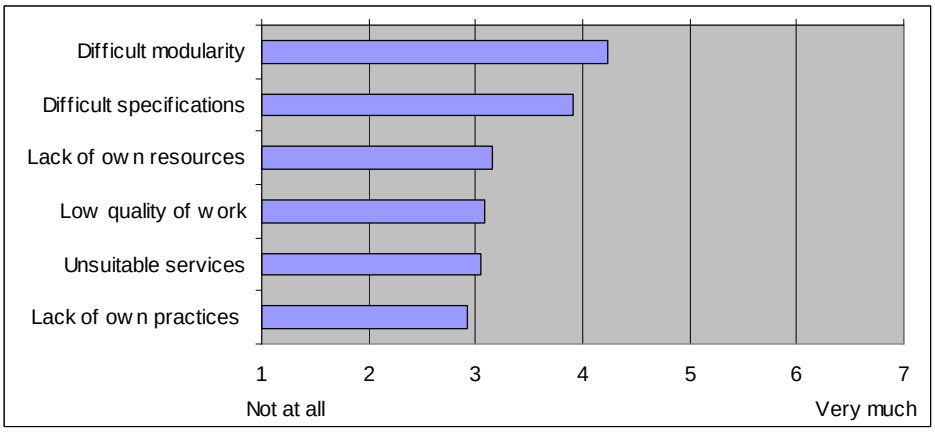

Figure 35. Restricting Factors in Subcontracting (n=125)

When taking a closer look at the correlations between the restricting factors and some variables describing the software process of the companies, there seems to be a connection between the variable "several clearly defined milestones in the process" and "lack of practices in distributed subcontracting". Since these variables are measured on an ordinal scale (or on the Likert scale), Spearman ordinal correlation coefficient was selected as the method of analysis. There is a significant negative 0.27 correlation between these variables (significant at the 0.01-level), which means that the more clearly the process is structured and defined, the more confident the companies are about their own capacities to manage subcontracting successfully. The correlation is not very strong

though; nevertheless, it is significant and indicates that a clearly structured process might prove to be helpful in the planning and execution of subcontracting.

Another interesting finding is that there is a very significant correlation between the restrictions posed to subcontracting by insufficient specifications and the company's reported capacities to handle subcontracting (Spearman correlation 0.49, significant at the 0.01-level). This indicates that the more the subcontracting is threatened by the companies' inability to provide subcontractor with sufficient specifications, the more the companies feel that they do not have the capacities to manage the subcontracting relationship. In other words, ability to provide subcontractor with good specifications seems to be related with confident expectations about the management of subcontracting.

3.5 The Use of Knowledge Intensive Business Services[3]

We asked the companies about their use of external knowledge intensive business services (KIBS). Many factors affect the companies' need and the amount of use of these services, i.e. size, age, strategy, processes etc. In general, the use of these services is not very common, as on average companies spent 11 % of their total revenue (median 3 %) on KIBSs. Even the largest companies seem to use KIBSs quite rarely. This could indicate that either larger companies have the knowledge in-house or companies and service providers do not find each other or the quality of the services is not good enough to add value to the company. The mean and median use of KIBS is depicted in Figure 36.

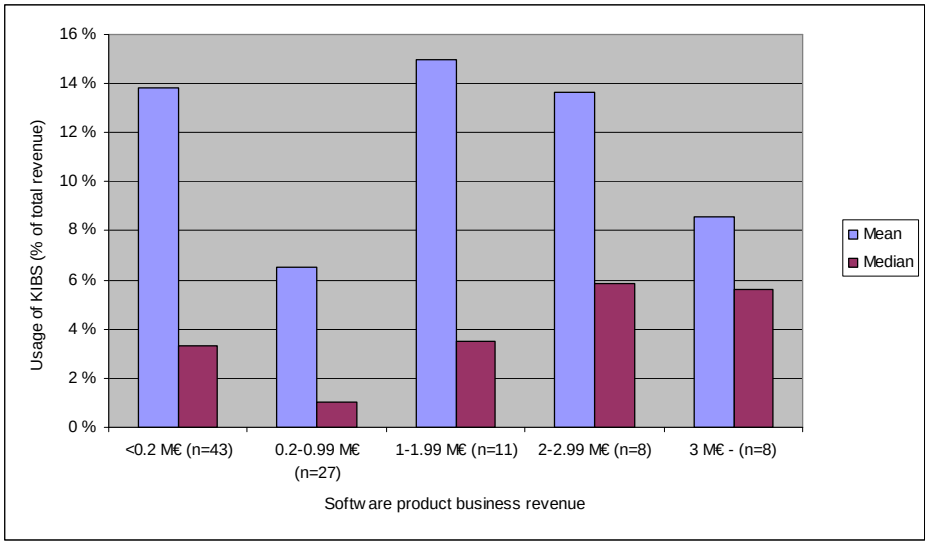

Figure 36. The Use of Knowledge Intensive Business Services (% of the Total Revenue) in 2002

Companies whose software product business revenue did not exceed 2 M Euros used R&D and software production services most. The use of marketing and advertising increases as the companies' revenue grows. This is quite logical as larger companies often attract larger markets and try to establish a company or a brand image. An

[3] There is an ongoing research project on KIBS performed jointly by Helsinki University of Technology (Software Business and Engineering Institute) and Helsinki School of Economics (LTT Research Ltd.). More info available at http://www.soberit.hut.fi/kisa/

interesting finding was the relatively marginal use of legal services: companies that have revenue exceeding 2 million Euros start to put more emphasis in legal services. It is also worth mentioning that only the largest companies (with revenue exceeding 3 million Euros) used financing services intensively. However, the amount of companies in mid-categories is relatively low and therefore further generalizations cannot be made. The average use of KIBS is depicted in Figure 37.

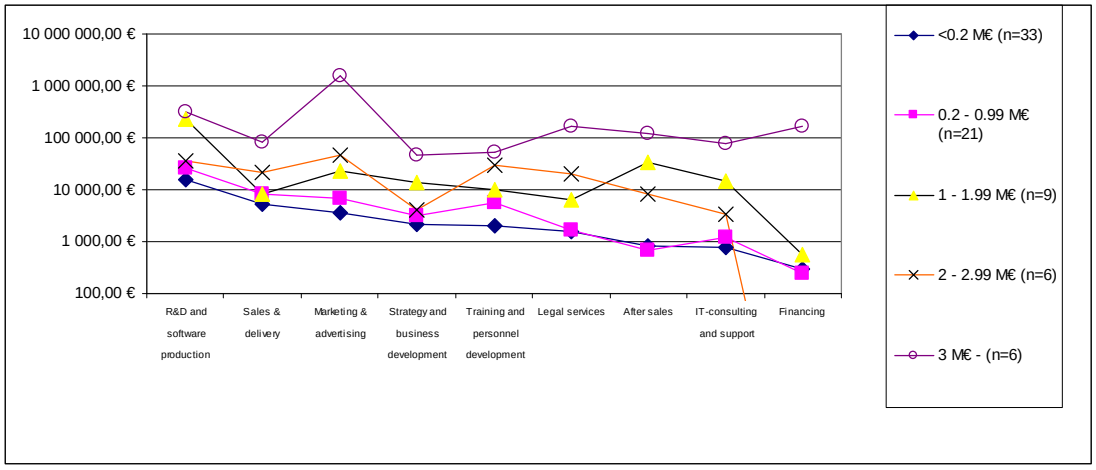

Figure 37. Average Use of KIBS by Software Product Business Revenue (n=75)

As Figure 38 shows, companies whose software product business revenue did not exceed 2 million Euros used proportionally most of the R&D and software production services. Companies larger than that started spending proportionally more on marketing and advertising as well as on other services.

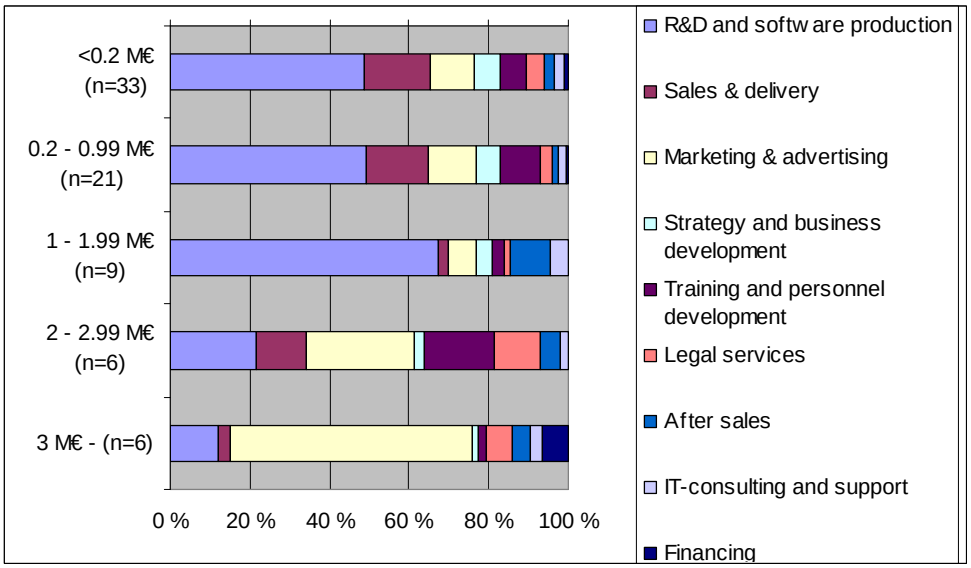

Figure 38. Breakdown of KIBS Use by Software Product Business Revenue (n=75)

In addition, we studied how the age of the software product business affected the use of KIBS. Interestingly, companies having been in business just for a year used marketing and advertising services the most. However, companies whose age in business ranged from 2 to 5 years used by far most R&D and software production services. Companies having been more than 5 years in business started to spend essential sums on marketing and advertising. In our sample, only companies having been two years in business and

more than 10 years in business started spending more on financing services (on average 7 000 Euros and 32 400 Euros respectively).

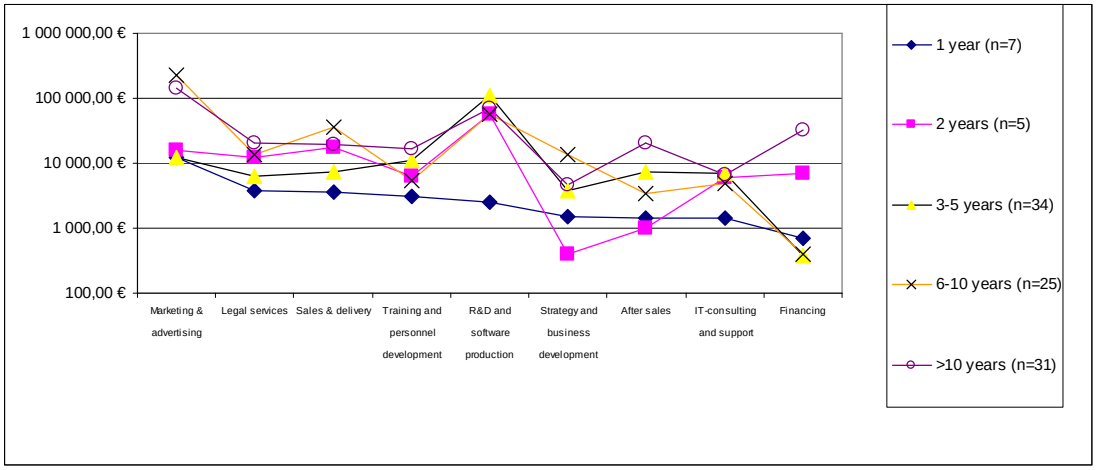

Figure 39. Average Use of KIBS According to the Age of Software Product Business (n=102)

The breakdown of the KIBS in relation to the age of software product business shows that R&D and software production services play an important role for the companies having been in business more than a year. We can also see that the role of strategy and business development, such as business consulting, is playing a relatively marginal role in the KIBS cost breakdown. This could indicate that business consultants are rather used in numbers measured in days rather than in larger business development projects, where consulting days can be measured in months. The use of legal service is relatively important for start-up companies who often have to hire help to set up contracts and other legal issues. However, for the companies having been in business from 3 to 10 years the use of legal services is quite marginal. Companies having been in the business more than a decade had an increase in their legal spending. This could indicate that these companies have to put an increased effort in legal issues since they are operating in international markets. The breakdown of the KIBS use based on the age of software product business is depicted in Figure 40.

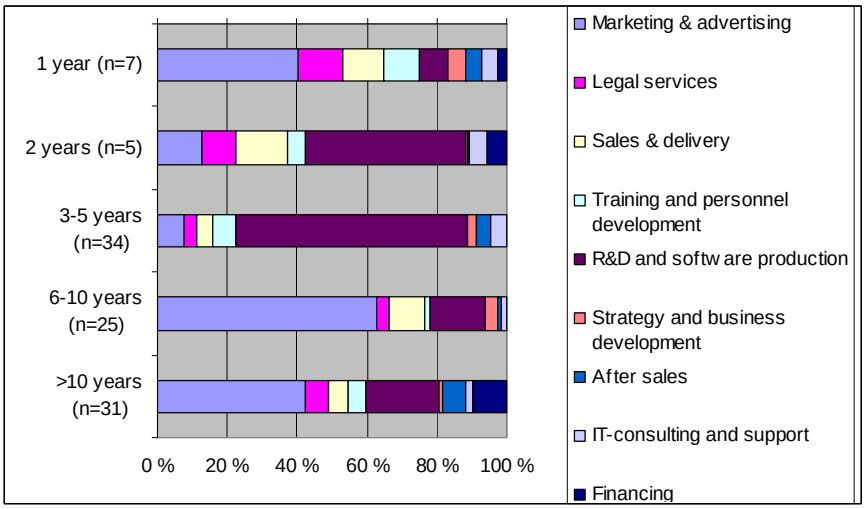

Figure 40. Breakdown of KIBS Use According to the Age of Software Product Business (n=102)

We also studied the correlation between the use of different KIBS and some characterized elements of software product business such as growth orientation and the amount of software exports. The use of KIBS correlated more with the amount of software exports than domestic software revenue (Pearson correlation 0.804 versus 0.404). This correlation is in line with our understanding and empirical findings that companies operating internationally more often have established networks and partners, who are able to prove their own core competence to support the software product business. We can also see that the use of KIBS has a higher correlation with software exporting than with domestic revenue in after sales, financing, legal services, marketing & advertising and sales & delivery. That is quite logical since these areas, i.e. legal services require much more effort in international surroundings. On the other hand, domestic revenue had higher correlation with training and development than exporting. The correlations are depicted in Figure 41.

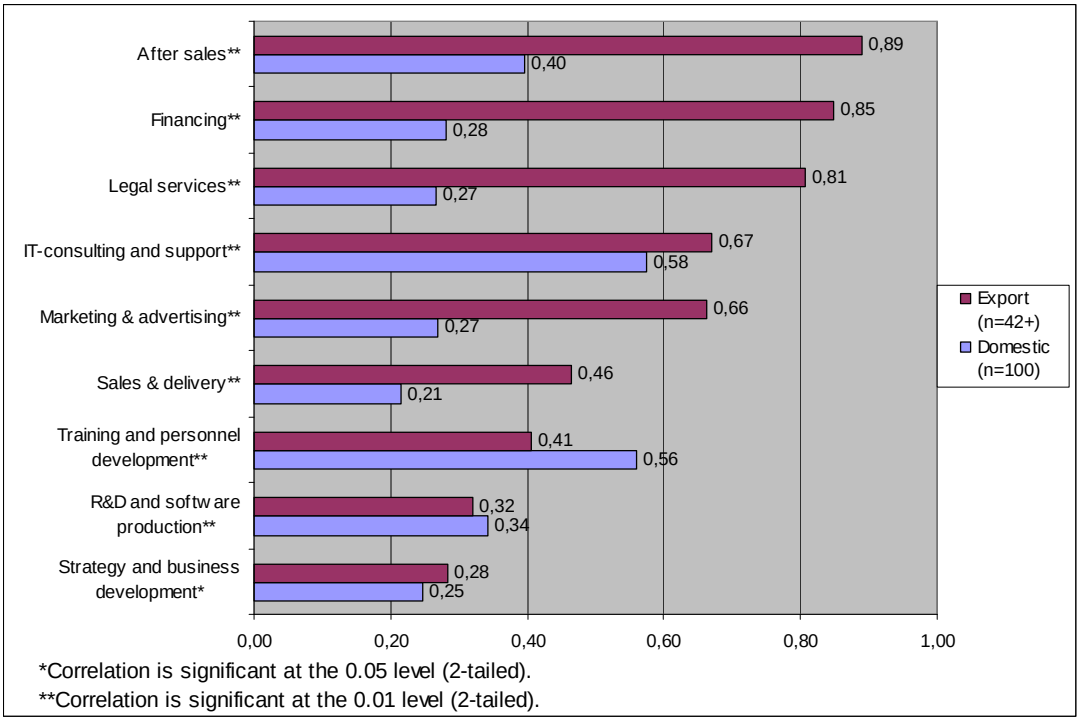

Figure 41. Pearson Correlation between Software Exporting and Domestic Revenue in 2002 and the Use of KIBS

Interestingly, no correlations were found between the strategic internationalization aims and the use of KIBS. However, there was a negative Pearson correlation between the use of legal services and strategic aims to grow in domestic markets (-0.305 significant at the 0.05 level). This indicates that the companies focusing on domestic markets have to take legal aspects less into consideration.

We also studied how the product development process of the company affects the use of KIBS. There was an indication that those companies that are scheduling their version releasing on a time-paced approach spent on average more money on KIBS than the ones using feature-paced approach, even though no significant correlations were found. This is quite logical as time-restrictions can force these time-pacing companies to use external resources in order to keep their planned schedule. Once again, there was no significant difference in the use of different types of services –time-pacing companies in general just use more money in general in KIBS. Similarly, those companies who

announced that they have many internal milestones in their product development used more KIBS than the ones who did not (Spearman correlation 0.286, significant at the 0.01-level).

In addition, companies whose products requirements are based on the thorough understanding of the markets instead of gathering requirements merely from the key customers used more KIBS (Spearman correlation 0.318 significant at the 0.01-level). There was a significant difference in the use of sales and delivery as well as strategy and business development but surprisingly not in the use of marketing and advertising.

4 INTERNATIONAL OPERATIONS[4]

Software product business is typically dependent on high volumes, reusability, and wide market acceptance. Therefore, international expansion will at some point become a necessary step for growing companies beyond the growth limits imposed by the size of the Finnish market, which counts for less than 1 % of the world software market. But internationalization is also highly risky. The pressure on early internationalization, required resource intensity, the dynamism of external environment, fierce competition, and the general immaturity of the industry are only some of the factors that contribute to the high risk level of internationalization. These risks impact not only the growth and profitability prospects of the internationalizing firm, but often also the very viability of the business. These arguments justify the special attention put to international operations in this report.

This chapter provides an extensive overview of Finnish software product industry firms ' international operations. More specifically, the focus of our analyses in this chapter is mainly on identifying the typical profile of an internationally operating software product firm and its differences from its domestically operating siblings. We also analyze data on the process of internationalization, on primary foreign markets, on modes of international entry, and on the resource propensity of the analyzed firms for international operations.

4.1 Scale of International Operations

Overall, 76 (46 %) out of the 165 firms in our sample had some revenue streams from foreign markets in 2002, and thus can be considered as internationally operating. This represents a significant increase from the 9% reported in the 2001 software product firm survey. The distribution of internationally operating firms, as well as the distribution of their foreign revenue share, are presented in Figure 42. We can observe that about half of the companies with international sales received only one quarter or less of their revenue from outside of Finland. On the other hand, more than 20 % of the firms generated more than 75 % of their revenue abroad. This U-shaped distribution suggests a strong gap between initial sales abroad and full-scale internationalization.

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[4] There is an ongoing research project carried out by Helsinki University of Technology (Institute of Strategy and International Business) on internationalization capabilities, processes, and support mechanisms for creating successful global new ventures. More info available at http://www.tuta.hut.fi/units/Isib/research/cgs/cgs.php

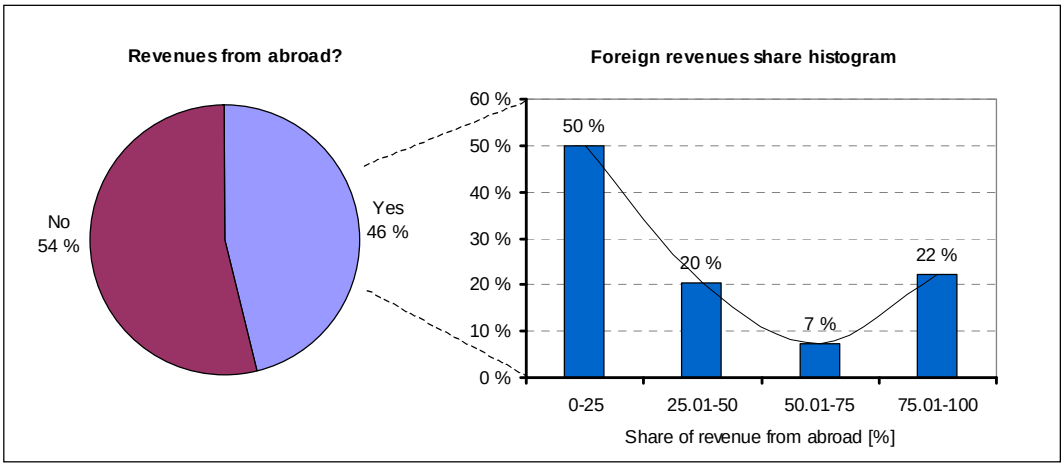

Figure 42. Count of Firms that Generated Revenue from International Operations (n_1=165 and n_2=54)

In aggregate terms, the internationally operating firms generated some 43 % of their total revenue abroad, as Figure 43 indicates. This is because larger international companies tended to do more export business. Also, the internationally operating companies tended to derive a greater proportion of their sales from software products. This suggests that when successful, internationalization can give a significant boost for growth. This also suggests that packaged software lends itself more readily for export business than does, e.g., customized software.

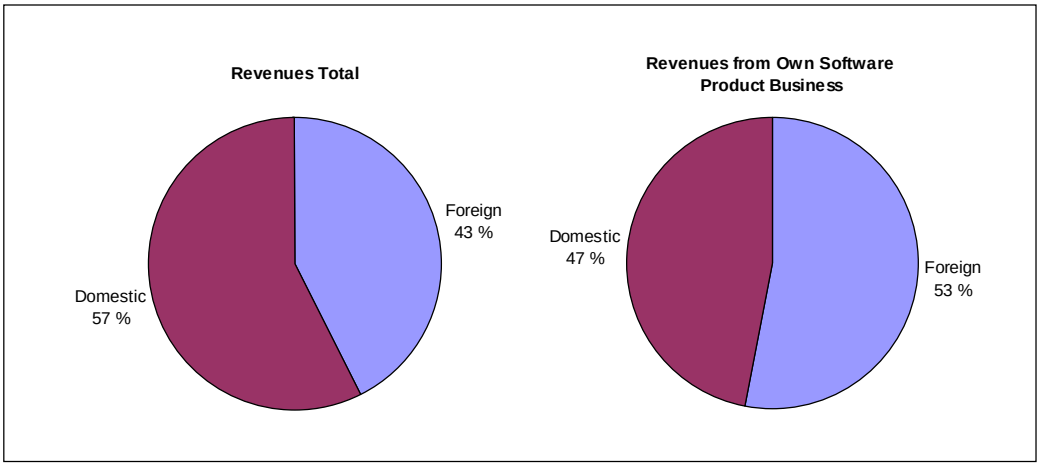

Figure 43. Domestic vs. Foreign Total Revenue (n_1=143; n_2=135)

The message above is further emphasized by the finding that the companies' growth expectations were significantly higher for foreign revenue than for domestic revenue. Based on answers from 75 firms, the total industry foreign revenue from their own software business were expected to grow 42 % per annum during 2002 - 2005, where as the expected annual growth of domestic software business was only 24% for the same period.

4.2 Profile of Internationally Operating Firms

The basic indicators of international operations and their averages from 2002 and 1999 for internationalized firms are presented in Table 18. The average number of foreign markets targeted in 2002 was 8.1. This represents strong growth in geographic coverage, as the corresponding figure was only 4.3 in 1999. Also the median number of export countries had grown, albeit less significantly: from two export countries in 1999 to three in 2002.

Probably the most important internationalization indicator, the share of foreign revenue, shows that almost 40 % of revenue (25% in 1999), were generated abroad in internationalized software product companies. The corresponding median is again much lower, at 25 % (10 % in 1999). The numbers indicate a significant increase in the share of foreign revenue since 1999.

On average, the internationalized firms had employees in less than two export countries and more than half of the firms did not have any employees abroad. Almost one quarter of their total employees (including those based in Finland) focused on export business on a full-time basis. The corresponding median value is only 10 % (1% in 1999). The strong increase since 1999 suggests that many companies today assign significantly more employees to foreign operations.

Table 18. Indicators of International Operations

Indicator	2002			1999		
	n	Mean	Median	n	Mean	Median
Number of countries generating revenue, excl. Finland	57	8.1	3.0	50	4.3	2.0
Share of revenue from outside of Finland 2002 (%)	54	39 %	25 %	48	27 %	10 %
Number of countries where company had employees, excl. Finland in 2002	47	1.7	0.0	44	1.0	0.0
Share of employees focusing full-time on foreign operations in 2002 (%)	48	24 %	10 %	44	15 %	1 %

A comparison of some key descriptive statistics between internationally and domestically operating companies is presented in Table 19. The average total revenue of internationalized firms was 31.1 million Euros in 2002 and 27.4 million Euros a year earlier. There was a significant difference in the total revenue between internationalized and domestic firms, and the average internationally operating company was more than 10 times bigger than the average domestic software company. Because the sample includes two very large companies, the distribution median gives a more correct profile of a typical internationally operating software firm. But even the median indicates significant difference in size between domestic and international software product firms.

Table 19. Profile of International vs. Domestic Firms in 2002 and 1999

Indicator	2002			1999		
	n	Mean	Median	n	Mean	Median
Total revenue (M Euros)	74	31.1	2.1	72	2.3	0.4
Predicted growth rate 2002-2003	49	43 %	19 %	60	70 %	27 %
Predicted compounded annual growth rate 2002-2005	42	43 %	24 %	56	57 %	24 %
Proportion of revenue from company's own SW products	68	60 %	71 %	83	53 %	60 %
Return on sales	60	-8 %	1 %	58	4 %	2 %
Profit (M Euros)	61	0.173	0.000	59	0.215	0.010
Number of employees	75	286	20	82	20	6
Age of company (years)	75	12.1	12.0	86	12.4	11.0
Age of company's own software product business (years)	64	9.1	8.0	78	9.9	8.0

In order to analyze differences in the distribution of revenue between international and domestic firms, we have used a modified histogram[5], which is presented in Figure 44. It clearly shows that domestic firms tend to have much lower sales volumes. Quite opposite is true for international firms. International firms, by virtue of not being limited by the size of Finnish market, have flatter revenue distribution, suggesting much weaker growth limits.

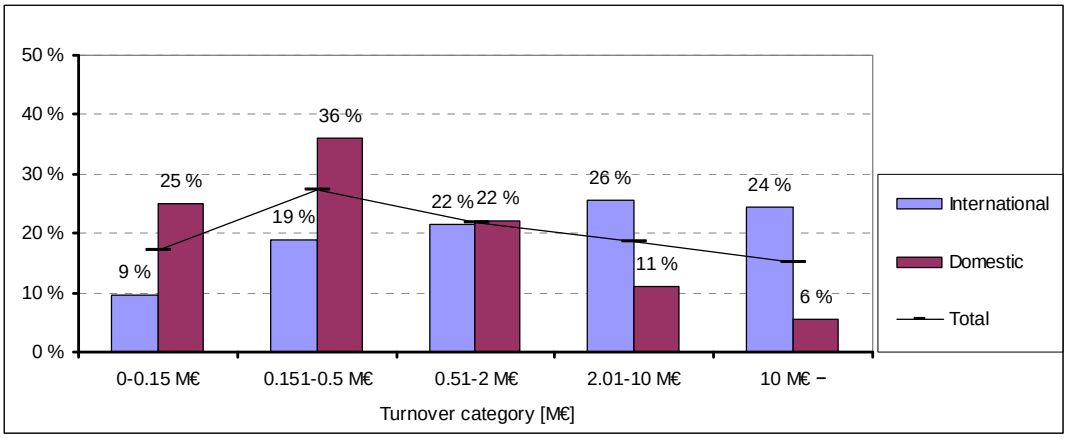

Figure 44. Distribution of International vs. Domestic Firms by Revenue (n=120)

The average profits of both domestic and international firms are around 200 000 Euros, similarly as in 2001, and both medians are close to zero. Although the central tendency measures, mean and median, of both groups are almost identical, the distribution of domestic firms by profit is much more centralized and is highly concentrated around zero. More than 50 % of domestic firms have profit between 0 and 100 000 Euros. On that the other hand, the profit distribution of internationally operating firms is much wider, with the one quarter of these reporting losses in excess of 300 000 Euros, and another quarter reporting profits in excess of 300 000 Euros. This clearly indicates that

[5] Modified histogram: The bar chart showing frequency of occurrence within a series of variable (non-constant) ranges. While this chart can emphasize differences between variables, it should not be used to conclude on shape of distribution due to the irregular categories and consequent deformation of distribution shape.

international operations are significantly riskier in general than domestic ones. These risks are associated with greater growth opportunities, if the firm is successful.

Another, perhaps more objective and comparable measure is profitability. The following analysis focuses on return on sales (profit divided by annual sales). The distribution of international and domestic firms is presented in Figure 45. Even here, it appears that internationalized firms have a wider profitability distribution than domestically operating firms.

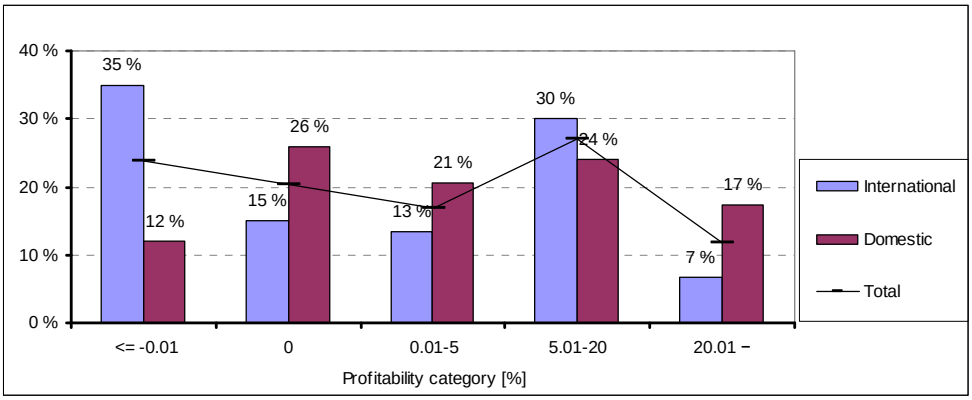

Figure 45. Distribution of International vs. Domestic Firms by Profit (n=146)

Highly surprising is the finding that the age, both in terms of mean and median, is almost identical for both international and domestic firms. This would suggest that decision to internationalize is in software product industry highly independent on maturity of a firm in terms of age. Even closer examination of age distribution, as presented in Figure 46, does not uncover any significant differences between the age structure of international and domestic firms.

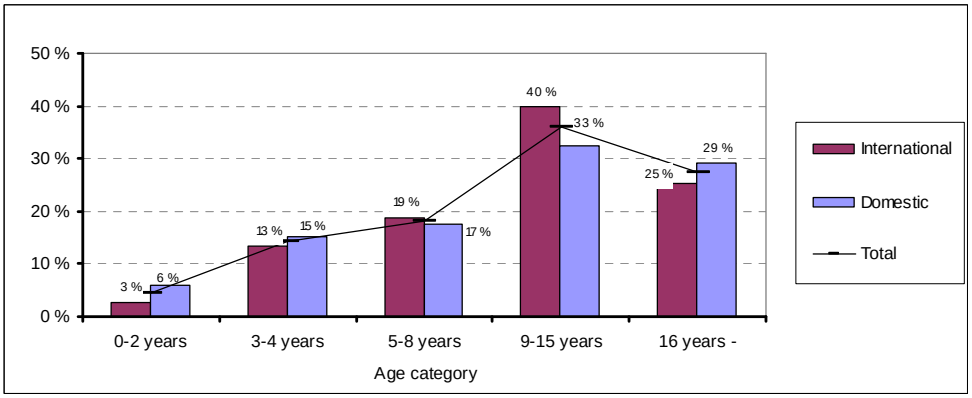

Figure 46. Distribution of International vs. Domestic Firms by Age (n=161)

The number of employees is for both domestic and international firms in proportion with revenue. This indicates that there is no significant difference in productivity between international and domestic firms.

The next issue of our interest is difference in emphasis on improvement areas. The importance of six areas as perceived for horizon of three years by international vs. domestic firms is presented in Figure 47. The average internationalized firm in our sample finds as key areas for improvement R&D and productization, international sales and marketing, and knowledge and skill of its personnel.

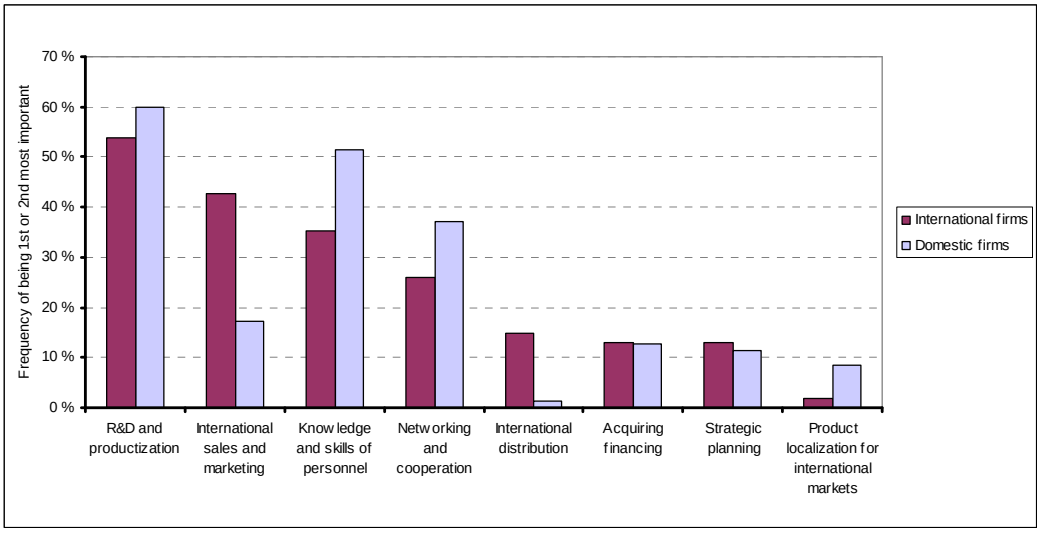

Figure 47. Improvement Emphases by International vs. Domestic Firms for 2003-2005

The most significant difference in importance perception between internationally and domestically operating firms is in international sales and marketing, and also in international distribution, which are found much more important by international companies. The results indicate that for many currently domestically operating firms, internationalization is not currently issue of high priority. However, distribution of the answers is highly heterogeneous and there is more than one third of domestic firms finding international sales and marketing as one of the two most important improvement areas.

Product localization for international markets was felt to be more important by domestic firms than international ones. This can be explained by the fact that most of the internationally present firms already went through product localization issue and established corresponding processes, while for some domestic firms thinking of internationalization this is the current issue to deal with.

4.3 Internationalization Process

In the effort to understand the early internationalization attempts, we have studied respective scenarios for the companies entering first three foreign markets. Our focus was to find out what countries were targeted as the first ones, how the market entries were sequenced, what was the timing of market entries, and, finally, how initial goals were met. In addition, we did some analyses on trends in internationalization age and its impacts.

The ranking of the first three targeted geographic markets as reported by our sample firms is in Table 20. The geographic and cultural proximity is reflected in Sweden being the most frequently first foreign market addressed by Finnish software product firms. Almost half of the firms reported Sweden to be one of the first three foreign markets entered. In further international expansion, high volume markets of USA and Germany usually followed. Other markets most frequently entered as one of the first three were Norway, UK, Denmark and Estonia.

Table 20. First Three Foreign Markets

Rank	1st export country (n=53)		2nd export country (n=42)		3rd export country (n=35)		1st-3rd export* (n=130)	
1	Sweden	32 %	USA	19 %	USA	14 %	Sweden	47 %
2	Germany	9 %	Sweden	12 %	Germany	11 %	USA	41 %
3	Estonia	9 %	Norway	10 %	Denmark	11 %	Germany	29 %
4	UK	8 %	Germany	8 %	Norway	9 %	Norway	22 %
5	USA	8 %	Latvia	7 %	UK	9 %	UK	21 %
6	Norway	4 %	France	7 %	Lithuania	6 %	Denmark	18 %
7	France	4 %	Netherlands	7 %	Netherlands	6 %	Estonia	15 %
...	...	...	...	...	...	...	...	...
		100 %		100 %		100 %		300 %

(* probality of being first three markets entered)

The average age for starting preparations of foreign market entry was 6 years as reported by 42 sample firms. However, some of the firms started preparations as late as at 18 years of age, and thus the median, being 5 years, better represents typical situation. The histogram showing distribution of preparations start age along analyzed firms is in Figure 48. It should be noted that sample for this analysis includes only internationalized firms, and thus doesn t include companies starting preparations but failing to make any foreign sales.

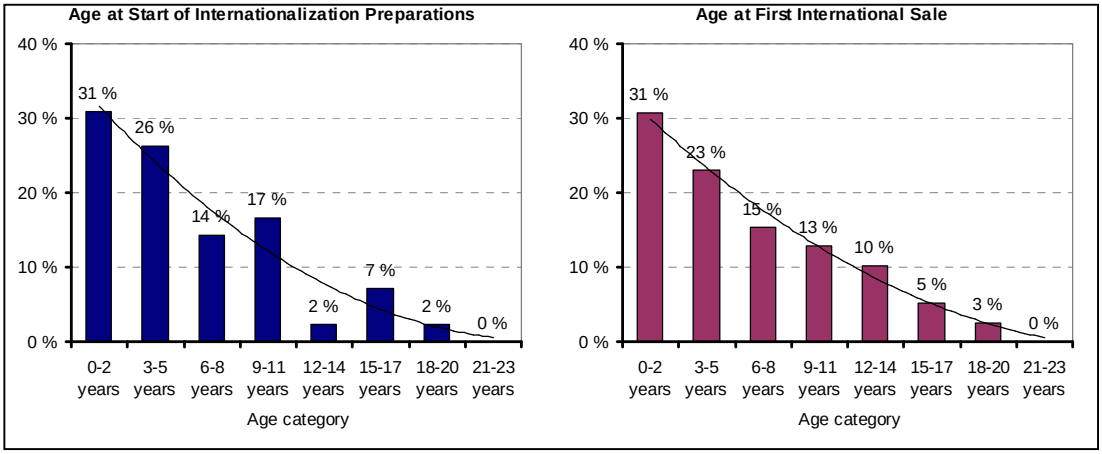

Figure 48. Age of Firms at Start of Internationalization and at First Foreign Sale

The first foreign sale occurred on average at age of 6.2 years with median 5 years. It should be noted that samples used for preparations and sale age analyses are slightly different and therefore results are not directly comparable. The distribution curve is almost perfectly parabolic and indicates that about three quarters of firms succeeding in internationalization had their first sale abroad before 10 years of age.

However, there is significant difference in internationalization patterns between young and more mature firms. Internationalization age is significantly decreasing and many new firms virtually start their sales on global scope. The pressure on early internationalization is confirmed by data presented in Table 21. We have found in our sample that there was significantly higher share[6] of early internationalized firms among youngest ones. About 21 % of three years old or younger firms were already internationalized, while in subsequent age groups this share was clearly decreasing.

[6] In this analysis, a share is calculated out of all firms in the sample, not only internationalized ones, in order to ensure comparability between age groups

Table 21. Internationalization Acceleration

Age group n	0-3 years 19	4-8 years 40	9-15 years 58	16 years – 44
Share of early internationalized firms*	21 %	15 %	9 %	0 %

(* share of firms internationalized within first 3 years of lige ofe out of all firms in a given age group)

Pressure on international expansion and rapidly shortening cycle between establishing firm and expanding abroad increases vulnerability of businesses. Early internationalization can rapidly accelerate early growth and secure firm's position, but can also drastically destabilize firm financially and consequently impact its viability. Based on our analysis, firms internationalizing in 5 years of age or less reported 3-year growth expectations to be about 65 % p.a., while for firms internationalized later it was only approximately 32 % p.a. Early internationalized firms had frequently negative returns on sales with average almost -10 %. Firms undergoing internationalization after 5 years of age reported profitability to be slightly more than 4 %. Even more interesting was profitability distribution of early internationalized firms forming two clusters; firms with negative returns and firms with higher than average profitability. Surprisingly, profitability of later internationalized firms was more balanced. These all suggest that while early internationalization can be rewarding in terms of growth, there is also high risk connected with that.

The anticipation that presence on international market unlocks significantly higher growth opportunities than would offer domestic market is supported by Figure 49. The chart presents the share of foreign revenue from the total revenue along the sample firms grouped based on the length of their international presence. It clearly indicates that share of foreign revenue correlates with length of international presence, and, thus, foreign revenues are generally growing at much higher pace than domestic ones. The firms undertaking internationalization nine or more years ago reported to have almost two thirds of their revenues acquired from abroad.

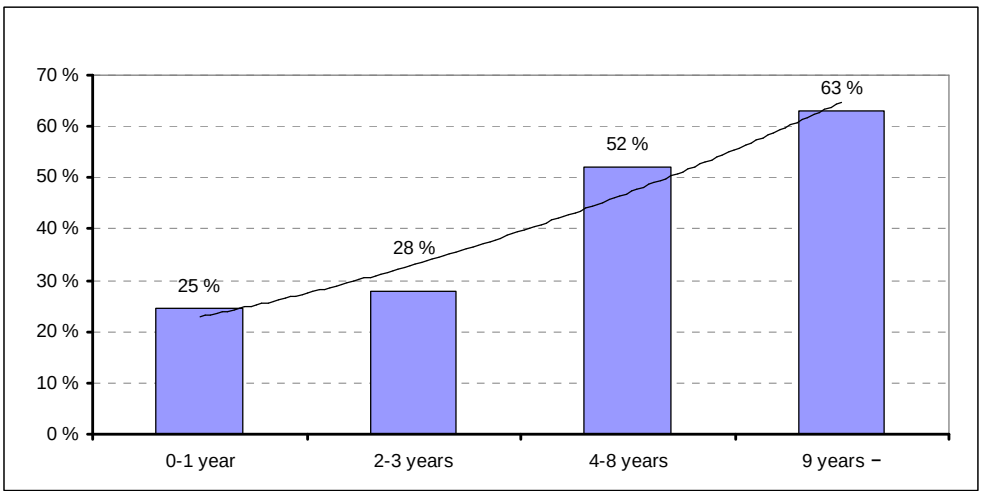

Figure 49. Development of the Share of Foreign Revenues (n=37)

The average market entry execution time, defined as the time difference between the start of preparations and the first sale, was for the first three market entries on average about 10 months. The median was generally much lower with the exception of second entry. The goals achievements of early foreign market entries were graded on average as medium success. Similarly, as in the case of market entry execution time, entry to the second market had generally lower grading. The market entry time and goals

achievement indicators for the first three market entries are presented in Table 22. It should be understood that samples for individual markets differed and, therefore, the sequence of market entries is not directly comparable.

Table 22. Market entry indicators

Foreign market	1st	2nd	3rd	Total
Market entry execution time (months)				
n	32	24	23	79
Mean	9.2	10.7	9.7	9.8
Median	5.9	9.3	3.9	n.a.
Goals achievement (1.. not at all, 7.. very well)				
n	44	37	31	112
Mean	3.9	3.5	4.2	3.9
Median	4	3	4	n.a.

Table 23 presents market entry indicators for the three most common foreign markets. Market entry time is in accordance with expectations very low for Sweden, being about a half of year. In the case of Germany, the market entry process is slightly longer. The situation is quite different for the U.S. market; it takes on average more than one year from start of preparations till initial sale. Despite of being easy to access and in many cases the first one to be entered, Swedish market is reported to meet expectations less than other two major markets. This could indicate fewer opportunities on Swedish markets, but also problems with fulfilling goals during very early internationalization stage. The highest satisfaction with goals achievement was in the case of the U.S. market. The size of samples was quite a limited and thus results should be interpreted with this consideration.

Table 23. Entry Indicators by Country

Foreign market	Sweden	Germany	USA
Market entry execution time (months)			
n	15	5	8
Mean	6.1	7.6	12.4
Goals achievement (1.. not at all, 7.. very well)			
n	19	8	11
Mean	3.8	4.0	4.4

We have been highly interested in identifying some learning patterns in sequence of initial market entries. In order to undertake this analysis, we have selected the sample of firms, which reported on full sequence of three foreign market entries. The average of market entry execution time and goals achievement grading and their development through the sequence of the first three market entries is presented in Figure 50.

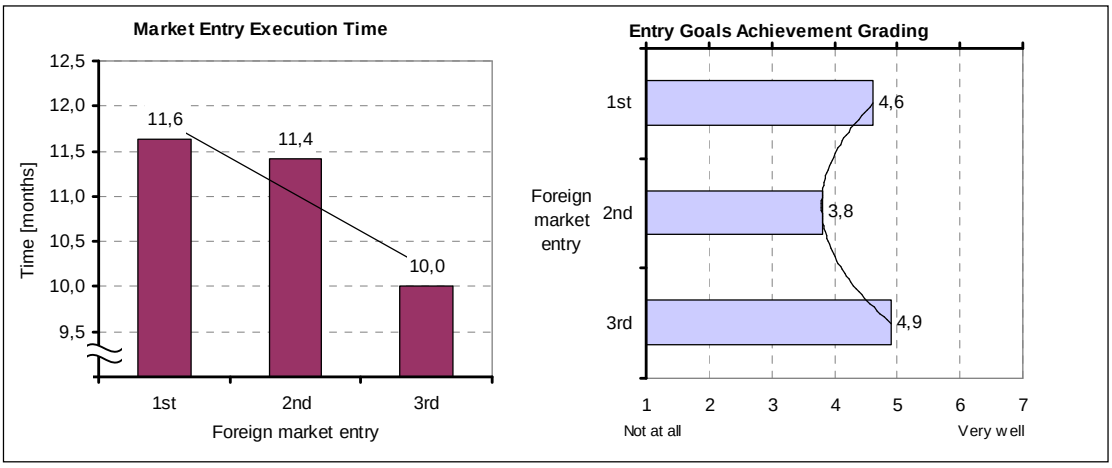

Figure 50. Internationalization Learning Effect (n=21)

The first chart of market entry execution time indicates clearly decreasing trend despite not being very strong. The first market entry took on average almost one year, while third was done already in 10 months. However, second entry had only minor improvement in required time. Certain discontinuity between first, second and third market entry is apparent also in second chart presenting achievement grading. But when looking more carefully to underlying data, we found that the first entry in our sample was usually done into close, not so difficult to enter market, while second and third entries were made in large, difficult to enter markets such as USA or Germany. This explains relatively low improvement between the first and the second foreign market entry. Overall, we can conclude that data suggest some internationalization learning effect, but further and more focused analysis would be needed to validate this.

4.4 Primary Foreign Markets

The next issue, being of major concern when analyzing international operations, is to find out what geographic markets are perceived as the most important ones, how foreign sales are distributed between them, and, in addition, if and what functions are located in these major export markets.

Swedish market is reported to be not only one of the first foreign markets entered, but also on top in terms of importance as presented in Table 24. However, reported importance of Swedish market is not much higher than that of the German one. Both Sweden and Germany have been reported as one of the three most important markets in about 40 % of cases. As other most important markets were mentioned USA, UK, Norway, Estonia and France. The structure of geographic markets in 2002 was similar as the year before.

Table 24. Three Most Important Markets

Rank	1st export country (n=52)		2nd export country (n=43)		3rd export country (n=32)		1st-3rd export* (n=127)	
1	Sweden	23 %	Norway	14 %	Germany	16 %	Sweden	40 %
2	USA	13 %	Sweden	14 %	UK	16 %	Germany	40 %
3	Germany	13 %	Germany	12 %	Denmark	9 %	USA	32 %
4	Estonia	10 %	USA	9 %	USA	9 %	UK	26 %
5	UK	6 %	Latvia	7 %	Estonia	6 %	Norway	23 %
6	Norway	6 %	France	7 %	Brazil	3 %	Estonia	16 %
7	Switzerland	6 %	UK	5 %	Japan	3 %	France	11 %
...	...	...	...	...	...	...	...	...
		100 %		100 %		100 %		100 %

(* probality of being first three markets entered)

We found that exporting firms were generally focused only on one foreign market. In the sample of 27 firms, almost half of the export volumes, both in terms of mean and median, came from single foreign market. The three most important countries stood for almost 85 % of all exports. However, there is slightly decreasing trend in export concentration when compared with year 2001. The concentration of exports for 2002 is shown in Figure 51.

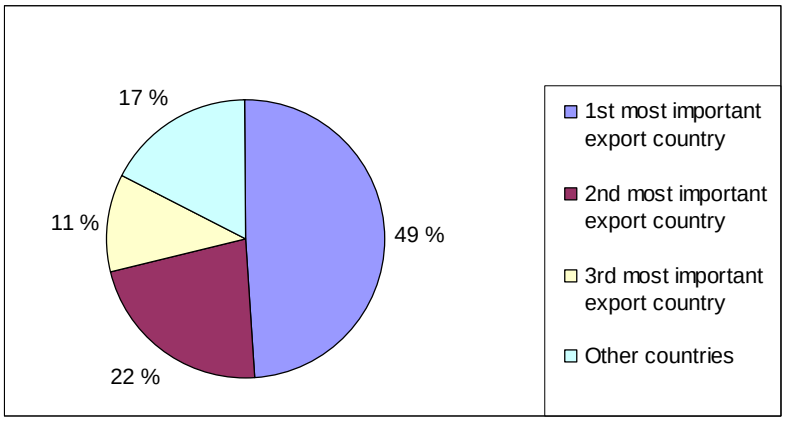

Figure 51. Concentration of Exports (n=27)

Figure 52 shows functional presence of firms in the three most important markets. Although most of the activities is generally organized and taking placing domestically due to the generally small size of analyzed firms, many companies report on wide portfolio of functional presence also in their primary foreign markets.

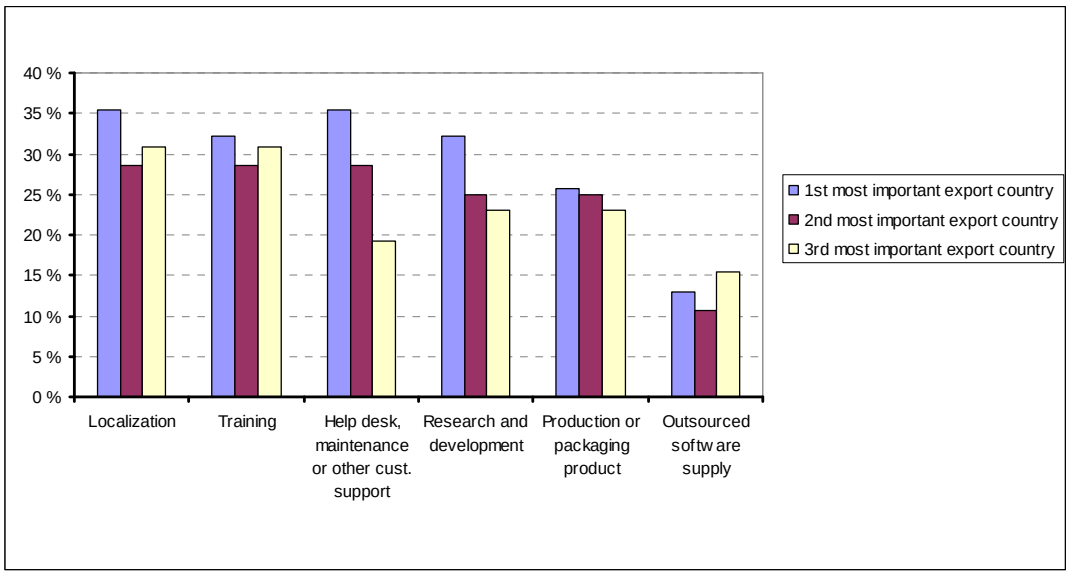

Figure 52. Functional Presence of Firms in Export Markets (n_1=31; n_2=28; n_3=26)

About one third of the firms reported localization and training activities at their target markets. Help desk, maintenance or other customer support took place directly in occupied markets in about 28 % of the cases. Relatively low presence of training and customer support in major markets is rather surprising. It is quite common in software industry that additional services including customer training, maintenance and multiple forms of customer support can unlock substantial value and bring corresponding revenue to supplier.

On the other hand, it was reported surprisingly frequently, in 27 % of the cases, that research and development took place in major foreign markets. Production and packaging was located in 25 % of cases directly in target market, while software was outsourced abroad by 13 % of analyzed firms.

In functions such as customer support, R&D, and also in production and packaging, it is noticeable that their share is much higher in the most important market while decreasing with every additional market. This can be assigned to centralization of these on local basis and provided coverage to more than one country.

4.5 International Operation Modes

In order to understand the means different groups of firms were using to direct their products and services to foreign markets, we have analyzed their international operation modes in terms of popularity and consequently built profiles of typical users for most common operation modes.

By far the most popular operation modes used for foreign sales, same as the year before, were direct export followed by foreign value-adding retailer or agent. Direct sales were reported by 60 % of internationalized firms, while about 48 % of them made use of retailer or agent. About one fifth of firms had their own foreign subsidiary, and 15 % of them were selling to OEM or under private label. Joint ventures, foreign wholesalers and bundle sales with foreign products were in Finnish software product industry used only rarely. The level of use of individual international operation modes is shown in Figure 53.

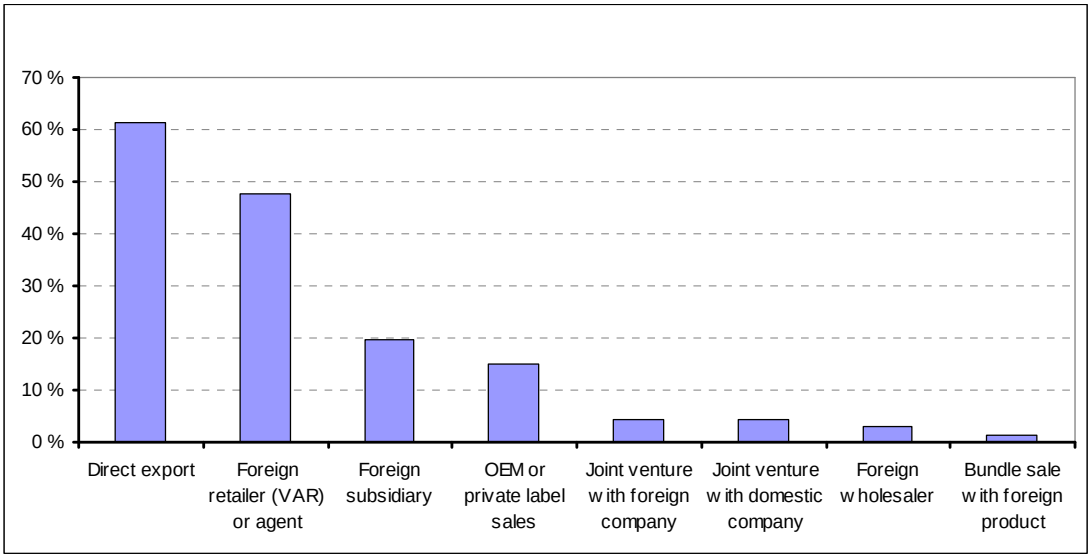

Figure 53. Frequency of Use of Alternative Operation Modes (n=64+)

Direct sales was the most popular sales mode targeting on average 8 countries. Typical firm using this operation mode was rather small in terms of revenue, had medium expected growth, small losses, and only limited international operations both in terms of number of markets and share of revenue from them. In general, direct export seems to be a common mean for smaller firms with not fully developed internationalization.

Foreign retailer or agent was deployed on average in 6 out of 9 revenue generating foreign markets. Typical firm had usually medium revenue, rather high predicted growth, and small losses. Firms choosing foreign retailer or agent to access foreign markets seem to be rather conservative in international operations, to have relatively low foreign revenue share, and to be internationalized later than on average.

A foreign subsidiary, an operation mode typically used by larger companies, was usually established in three countries. Such firms had rather small growth expectations, big losses, wide geographic coverage, and very high share of international revenue.

The fourth commonly used operation mode, OEM or private label sales, was usually used to cover large number of markets. Firms using this mode were rather young and dynamic with early internationalization, but having quite a high revenue, optimistic growth outlook, and rather high share of foreign revenue despite of being in significant losses.

4.6 Resource Fit for Internationalization

The intention of this short subchapter is to analyze resources of sample firms from the perspective of their fit to international operations and to make some findings on general predisposition of Finnish software product industry firms to operate on foreign markets. The firms were asked to grade the fit of selected resources on 7-point Likert scale. The value seven represented a complete fit for international business, while the value of one for domestic one.

The chart showing distribution of grading is in Figure 54. Highest rating, on average 3.9 points, was given to the fit of current products and services for foreign markets. It was actually the only aspect receiving more than 3.5 points, and thus being better suitable for foreign than domestic markets. Quite a balanced view was expressed whether most attractive risk-return ratio for existing resources could be achieved domestically or abroad, which got 3.5 points. However, growing of a business was considered to be much cheaper domestically as suggested by 2.6 points it received. Knowledge, skills and motivation of employees, reputation and brands, and current customer and supplier relationships were graded slightly in favor of domestic operations and all of them received about 3 points.

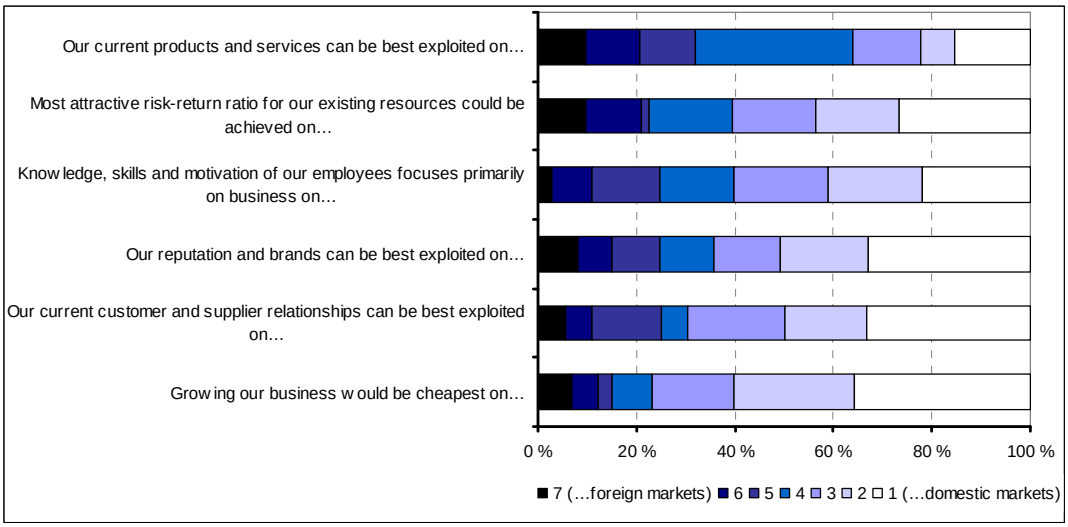

Figure 54. Resource Fit for Internationalization (n=71+)

The general grading of resources and opportunities was not very favorable for international operations especially when considering that answers were mostly received from firms having already some revenue from abroad. However, it is noticeable that the fit of existing products to foreign markets was considered to be rather good and risk-return ratio for existing resources was found to be similar internationally or domestically. The main barriers seem to be related to the costs of international expansion and the problems with deploying some of the internal resources in international scope.

5 FINANCING AND OWNERSHIP

The financing needs of Finnish software product companies are different compared to Finnish companies in general. The financing of software product firms is influenced by industry characteristics including high reliance of intangible assets, difficult protection of intellectual property, and the global nature of the software product business. For Finnish software product companies, the small domestic market in Finland (significantly less than a percent of the global markets) makes it imperative to internationalize rapidly, which has influences on the financing needs. At the same time, Finnish software product companies are generally small, young, strongly orientated on innovation and intensive R&D in their early stages of development. Further, the whole industry is young, dynamic, and still undergoing a self-definition. These factors contribute to making the software product industry quite specific in terms of the financing needs, the corresponding investment opportunities the industry can provide, and the resulting financial structures and governance mechanisms in the Finnish software product industry. The information asymmetry, a short or completely missing track of record of companies, and unavailable collateral create a transparency problem, which is intensified by technological innovation being often a key source of eventual future competitive advantage. As a result, Finnish software product firms have a limited access to traditional financing instruments on established financial markets and have to rely, at least in their early stages, on insider equity and a limited selection of risk finance instruments.

This chapter examines the typical financing sources for software product firms, how the use of these sources has developed along the maturity of firms, and what is the resulting financing and ownership structure in the industry. In the light of shaken expectations for high-tech industries, revised investment policies of venture capitalists, and potential gaps in the Finnish risk capital market, we also examine the recent attempts of the firms to acquire external financing and even more importantly their plans for the future. The last section of this chapter focuses on the presence and the internationalization support provided by private equity investors.

5.1 Ownership

The largely equity based financing reflected in the financial structure of Finnish software companies differs significantly compared to more established industries. In addition, ownership structure and the presence of different types of shareholders aside from founders can significantly influence strategic choices a firm has. Therefore, in this subchapter we will present the typical ownership structure classified both along ownership type and its origin, analyze its dynamisms and identify some of its patterns.

The average structure of ownership, classified both along the type of ownership and the origin of owner, is presented in Table 25. The sample used for ownership structure analysis consists of 136 responding companies. The majority of the ownership was in the hands of the founders and their family members, representing on average 70 % of the ownership. The second biggest share, about 10 %, was owned by corporations. Other important owners, management and employees, followed with 9 %. On average in our sample, only 3 % was held by venture capital investors. Out of this, more than 2 % belonged to private venture capitalists and less than 0.5 % to government VC investors. Same ownership share as by VC investors, 3 %, was held by business angels, and remaining share was in hands of financial institutions and other investors.

Table 25. Average Ownership Structure as of 31.12.2002 (n=136)

Type ownership	Domestic	Foreign	Total
Founders and their family members	69 %	1 %	70 %
Management and employees	8 %	1 %	9 %
External individuals / business angels	2 %	0 %	2 %
Private VC investors	2 %	1 %	3 %
Government VC investors	0 %	0 %	0 %
Banks, insurance companies and other FIs	1 %	0 %	1 %
Corporations	7 %	3 %	10 %
Other investors and shareholders	4 %	0 %	4 %
Total	94 %	6 %	100 %

From the perspective of the dynamics of the ownership, the decreasing share held by VCs compared to previous years should be noted. VC investors' ownership shrank almost by half from the 5 % as reported in 2001 to less than 3 % in 2002. This could possibly indicate limited number of new investments made into the sector during 2002 (FVCA 2003).

As presented by Figure 55, foreign share of ownership is still very modest, being on average just above 6 %. Despite of that, it indicates growing foreign investments when compared with previous year's less than 5 %. Highest proportion of foreign ownership, 28 %, was among corporate investors. According to the survey, foreign VC investments represented 19 % of all VC investments done in Finnish software product business industry.

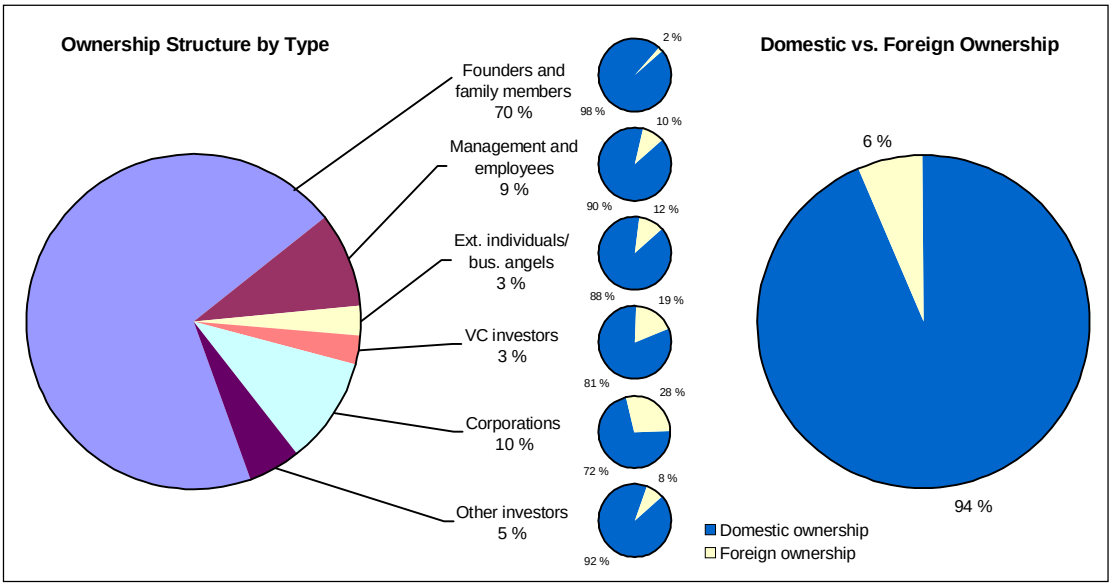

Figure 55. Ownership Structure as of 31.12.2002 (n=136)

Another useful perspective to study the ownership structure is to group the ownership structures along their age. For this purpose, overall usable sample of 134 firms was divided into five groups according to their age. Each group contains between 14 % and 36 % of total available sample, except for the first group representing 7 youngest firms corresponding only to 4.3 %. Figure 56 presents the resulting average ownership structure as distributed along the firms' age.

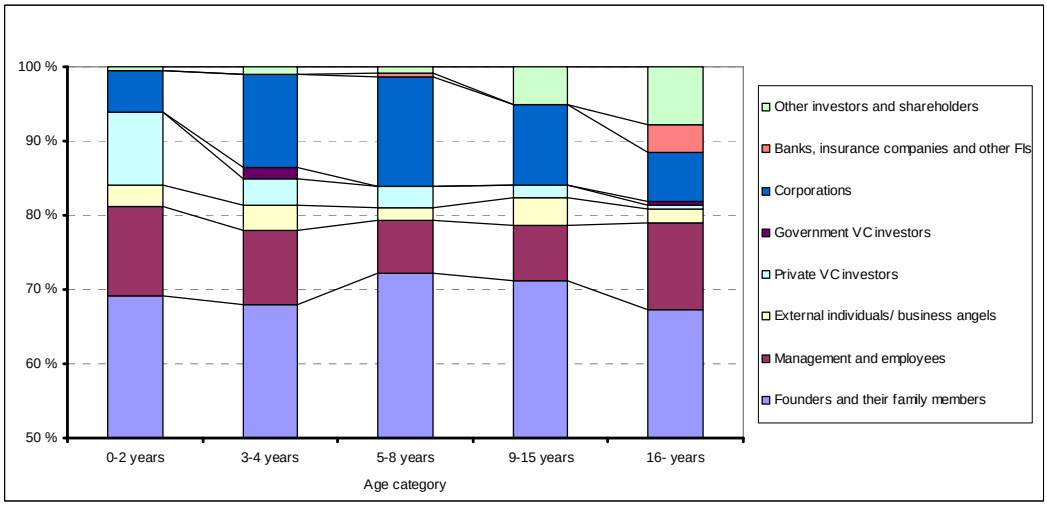

Figure 56. Ownership Structure by Firms 'Age as of 31.12.2002 (n=134)

The ownership share held by founders and their family members in Finnish software product firms was highly stable over the whole life cycle ranging from 68 % to 73 %. Such a high share is quite unusual especially for the more mature companies. In some more developed industries there is much stronger change in ownership towards institutional and publicly traded forms in later stages, which is not apparent in the case of analyzed sample. The ownership share of management and employees was also relatively stable over age groups, ranging from about 7 % to 12 %, and share held by external individuals, ranging from 2 % to 4 %.

A Strong trend, following the logic of risk capital, is apparent in the case of VC ownership. For the companies 2 years old or younger, private VC held on average 10 %, which was followed by 3 % held in firms of 3 to 4 years of age, and continued towards 0.5 % held in the group of oldest companies. Government VC investors had strongest ownership stake in 3 to 4 years of age firms, being 2 %. The ownership of banks and other financial institutions is present only in the group of oldest, most mature, and the least risk bearing companies and counts for almost 4 %.

Corporate ownership share had an inverse U-curve relation with the age of analyzed firms. Starting from about 6 % for the group of the youngest firms, it climbed towards 15 % in 5 to 8 years old firms, and fell back down to 7 % for the oldest companies in sample. Other investors and shareholders 'share had increasing trend starting after 9 years of firms 'age and reaching 7.8 % for the group of firms of 16 and more years. This can be probably accounted for the public ownership taking place in these age groups.

5.2 Financial Structure

Individual financing sources used by firms form their financial structures. This structure has impacts not only on acquired financing capacity and its costs, but also on firms ' financial leverage, solidity as perceived externally, future options to acquire additional financing, and its costs. Typical financial structure in the industry and its development over the firms 'life cycle are presented in this subchapter.

Figure 57 presents the aggregate financial structure, calculated both as a simple average, which represents an average sample company, and as a weighted average, representing the financing of the industry as a whole. The number of observations available for this

analysis is 72 firms. Capital loans are analyzed separately from equity finance due to its nature being rather of combination of equity and debt finance.

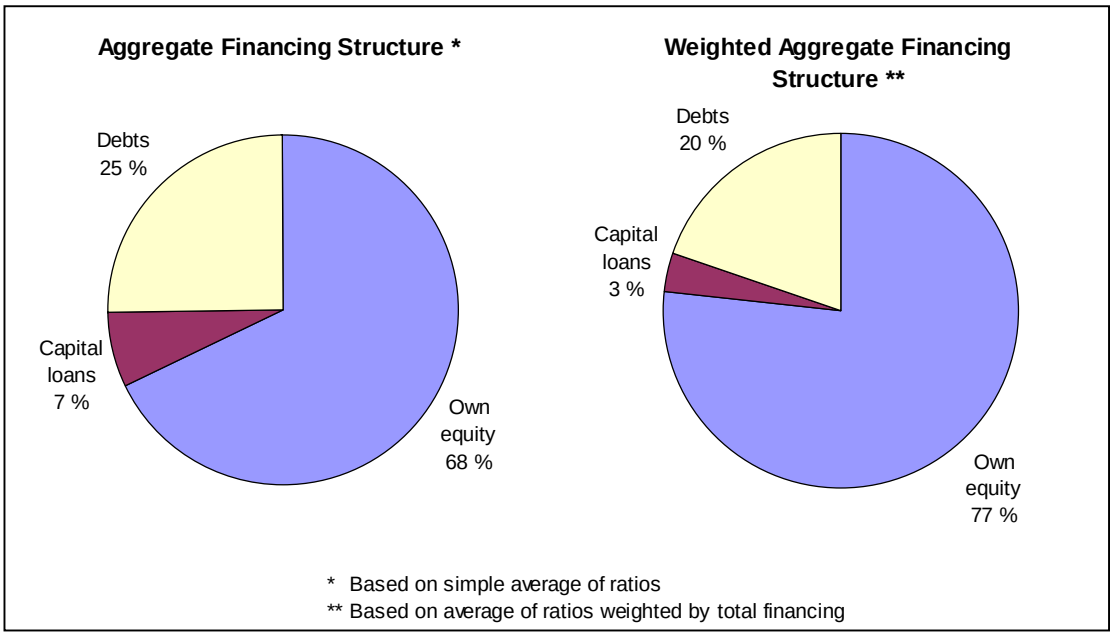

Figure 57. Aggregate Financial Structure as of 31.12.2002 (n=72)

The average distribution of sources of funds was 68 % of own equity, 7 % capital loans, and remaining 25 % is financed by debt. The weighted financing structure using total financing as weight coefficients shows that whole industry was approximately 77 % financed by equity, 3 % by loans and 20 % by debt. The differences between these two structures indicate that bigger companies had higher solidity and were financed significantly less by capital loans. The presented financial structure corresponds to a financial leverage of 0.33 for the average sample firm and to 0.25 for the industry as represented by sample.

When comparing the financial structure of software product business firms with ones of Finnish small businesses (Hyytinen and Pajarinen 2002) or with Finnish biotechnology SMEs (Hermans and Tahvanainen 2002), we can see that software product companies had on average much higher share of equity (68 %) in comparison to about 45 % for both reference groups. Although software product companies relied more on capital loans than SMEs on average, the reliance of software product companies on capital loans was small compared to Finnish biotech SMEs, which had 30% of their funding covered by capital loans. The detailed financial structure calculated as simple average of sample firms 'structures is presented in Table 26. The analysis is based on the data from 65 companies, therefore, aggregated items are slightly different from ones presented above being based on larger sample.

The highest proportion of capital loans, almost three quarters, came from government organizations and counted for 4 % of total financing. Out of these, Tekes took the first place followed by Finnvera. Capital loans from VCs composed about 1 % of total financing and were fully domestic. The first place in debt financing took domestic banks and provided on average 5 % of total financing. The trade credit counted for 4 %. These were followed by government organizations Tekes and Finnvera.

Table 26. Detailed Financial Structure as of 31.12.2002 (n=65)

Type of financing		Share	
Aggregate	Detailed	Aggregate	Detailed
Own equity total (excl. capital loans)		70 %	70 %
Capital loans total		5 %	
	Capital loans from Tekes		3 %
	Capital loans from domestic VC		1 %
	Capital loans from Finnvera		1 %
	Capital loans from other public sources		1 %
	Capital loans from domestic financial institutions		0 %
	Other capital loans		0 %
Debts total		25 %	
	Debts to domestic banks		5 %
	Trade credit		4 %
	Debts to Tekes		2 %
	Debts to Finnvera		2 %
	Debts to private individuals		1 %
	Debts to TEL employment insurance scheme		0 %
	Debts to domestic finance firms		0 %
	Other debts		10 %
		100 %	100 %

The distribution of financial structure along the age is presented in Figure 58. We can observe that equity ratio was relatively stable, being in the range of 57 % to 74 %. Substantial proportion of funding in early stage was provided by capital loans. For the group of firms aged 2 years or less, the capital loans represented 17 % with the clear convergence to zero as the firms mature. The debt financing was in the range of 18 % to 32 % with the highest proportion being in the case of firms between 5 and 8 years of age.

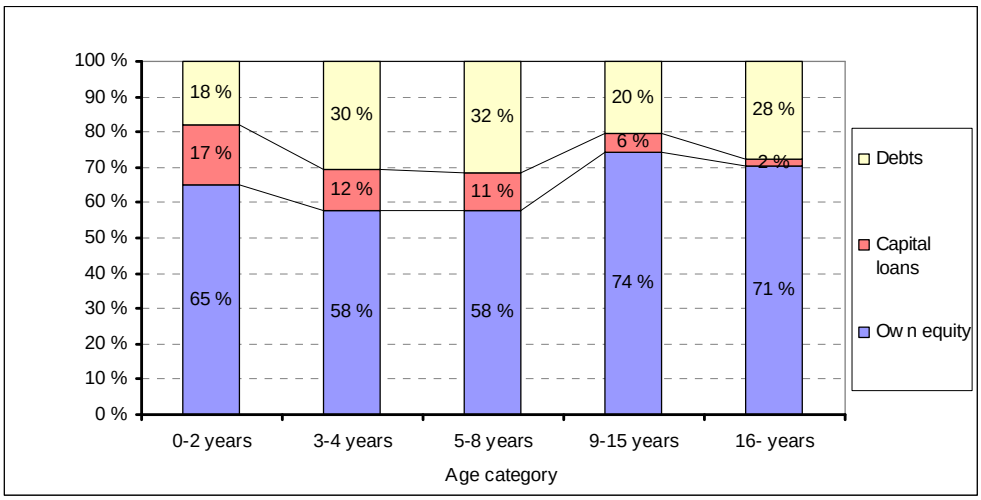

Figure 58. Financing Structure by Firm's Age as of 31.12.2002 (n=71)

5.3 Financing Sources

After introducing relative representation of various financing options used in software product business firms, financing sources in absolute terms are to be analyzed. The distribution of total financing and overview of most frequently used financing sources is presented in this subchapter.

As can be seen from Table 27, the firms within analyzed sample were highly heterogeneous in terms of total financing absolute values. The average value of total financial backing of 75 firms providing this information was 1.95 M Euros. The

significantly lower median of 0.30 M Euros indicates that the distribution of financing was highly asymmetric. Half of the companies had total financing less than 300 000 Euros, and one quarter not more than 100 000 Euros. On the other hand, two companies from the sample exceeded 40 M Euros of financing.

Table 27. Distribution of Total Financing (n=75)

Mean (M Euros)	1.95	Quartile 1 (M Euros)	0.10	Std. Deviation (M Euros)	6.71
Min (M Euros)	0.00	Median (M Euros)	0.30	Skewness	5.60
Max (M Euros)	42.00	Quartile 3 (M Euros)	1.00	Kurtosis	31.20

Table 28 describes individual sources of finance in terms of mean for all analyzed cases, frequency of use, and mean and median for non-zero cases. The size of sample differs across individual financing sources, thus resulting descriptives of detailed items are not necessarily coherent with aggregate ones.

The distribution of most of the financing items was highly asymmetric. The sample for most of the financing items contained few very high values, while most of the companies were positioned much lower than would be indicated by average values. High level of asymmetry and spread in financing items is confirmed by kurtosis, being centrality measure of distribution, which is for all items more than 16.5 and by skewness, being asymmetry measure, which is for all items more than 4.0.

Table 28. Descriptives of Used Financing Options

Category of financing source	n	General mean (k Euros)	Freq. of use	Active mean* (k Euros)	Active median* (k Euros)
Own equity total (excl. capital loans)	105	1355	92 %	1467	200
Capital loans total	89	72	25 %	291	122
Capital loans from domestic FIs	86	1	2 %	30	30
Capital loans from domestic VC	86	25	4 %	723	130
Capital loans from foreign FIs	86	7	1 %	580	580
Capital loans from foreign VC	86	0	0 %	n.a.	n.a.
Capital loans from Sitra	86	0	0 %	n.a.	n.a.
Capital loans from Finnvera	86	1	2 %	25	25
Capital loans from Tekes	86	26	16 %	160	100
Capital loans from other public sources	86	0	1 %	30	30
Other capital loans	86	0	2 %	10	10
Debts total	94	803	62 %	1301	115
Debts to domestic banks	89	23	15 %	155	30
Debts to domestic finance firm	88	3	1 %	250	250
Debts to TEL employment insurance	88	12	5 %	255	105
companies					
Debts to domestic insurance	88	0	0 %	n.a.	n.a.
companies					
Debts to foreign FIs	88	34	1 %	3000	3000
Debts to Finnvera	88	9	6 %	156	100
Debts to Tekes	88	22	15 %	149	100
Debts to other public organizations	88	0	0 %	n.a.	n.a.
CPs and bonds	88	34	1 %	3000	3000
Debts to other than finance companies	88	0	0 %	n.a.	n.a.
Trade credit	88	251	35 %	713	37
Debts to private individuals	88	2	6 %	35	15
Other debts	88	457	33 %	1387	127
Financing total	68	1947	96 %	2028	316

(* Calculated only for non-zero cases) Note: Limited size of subsample used for calculation of active mean and median for some of the financing sources should be taken into account

Independently of the strong asymmetry in data, we can state that the most frequently used sources of financing, in addition to equity, were trade credit, capital loans from Tekes, debts to domestic banks, debts to Tekes, and other debts. Especially capital loans

and debts to Tekes provided analyzed firms with strong financial backing in terms of value. Other financing sources were used by less than 10 % of companies within analyzed sample.

5.4 Access to Finance

The access to external financing is especially critical for dynamic young innovation-based industries. Most of the firms in the software product industry are young with extensive investments made into research and development while having yet limited or not any sources of internal financing. At the same time, high pressure on rapid expansion and internationalization even intensifies the urgency of need for external financial backing. Therefore, in this subchapter we will present how accessible firms find external financing, if and what are the impacts of finance availability problems, what financing types firms were recently looking for and what were the outcomes of that.

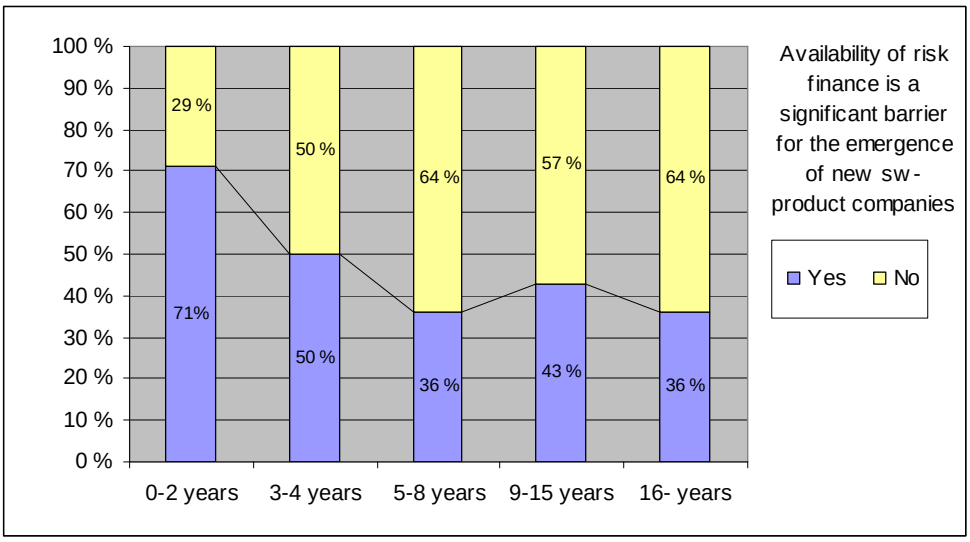

Figure 59. Opinion on the Availability of Risk Capital by Age (n=136)

On average, 42 % of the 138 firms considered the availability of risk finance to be a significant barrier for the emergence of new software companies. As shown in Figure 59, there was a strong difference in this perception based on the firms 'age. More than 70 % of companies 2 years old or younger perceived availability of risk finance as a significant barrier. However, we did not find a strong relation between this perception and the location of the respondent firms.

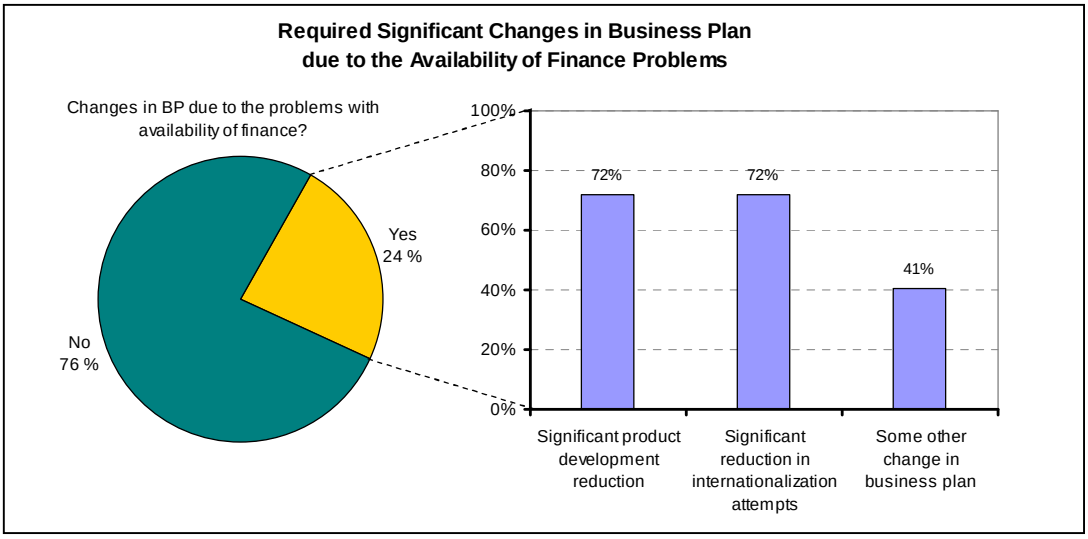

Figure 60. Availability of Finance and Impacts on Business Plan (n=136)

On average 24 % of the 136 respondent companies reported having been forced to significantly change their business plans due to problems in the availability of finance as depicted in Figure 60. The percentage can be put in perspective when contrasting it with the share of companies (30 %) that even attempted to seek external finance during the last three years (See Figure 61 below). For the majority of companies, access to risk capital is not a problem because of low growth orientation and thereby little need for external finance. However, for highly growth-oriented minority of companies that create the majority of growth and employment, access to risk capital is a crucial enabler of productization and internationalization. Of those companies that had to change their business plans because of problems in the access to finance, 72 % of the companies had reduced product development and 72 % had reduced internationalization attempts.

Although evidence from other sources would suggest the problems with access to finance being highest for young companies, we could not find a clear pattern in our data. A highly potential and worrying explanation is that capable entrepreneurs never started the venture they would have started if the financing waere not a barrier. In other words, rather than finding companies of less than two years old complaining the financing problems changing their plans, we may just not observe the companies if they do not exist, i.e., the potential entrepreneurs changed their plans before starting the venture in the first place. Figure 59 shows that 71% of the youngest companies considered the availability of finance as a significant barrier for the emergence of new software product companies supports this explanation.

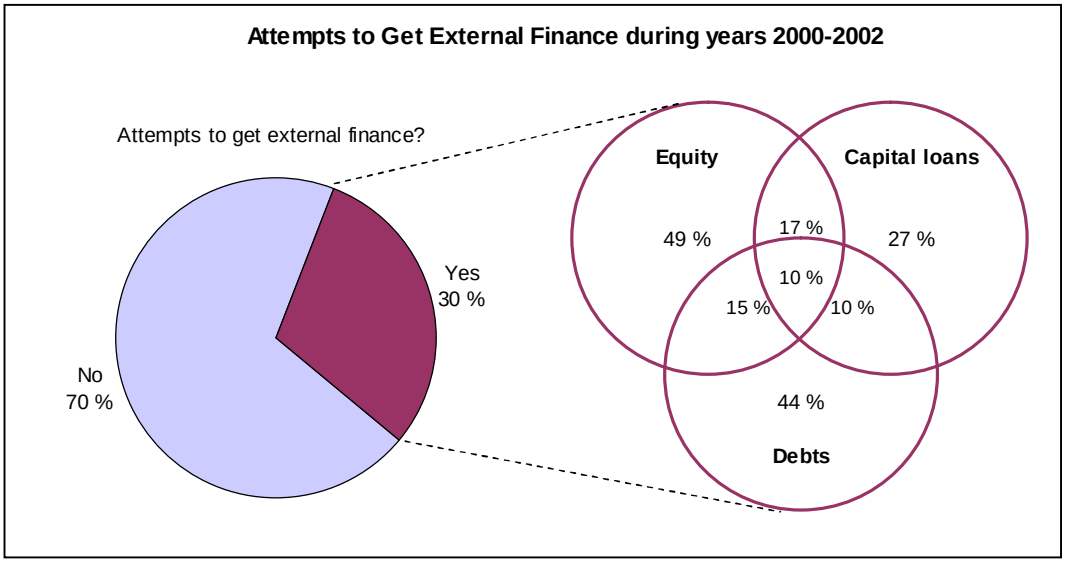

Figure 61. External Financing Attempts (n=136)

During years 2000 to 2002, only 30 % out of 136 firms in analyzed sample attempted to get additional external financing. As presented by Figure 61, almost half of the attempting companies (49%) attempted to raise additional equity, followed by 44 % attempting to obtain debt finance, and 27 % capital loans. Almost 10 % of these companies attempting to obtain external finance were interested in any form of capital.

In an analysis of success rates in raising different types of finance, highest success rate, about 82 %, in obtaining external finance was reported in the case of debt finance. This was followed by capital loans with 70 % and equity investments with 68 % success rate. In interpreting the success rates, it is important to remember that they differ significantly from the acceptance rates of investors because a company can approach a large number of investors before securing funding from one source. Furthermore, the very small number of respondents (10-18 respondents per category) in this question suggests potential selection bias exaggerating the success rate i.e. those who were successful were more likely to answer the question.

The reported equity investment value was on average about 6.0 M Euros but median only 0.8 M Euros. Mean value of reported capital loans was 220 000 Euros and mean debt finance 530 000 Euros. The average decision time between applying for financing and final decision was in the case of equity investment 73 days. For capital loans, it took 35 days and for debt financing decisions 48 days. More details on attributes of external financing are in Table 29.

Table 29. Attributes of External Investments/Loans

	Equity	Capital loans	Debts
Success rate			
Mean value	68 %	70 %	82 %
(Sample size)	(18)	(10)	(17)
Investment/loan value (k Euros)			
Mean value	6007	224	533
Median value	800	100	160
Minimal value	50	40	10
Maximal value	54000	580	3000
(Sample size)	(11)	(7)	(14)
Decision time (days)			
Mean value	73.0	35.3	48.0
Median value	45.0	14.5	0.0
(Sample size)	(10)	(6)	(12)

5.5 Financing Plans

Financing situation assessment and recent financing attempts as presented in the previous subchapter give some overview of the current situation on external finance markets, but maybe even more important and better depicting the trend and future development and providing some space for corrective actions are the financing plans of the analyzed firms. The focus of this subchapter is on firms 'intentions to seek external financing, structure of financing intended to be sought, how are the financing plans influenced by firms 'age, revenue, profitability and growth expectations, and what are the reasons behind recent changes in plans for external financing.

Only 30 % of the 139 responding firms planned to seek external finance within the next two years (2003-2004) as shown in Figure 62. This represents a very significant decrease when compared with 43 % year ago and 47 % two years back.

More than 38 % of firms declaring to seek for financing in next two years intended to raise additional equity based financing. Almost 24 % of these companies aimed to raise capital loans and close to 55 % were planning to raise debt finance. Compared to recent financing attempts, the reported plans for 2003-2004 were more oriented on debt financing than previously used equity-based investments.

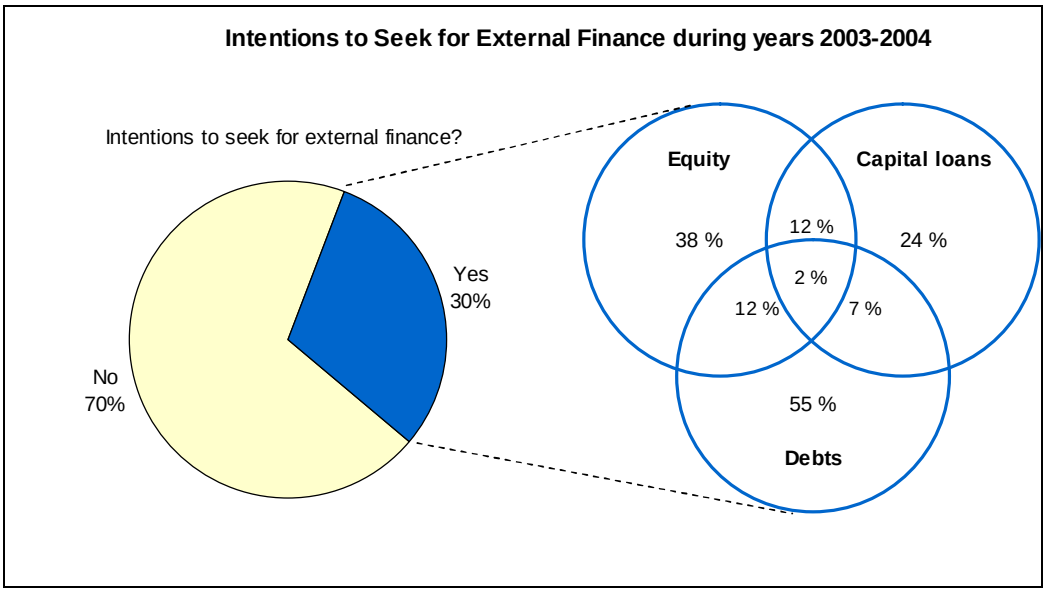

Figure 62. External Financing Plans (n=139)

Average value of equity financing aimed to be raised in years 2003 and 2004 for the companies intending to do so was 2.4 M Euros. In the case of capital loans the average value was 600 000 Euros and for debt financing about 660 000 Euros.

In order to understand the typical profile and grouping of firms planning to seek external finance, we have structured firms 'by age, revenue, profitability and growth expectations and compared proportions of them intending to seek external finance during 2003 and 2004 as presented in Figure 63.

The highest proportion of firms intending to apply for external finance in the horizon of two years, almost 60 %, was in the group of firms being two years old or younger. Still, plans to raise new external finance were quite frequent, about 40 %, in the age groups 3 to 8 years old. In the case of revenue, the most frequent plans for external financing

were not in firms with close to zero revenue, but in firms having 150 000 Euros to 500 000 Euros of revenue. This indicates that early stages of development are usually financed by founders 'capital and external financing is sought later for further expansion. Other possible interpretation is that firms were not confident that without any reference sales they would have a chance to raise external finance.

Profitability, measured by return on sales, had clearly negative relation with plans to seek for external finance. More than half of the firms with negative cash flow intended to raise external finance, while this was the case of none of those having ROS (Return of Sales) higher than 20 %. This situation confirms the effect of internally generated financing displacing the demand for external finance. As expected, the plans to seek for external finance were strongly correlated with growth expectations for 3-year horizon measured by compound annual growth rate. External finance acquisition was planned only by less than 25 % of firms having expected CAGR (Compound Annual Growth Rate) 15 % or less, while for firms with expected growth of 80 % and more p.a. it was more than 60 %.

Based on these analyses we can conclude that group of firms having highest interest in external financing consists of young firms with small but existing revenue, low profitability and very high growth expectations.

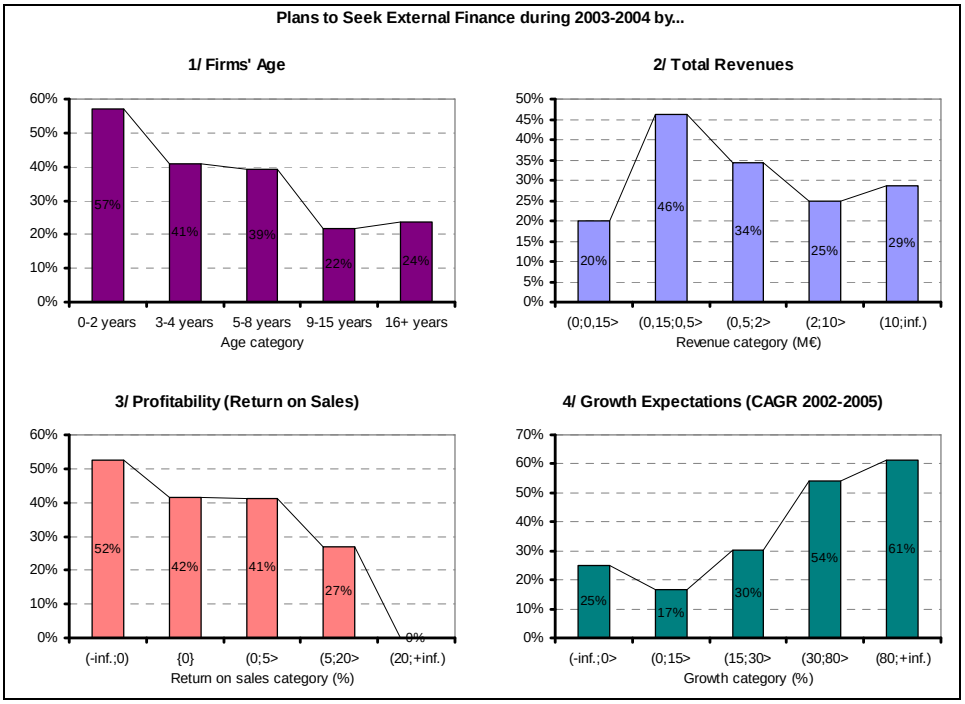

Figure 63. Plans to Seek External Finance by Age, Revenue, Profitability and Expected Growth (n_1=137; n_2=123; n_3=100; n_4=97)

When looking at the structure of external finance planned to be sought, we can recognize also some interrelations especially with the revenue, age, and growth expectations of firms. Generally, small and young firms had much higher proportion of planned capital loan financing plans. With increasing maturity and revenue, capital loan plans were continuously replaced by debt financing plans. The equity financing plans were stable along the revenue and age. Growth expectations appeared to be an important determinant of the appropriate source of finance. Presence of different types of finance in plans for raising external finance based on growth expectations is shown in Table 30.

The data indicate that more stabilized firms with lower growth expectations tend to strongly prefer debt financing. On the other hand, firms with high expectations for growth had much stronger presence of equity and capital loan financing in their plans.

Table 30. Types of Planned External Finance by Growth Expectations

		Share of individual financing types*		
Expected growth in 3-year horizon	(n)	Equity	Capital loans	Debts
Moderate to medium (<= 30 % p.a.)	(13)	23 %	15 %	69 %
Medium to high (>30 % p.a.)	(24)	46 %	29 %	54 %

(* Percentage represents share of external financing plans using given financing type)

These findings on structure dependence are coherent with financial theories suggesting that more mature and stable firms with lower risk are aiming to utilize financial leverage by employing debt instruments, which are reachable to them. On the contrary to that, highly risky young firms with hopes for rapid growth are limited in their choices and usually seek for financing on equity and capital loan markets.

As mentioned earlier, firms reported significantly less frequently their intentions to seek for external finance in two-year horizon when compared with two previous years. There are two major interpretations for this. Either firms have lower growth expectations and thus do not need as much external financing to support their expansion, or despite of need for external financing they are skeptical about its availability and thus do not even make any attempt. The comparison of external financing plans structured by growth expectations as in years 2001 and 2002 is presented in Figure 64. The comparison chart suggests that both introduced interpretations have empirical backing. While firms having prospects of negative or moderate growth did not change their already limited consideration for external financing, the firms with high growth expectations limited their plans to raise external finance significantly. The situation when firms reduced external financing plans, while having same growth expectations, indicates a decrease in the confidence on the feasibility of raising external finance. In addition to that, as indicated by population distribution curve on the chart, there has been a generally downward adjustment of growth prospects, which lead to reduction of expansion financing demand and consequently to less external finance including plans.

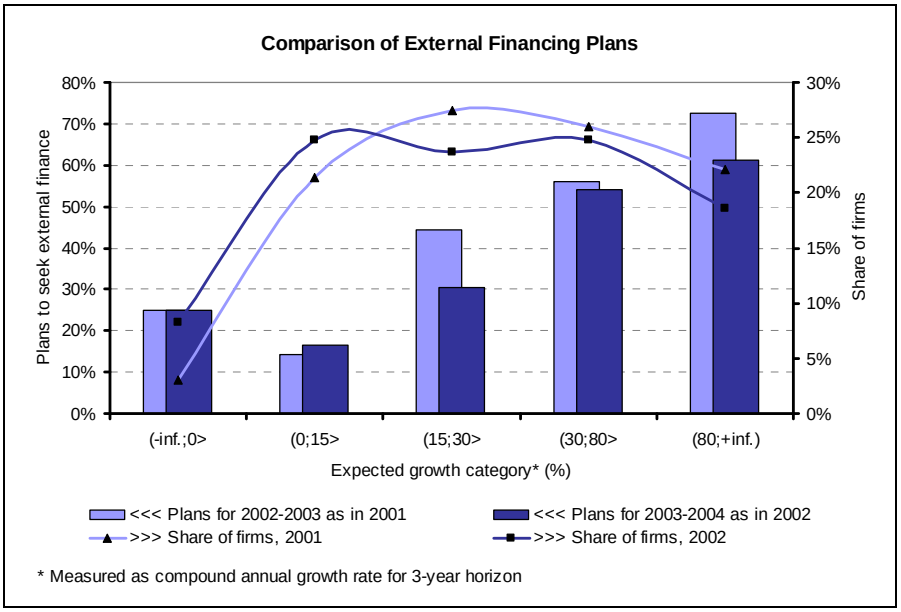

Figure 64. Comparison of Financing Plans between 2001 and 2002 (n_{2001}=131; n_{2002}=97)

5.6 VC Finance and Internationalization Support

Presence of private equity investors is common in novel rapidly developing industries with high but uncertain expectations where young firms can rarely rely on traditional institutional investors or creditors. Private equity investors are willing not only to selectively accept higher level of risk compensated by participation on potential fulfillment of expectations, but can also provide firms with various forms of value-added support beyond financing. The presence of private equity investors and their internationalization support are the subjects of our analyses in this subchapter.

Only less than 12 % out of 139 companies reported a private equity investor as indicated in the first chart in Figure 65. Most common type of private equity investor was a venture capital firm. In almost 67 % of companies having a private equity investor, there was at least one domestic private VC firm present. Domestic government VC firms were present in 20 % of these companies. Foreign VC firms were present in 20% of these companies. Domestic business angels were active in one third of companies having a private equity investor, but for foreign ones it was only 13 %. There was not reported any domestic corporate VC, but almost 7 % of firms having private equity investor had foreign corporate VC.

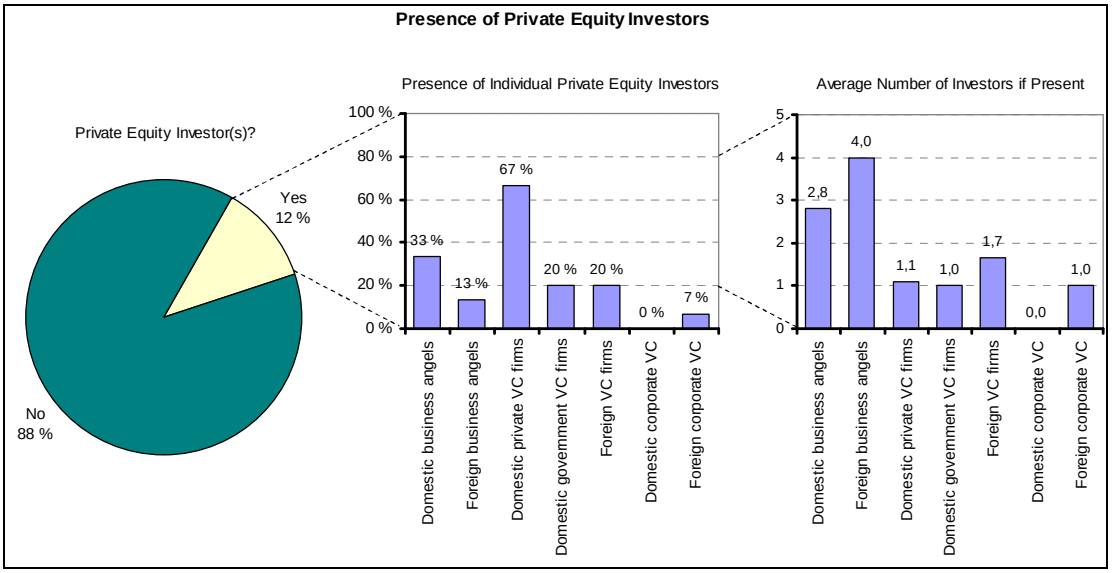

Figure 65. Private Equity Investors (n_1=138; n_2=15)

For the firms reporting domestic business angels, the number of them was on average almost three. There were usually four foreign business angels if present. Companies having domestic VC firm as an investor had on average slightly more than one in the case of private one and 1 in the case of government one. As already mentioned, there were reported no domestic corporate VCs, but average number of foreign ones was one.

Private equity investors usually provide various forms of value-added support in addition to financial backing. This year's survey focus is on the one of the most critical ones for Finnish software product industry: internationalization support. Unfortunately, we received only a very limited number of responses; all together only 11 companies reported their opinions on the issue of internationalization support from their private equity investors. Despite of that, we can see some clear patterns even in this limited sample used for the analysis.

The average grading of internationalization support as assessed by firms on 7-point Likert scale is presented in Figure 66. Grade 7 on the scale corresponds to finding internationalization support very valuable and grade 1 to not useful at all. As can be seen, absolutely maximal possible points for internationalization support were awarded to foreign corporate VCs and foreign business angels. These were followed by foreign VC firms having average grade 6.3. Out of domestic equity investors, private VC firms being followed by government VC firms seem to provide highest internationalization support and received on average 4.8 and 4.7 points respectively. Lowest contribution in internationalization processes was perceived in the case of domestic business angels having only 4 points.

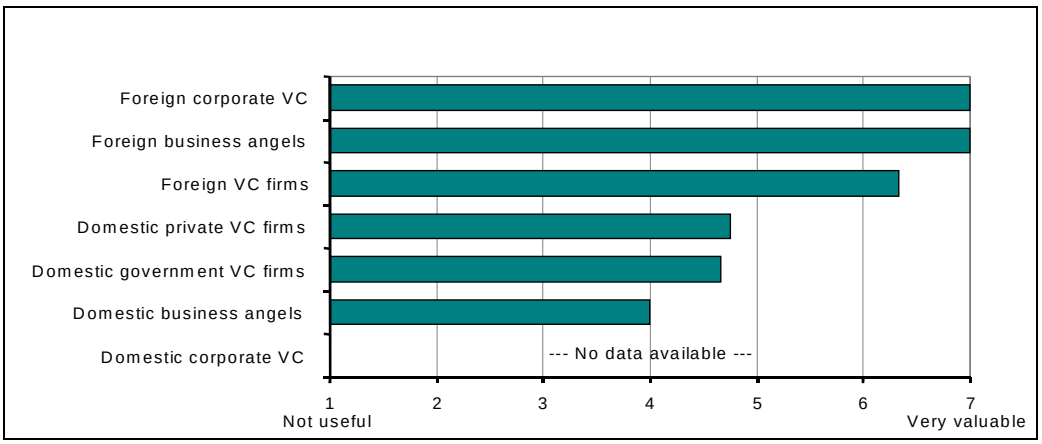

Figure 66. Internationalization Support from Private Equity Investors (n=11)

It is quite clear that foreign private equity investors can often provide very valuable internationalization support for their portfolio companies. Software product business, by its nature, requires high sale volumes, and thus internationalization and consequent access to new markets beyond the Finnish market is essential and natural for most of the ambitious firms in the industry. However, the process of actively entering foreign markets or starting operations abroad is not only a complex and expensive one, but also very risky. Given the value of internationalization support and the added capital and risk taking-capability associated with foreign private equity investors, higher openness to foreign financial capital would not only improve the current situation in availability of financing for young and dynamic firms, but in addition it would provide participating firms with significantly higher internationalization support and consequently higher potential growth prospects.

6 BUSINESS MODELS OF THE COMPANIES

A central issue for software product companies is the choice of business models with respect to the level of productization and how services relate are used to support the product sales. This section describes the findings of the survey regarding the types of business models companies use.

6.1 Categorization of the Companies

In order to understand the different business models of the companies, we categorized companies into different groups based on the degree of productization and the source of revenue (i.e. Hoch et. al. 1999, Rajala et al. 2001, and Cusumano 2003).

6.1.1 Categorization Values

We did the categorization of the companies according to two variables. The first was the degree of productization of the software offering; and second the share of pure product business, i.e., the percentage of revenue acquired from product licenses.

We asked the companies about the degree of their main offering's productization by asking how well the main product could be duplicated without customer-specific work. The degree of pure product business was measured by asking about customer billing: how many percents of total billing of an average customer delivery were based on product offering.

Based on answers to these two questions, we were able to categorize companies to four classes depending on the type of the business they practiced. We named categories to *product licensors*, *product integrators*, *solution consultants* and *product tailors* as shown in Figure 67.

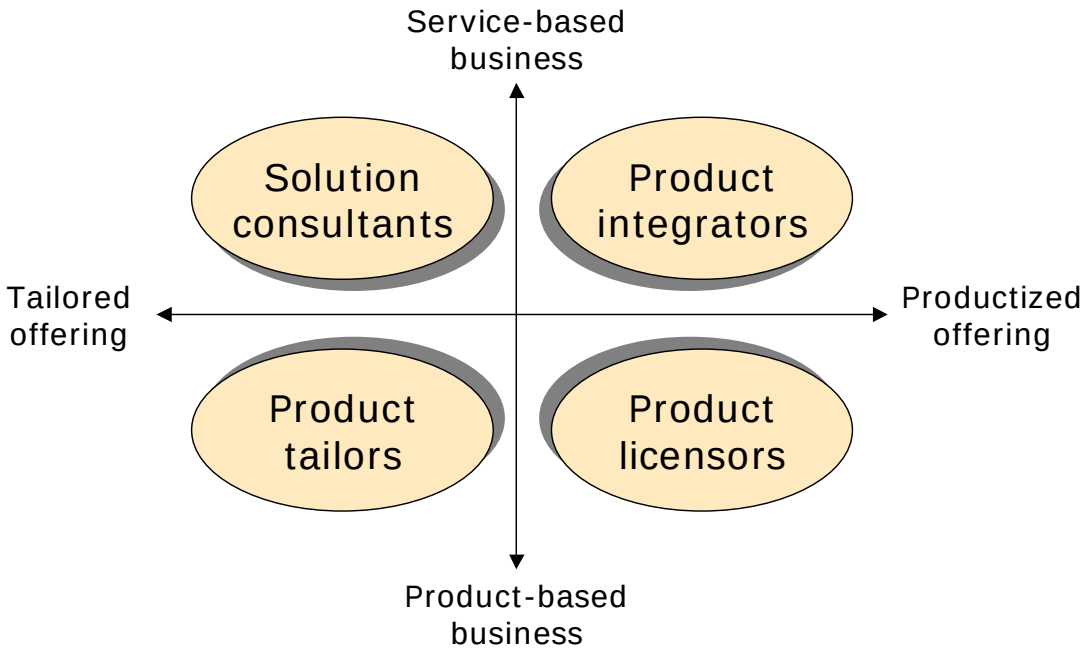

Figure 67. Categorization of Companies

We categorized all companies to one of these four groups. Finally, we had 37 product licensors, 45 product integrators, 29 solution consultants, and 27 product tailor companies.

6.1.2 Categorization Criteria

We selected product licensor companies to consist of those that had more than 60% of their product business revenue acquired from product licenses and whose product could be duplicated without hourly-based-billing to customers "quite often", "often", or "always". Product licensor companies base their product business on product that is highly productized and most of the revenue is obtained through licenses, thus the name "product licensor"

A company was considered a product integrator if it had 60% or less of their product business revenue acquired from product licenses; and products that could be "quite often", "often", or "always" duplicated to different customers without hourly-based-billing. Product integrator companies' customers are mainly enterprises and they emphasize services in their offering and often integrate their offering to customer's environment. This is why they are named as "product integrator" companies.

We considered a company a solution consultant if it had less than 40% of its product business revenue acquired from product licenses; and product that "could not be at all", "could not be almost at all", "could be only in very limitedly" or "could be only in some extent" duplicated to different customers. Solution consultants had more revenue acquired from services than product, thus the name "solution consultants".

On the contrary to solution consultants, product tailors were defined to earn 40% or more from product licenses; and to have equally low level of productization of their offering as solution tailors. Thus both solution consultants and product tailors had to do customer specific tailoring work to duplicate the product to different customers. Because main revenue of product tailors was product, but still they had to do tailoring work, we named them "product tailors".

6.1.3 Description of Categories

Based on variables on which the categorization was made, we can describe the groups in high level:

- Product licensor companies are companies, which have highly productized software offering and focus their business to develop and sell the product. These companies are in the "purest" end of software product business and often expected to have high growth potential.

- Product integrator companies also have highly productized software, but the software is only the core of the offering, services being the main part of it. Services consist of user training and maintenance to name but a few.

- Solution consultants have product with low degree of productization and, thus, they have to do much tailoring work for each customer. Thus their business is in the "impurest" end of software product business. Solution consultants are counted as product business because the core of their solution is based on product.

- Product tailors are companies whose business revenue is based on product licenses but whose product still has low degree of productization. Thus, some of their revenue still base on product tailoring and customer specific projects.

To find out more interesting characteristics about these groups, we outline their differences in following chapters based on the survey data.

6.2 Key Figures

6.2.1 Revenue and Profit

In Table 31 we can see that companies with high degree of productization have, on the average, higher revenue and higher revenue per employee. The differences are due to the fact that in product licensor and product integrator categories several companies are large, whereas in low productization categories there are fewer large companies.

If we compare median revenue in categories with same degree of productization (i.e., product licensor to product integrator and solution consultants to product tailors) we notice that categories with more emphasis on services have more revenue. This is natural, as service based businesses offer customer both product and wide range of services. Thus, the revenue becomes more than just selling product licenses. However, neither median nor average profits give hint about profitability being notably better in any group. Looking at the median revenue, we also note that majority of software companies are small in each category: half of all the studied companies had revenue less than 400 000 (Euros) in 2002.

Table 31. Revenue and Profit

Company type	Average revenue (M Euros)	Average revenue (M Euros)/ employee	Median revenue (Euros)	Median profit (Euros)
Product licensor (n=35)	3.8	0.09	300 000	0
Product integrator (n=41)	4.0	0.09	680 000	20 000
Solution consultant (n=23)	2.3	0.07	500 000	0
Product tailor (n=24)	1.2	0.07	250 000	1 000

Low revenue per employee ratio indicates that in every group the amount of companies still in first product development phase is lowering the averages. Therefore, in every category the revenue per employee falls under 100 000 Euros per employee.

6.2.2 Personnel and Ages of Product Businesses

Categories with productized offering have, on the average, much more personnel than companies with lower degree of productization. However, median number of personnel is small in each category.

An interesting result is that businesses whose income is product-based are the youngest category both in median age of company as well as in median and average age of product business. Other interesting result is that in median it has taken five years for product licensor companies and four years for product integrator companies to get product business started.

Table 32. Number of Personnel, Age of Company and Software Product Business

Company type	Average number of personnel	Median number of personnel	Median age of company	Median age of software product business	Average age of software product business
Product licensor (n=35)	43	5	9	4	7
Product integrator (n=41)	31	10	12	8	9
Solution consultant (n=23)	23	4.5	11	10	11
Product tailor (n=24)	13	6.5	7	6	8

Product licensor companies are the youngest group, when measured from the age of software product business (combined with low median revenue per company).

6.3 Actual and Estimated Growth

We studied realized and estimated growth based on common data from years 2002 and 2003 which made our sample small, containing only 6 companies in the solution consultant group. Thus results in this chapter are directional.

In Figure 68 and Figure 69 we show average and median growth of sample product businesses. Whereas these businesses did not grow between 2001 and 2002 in median, we notice that product licensor and product tailors have grown. This is because their product-based incomes might be large enough to finance growth. Both average and median growth was seen positive between 2002 and 2003 in each group.

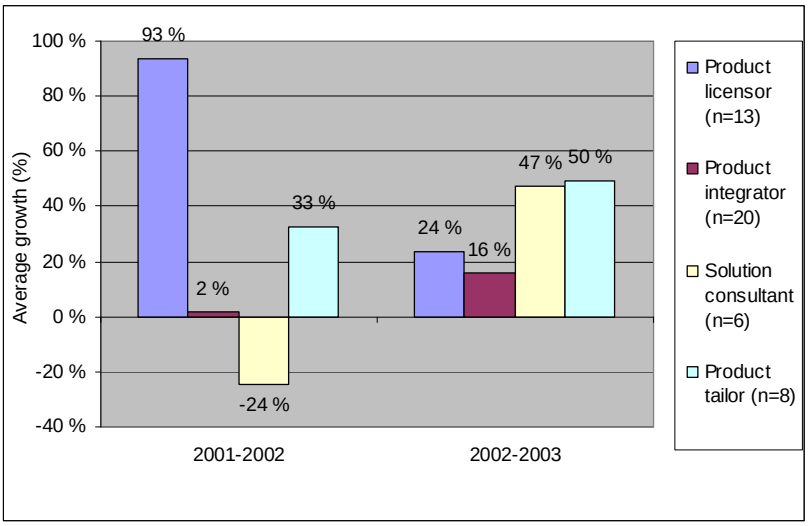

Figure 68. Actual and Estimated Average Growth of Sample Businesses between 2001-2002 and 2002-2003

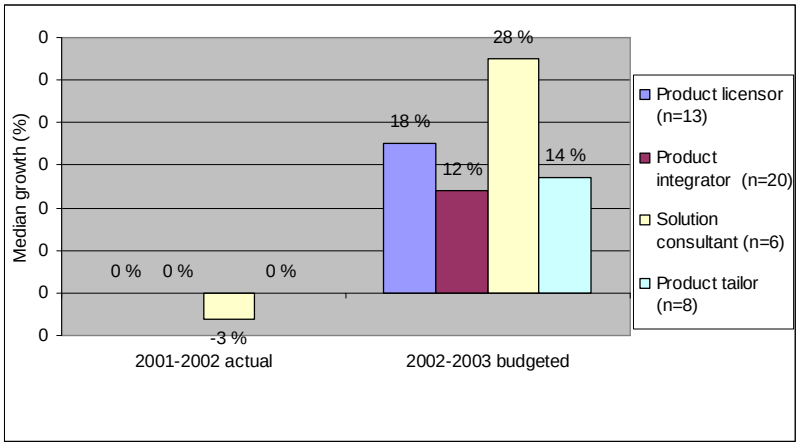

Figure 69. Actual and Estimated Median Growth of Sample Businesses between 2001-2002 and 2002-2003

Significant differences between averages and median reveal that some companies have been dramatically able to increase their business volumes, but majority has not taken any giant leaps. This can be seen especially from the actual development of product licensor companies in 2001-2002.

6.3.1 Actual and Estimated Gross Profit

The median company in each group has had positive gross profit, even though profitability has been relatively weak. Product integrator companies had 2.3% gross profit, being the most profitable category. All groups saw their future positive and believed to be able to raise gross profits – even up to 18.5% by product licensor companies.

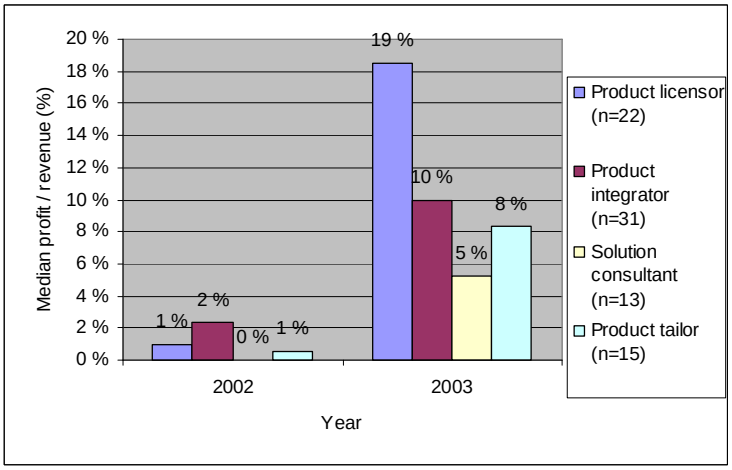

Figure 70. Actual and Estimated Median Profit/Revenue in 2002 and 2003

Higher profitability expectations for the companies with higher degree of productization reflect to the fundamentals of the business. As higher R&D investments and more volatile markets for productized software mean higher risks, the profitability expectations are also higher.

6.4 Business Figures

6.4.1 Revenue

Product licensor companies have on average over 87% and on median over 90% of their total revenue acquired from license selling whereas product integrator companies' business is only 41% product-based. 59% of their revenue comes from product related services of which customer projects and maintenance are the most important.

Solution consultant companies get only 12% of their revenue from license sales and their main source of revenue is product based customer projects and tailoring. Compared to solution consultants, the business of product tailors is really product-oriented: almost 59% of their revenue comes from product licenses and 18% from customer-specific projects and tailoring. Breakdown of main product's sales revenues are presented in Figure 71.

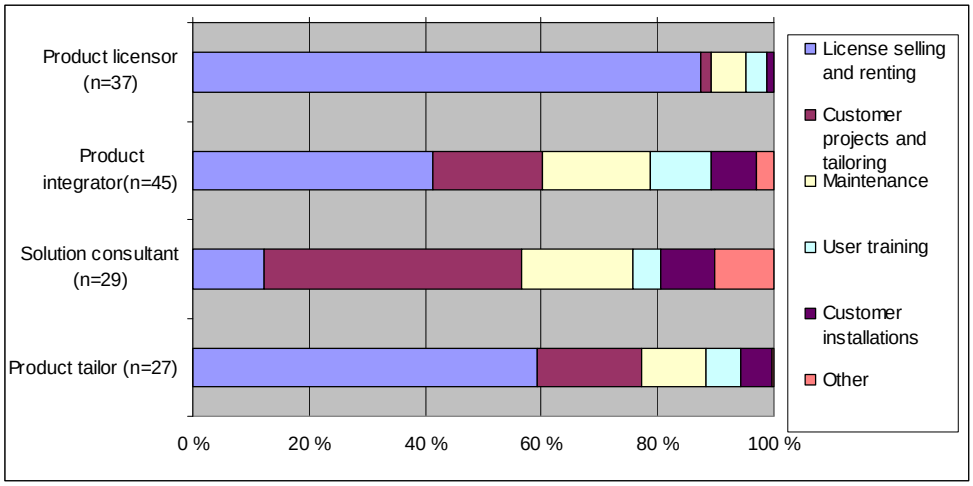

Figure 71. Composition of a Typical Delivery of the Main Product by Software Product Business Revenue in Different Groups

It is worth mentioning that in software business new ideas for revenue logic are possible, i.e., distributing licenses for large amount of customer for free and charging for training or different revenue sources of open source companies. However, there were only a few cases indicating the use of untraditional revenue logic.

6.4.2 Personnel

Studying companies' business revenue gives also hint about organization of personnel between different functions: companies with product-based revenue have higher percentage of personnel working in product development than other companies. Their second largest function is sales and marketing. Companies with service-based revenue have also most of their personnel working in product development but second and third largest functions are services and delivering and customers service. The allocation of personnel is presented in Figure 72.

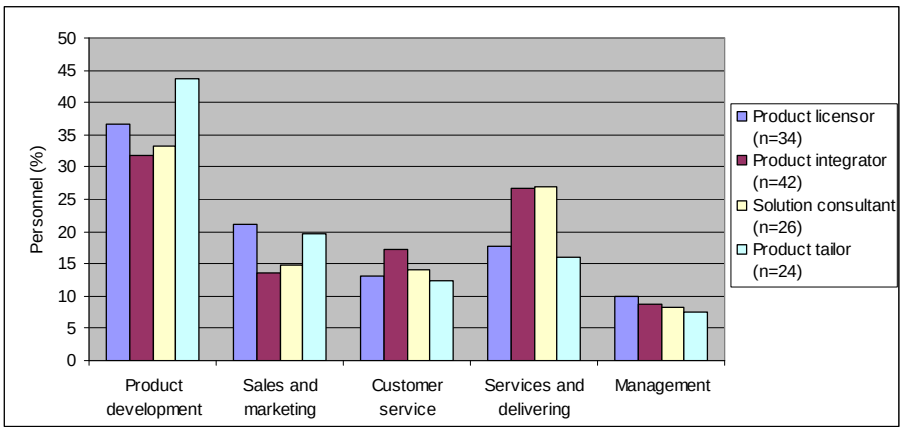

Figure 72. Distribution of Personnel between Functions

Product tailors had relatively largest amount of personnel working in product development. This could indicate that these companies are trying to improve their degree of productization and/or that the roles of customer delivery and product development are somewhat mixed.

6.4.3 Sales and Distribution

All groups used direct selling very often; especially service-oriented companies. Companies with high degree of productization used also resellers and agents, which was made possible by their highly productized offering. Half of the solution consultants did not used resellers of agents in any situation.

Using a reseller's brand to sell the product or selling product as a part of resellers product was only used in few cases and the same hold true with bundling and wholesalers. Majority of companies in all categories did not use these sales channels in any situation. Using other than a company's own selling was best suited, and thus used, by product licensor companies: their offering is product-based and productized can be thus most easily delivered for example through wholesaler.

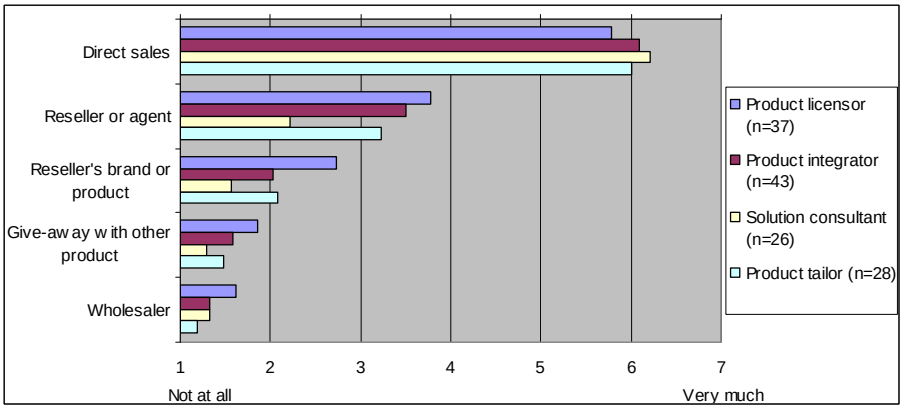

Figure 73. Average Sale Channel Use by Each Category

Electronic delivery through Internet is the most popular delivery means in all but solution consultant category. Businesses having product of high productization used electronic and physical delivery more often than business with low productization products.

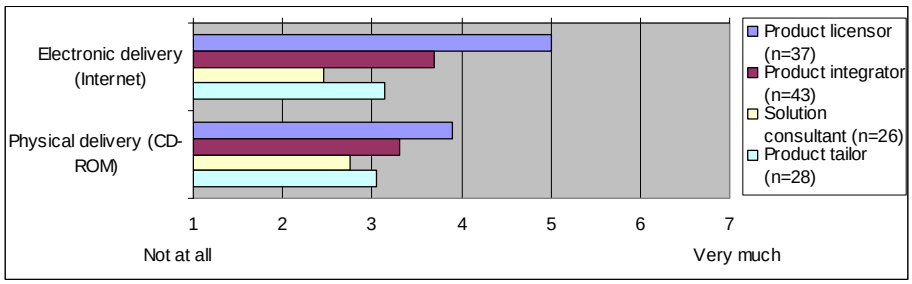

Figure 74. Average Use of Internet and CD-ROM Delivery by Each Category

Only product licensor companies use more extensively delivery methods that can exploit the idea of duplicating the software. Even so, even product licensor companies often have value-adding services that cannot be "shrink-wrapped" and delivered to customers as is.

6.4.4 Customers

The majority of the business is done with other companies and public administration in every group whereas private consumers are the most unusual customers. Product licensor companies served most often private consumers.

Table 33. End Users by Different Groups (Dichotomy Label)

	Type of the company			
End user	Product licensor	Enterprise	Solution consultant	Product tailor
SM Enterprise	68 %	64 %	66 %	63 %
Large Enterprise	32 %	36 %	48 %	52 %
Public Administration	30 %	24 %	28 %	33 %
Private consumer	19 %	7 %	7 %	4 %
Total	149%	131%	149%	152%
Number of cases	37	44	29	27

Companies with lower degree of productization were most dependent on their key customers: product tailors had 27% and solution consultants on average even 43 % of their revenue acquired from their largest customer. Product licensor companies had an average of 24 % and product integrator companies just 21 %. The average of product licensor companies is relatively high, which could be explained with the fact that some of the companies have not yet fully had a break through in the markets.

6.4.5 Financing

Lack of finance had affected in average every forth software product business. Companies with low productization were the most affected ones, third of them had suffered. Almost half of all companies considered financial situation to be major obstacle for new companies.

We asked the companies if the lack has affected to their productization, international efforts or to something else, which we left open. Most often insufficient financing had reduced product-based business 'productization and high productization degree business' internationalization efforts. Other mentioned consequences were the necessity to focus the business and business downscaling. Low productization companies, i.e., groups most frequently affected by insufficient financing, mentioned the need to downscale business more often than others.

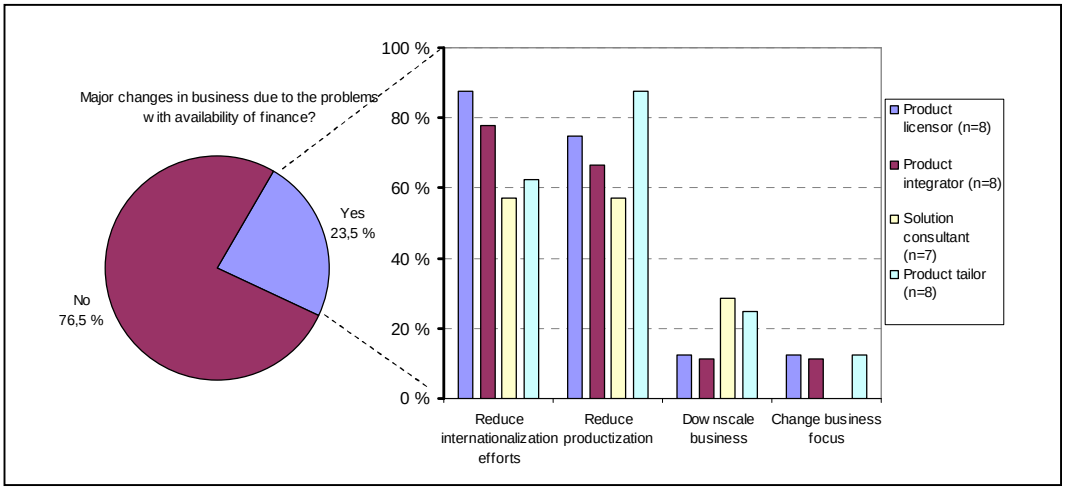

Figure 75. Consequences of lack of finance

It is noticeable that the degree of productization is closely linked to the internationalization capabilities of a company. However, companies with higher degree of productization (who assumedly have better internationalization capabilities) are the ones who have to decrease their internationalization efforts the most.

6.5 Main Product

6.5.1 Characteristics of Main Product

The most considerable differences in characteristics of main products 'business were that products with high productization degree were most often cost leaders and that ASP-renting, open source and IPR transferred to the customers were more often by low productization companies.

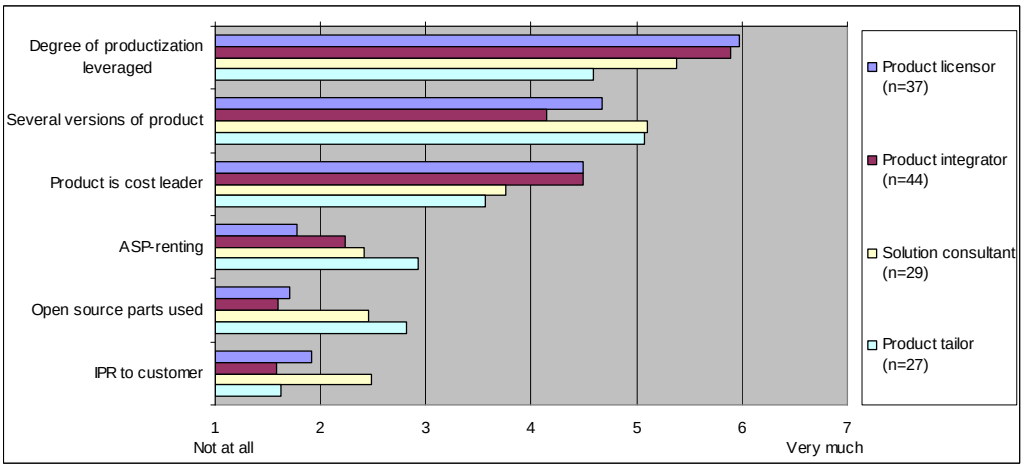

Figure 76. Characteristics of the Main Product's Business

6.5.2 Releases

Releases of main product were done most often in irregular basis. Only solution consultant did not do not released so irregularly than others, which was because solution consultants were the most eager group to release in every customer delivery. Product licensor companies were the most usual groups to release a new version on a fixed schedule (33% of cases). The basis of release was asked at a dichotomy label and the

reason for a release is often a combination of several factors. Release strategies are presented in Figure 77.

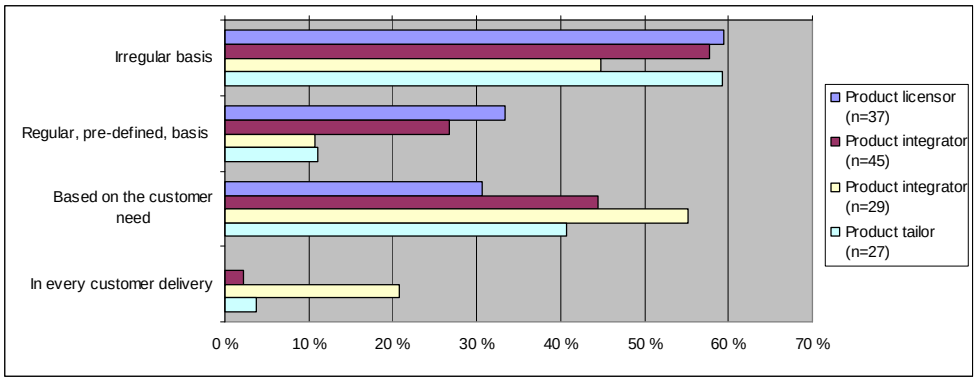

Figure 77. Release strategies for main product by different groups (dichotomy label)

Product licensor companies released most frequently: 14% of them released once a month or more often. Majority of all companies, 76%, released from one to four times in a year, 12% more often and 12% less frequently.

6.5.3 Organization of Product Development

Companies that had high degree productization had significantly most often a separate product development unit. This is natural because it is often challenging to find time and money for product development of productized offering in customer projects.

Companies of high degree productization had also more programmers in their product development units. This is understandable because often a productized offering needs several developers to be developed and after that to be continuously improved.

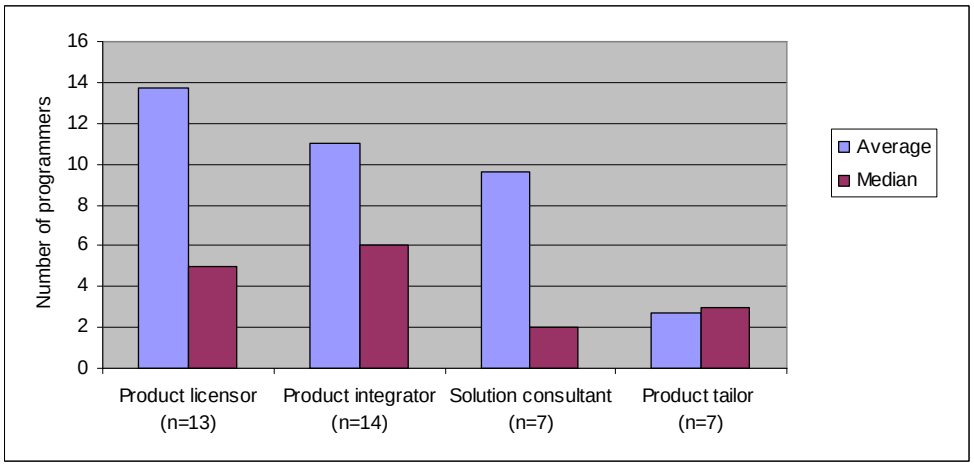

Figure 78. The Number of Programmers in Product Development Unit

6.5.4 Product Development Investments

There are huge differences in investment to product development between categories and especially between companies: in 2002 one product licensor company had invested two and another four times of their revenue to product development.

Product licensor companies and product tailors, companies that get most revenue from product, were also the most eager to invest on product development. We also found that

younger companies and younger product businesses invest more on product development than older companies and product businesses. This might explain part of the decrease in investments between 2002 and 2005; new companies and product businesses are missing from the sample.

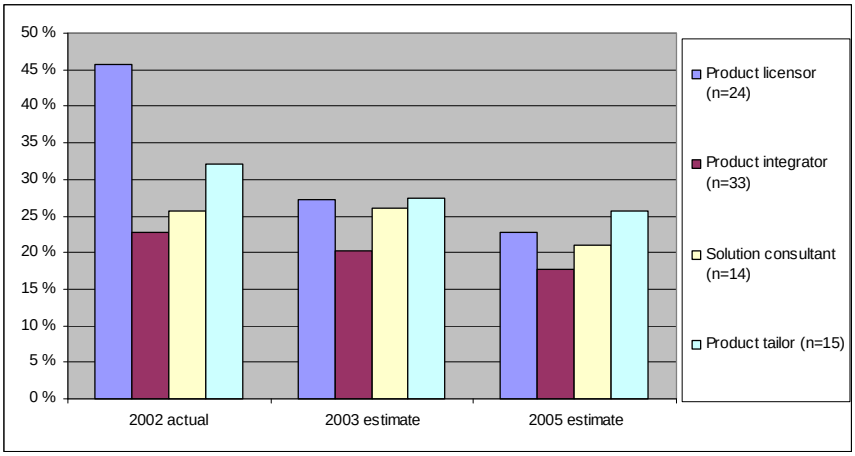

Figure 79. Product Development Costs as Percentage of the Total Revenue

6.6 Internationalization

6.6.1 Number of Countries

Whereas over half of the companies in each category were domestic in their business, the international rest differed between categories: all international product tailors ran their business in less than six countries while third of international solution consultants operated more than five countries. Companies of high productization degree were most international both as percentage of companies running international business as in number of countries they operated. Product licensor companies were the most international ones, which is generally recognized fact.

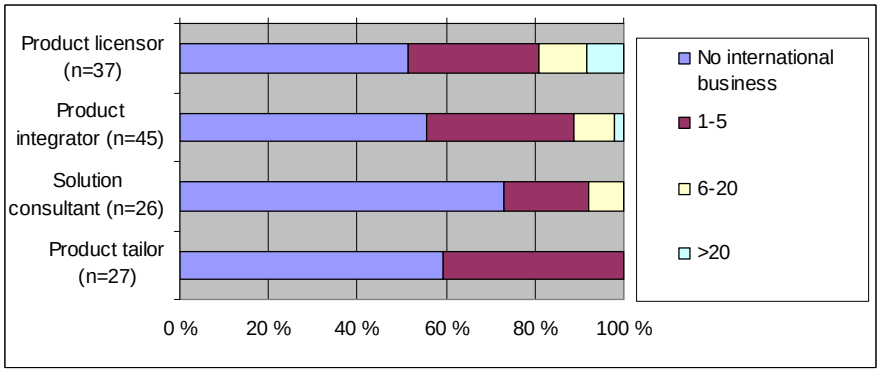

Figure 80. The Number of Countries the Company is Running its Product Business

6.6.2 Internationalization Strategy

A direct sale, most used in domestic sales, was also the most used sales strategy in international markets. Reseller or agent was second used. Wholesalers and giving product free with other product were not used almost at all.

A third of product licensor companies and a seventh of product tailors used selling under resellers brand or as a part of their products whereas other companies did not used it at all. On contrary other than product licensor companies used more daughter companies and joint ventures. Solution consultants, a group which service content is high and productization low, did almost all selling through direct sales and daughter companies. These are expensive strategies compared to use of resellers or agents. As it happens, solution consultants are often running only domestic business.

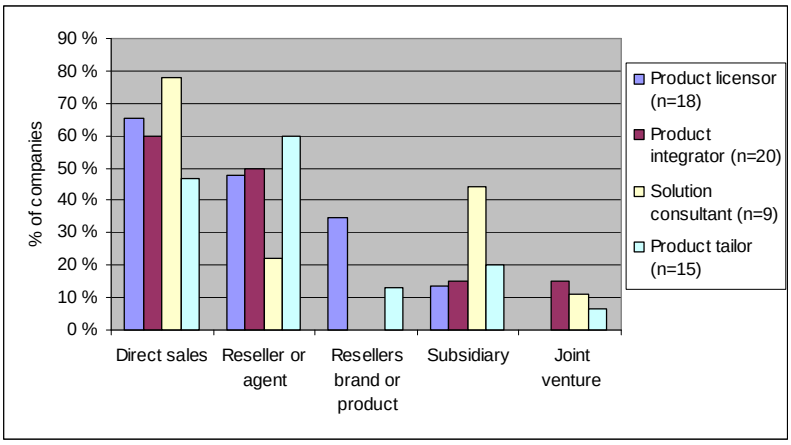

Figure 81. Percentage Used Sales Strategies of International Companies

6.7 Conclusions

From the sample, we were able to identify four different groups of companies: product licensor, standard solution, solution consultant and product tailoring companies. Grouping was based on productization and percentage of product-based business. Common characteristics for different groups is presented in Figure 82.

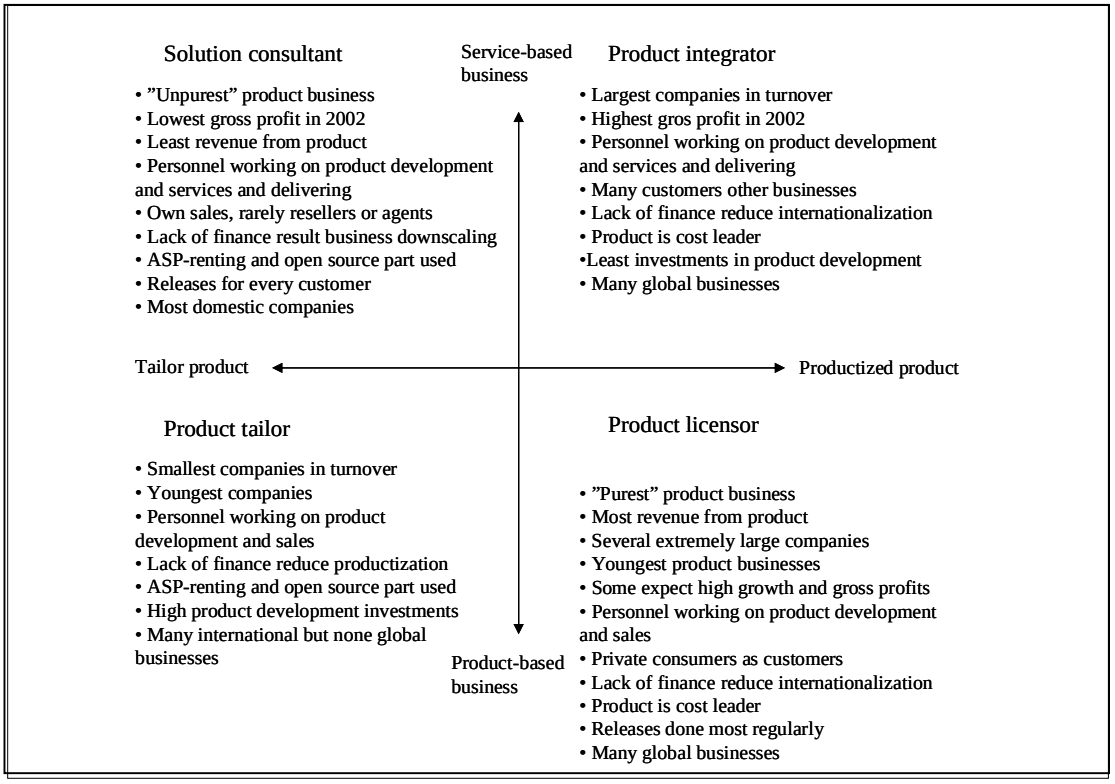

Figure 82. Categorization of Software Product Businesses

All groups were diverse in their nature: in each group there was both small and large companies as well as profitable and non-profitable ones. However, groups have their own special characteristics and benefit in many situations if are treated as separate groups.

7 CONCLUSIONS

7.1 The Current State of the Finnish Software Product Industry

Despite the current economic situation, the Finnish software product industry grew 13% in 2002. In 2003-2005, companies are still expecting to continue their growth even though expectations for the future are not regarded as positive as some years ago. The difficult economic situation weakened companies' profitability. Despite the fact that there are already some fully internationalized and mature companies, majority of the companies are still rather immature. This can be seen in moderate revenue, in low revenue per employee ratio, in lack of established business models, and in low degree of productization. In addition, despite the fact that especially young companies' product development costs were cut back in 2002, many companies are still in a relatively early product development phase.

Raising the degree of productization is one of the most important issues for software product companies. At the difficult economic times, this is especially challenging, as companies have to find a balance between long-term productization aims and short-term need for cash (often done by customizing and customer projects). In order to find a balance, good and clear vision and strategy for the products and business is needed in addition to suitable and flexible software production processes.

Difficult economic situation has caused the number of companies looking for financing to decrease from previous years. However, software products are difficult to produce without capital, which enables companies to focus on developing the product instead of doing customer projects. Since venture capitalist seem to concentrate merely in their existing portfolios instead of finding new investment targets, the next year will be challenging especially for the companies in early product development phase. This lack of venture capital emphasizes even more the crucial role of the public capital.

Software product business is also a very entrepreneurial industry as quite often small and young companies can come up with most innovative products and solutions (see Christensen 1997). Therefore, it is a worrying sign that the number of new start-up software product companies has been decreasing in the last few years.

As software product business is knowledge based, the availability of highly skilled professionals is crucial. This, as well as the need for partnerships and networking – deemed important by most respondents – might explain the concentration of the industry to university cities and technology centers. The availability of skilled work force and support activities was good. Areas were more professional work force is needed were some special application programming skills and software business sales, as well as marketing skills.

7.2 Points to Consider

The study brought up some issues that we think need further discussion. These included the raising the degree of productization and mastering product management, financing, networking, business understanding and internationalization.

7.2.1 Business Understanding and Management Skills

The results from the long-term study of the companies in 2002 survey (Hietala et. al.) showed, that those companies with executives experienced in managing a growing firm

and understanding the nature of the software business had gained the fastest growth. In addition, experienced management board is necessary in creating products that can be duplicated with low costs and respond to the needs of markets. The availability of these experienced executives is quite obviously very limited.

Obviously, one approach in a long term to increase the amount of competent software business managers is to increase the combination of general business management and software production and engineering education. In a short term, one possible approach could be to encourage those competent managers working in larger companies to give their expertise to young software companies. One way to encourage this kind of activity could be some sort of "public hiring" of competent managers, or better utilization of competent executives in board of directors.

7.2.2 Financing and Ownership

Finnish software product companies have very conservative financial structures with little debt or outside equity compared to Finnish biotech companies or SMEs in general. While good for survival, such conservative capital structures are not optimal for rapid growth and internationalization, which is crucial for the long-term viability and growth of the industry. An alarming sign is that the percentage of software product companies seeking external finance (30%) has decreased significantly compared to the situation in 2001 (43%) and 2000 (47%) as a result of decreased growth expectations. Overcoming the barriers for growth and internationalization success is crucial for tapping the growth and job creation potential of the industry.

Problems in the availability of external finance are most serious for growth-oriented, young, small, and negative cash-flow companies. These companies would need it most. These companies are significantly more pessimistic than older companies concerning the lack of financing preventing the emergence of new software product companies. The current financial environment discourages capable potential entrepreneurs from starting new growth oriented ventures or existing entrepreneurs from investing in growth. Public policy measures should be targeted to make the environment more rewarding for growth-oriented new ventures and their investors.

Internationalization success is imperative for growth, wealth creation and successful exits for investors, which are necessary conditions for them to make risky investments in software product companies. Foreign investors appear to provide highly valuable internationalization support for their portfolio companies thus complementing in a valuable fashion domestic investors. However, foreign investors are still very rare in Finnish software product companies. In addition to adding to the supply of risk capital, attracting more foreign investors in Finnish software product companies could help the industry also by improving the internationalization success leading to both increasing growth expectations and subsequently increasing supply and demand for domestic risk capital. The participation of foreign investors in creating globally successful Finnish software product companies should be encouraged.

7.2.3 Productization and Product Management

As this study shows, the majority of the companies still suffer from an inadequate productization level, a problem typical for the European software industry. It should be understood that raising the level of productization is a very deep and difficult issue influencing most aspects of the software product industry, from business models to internal processes. Possible means include changes in university curricula, and the provision of consulting services. As majority of the Finnish software product companies

are technology-oriented, professional business management from the very beginning could improve the productization intentions. Therefore, importance of experienced executives, who have the knowledge and understanding of market needs in addition to technological capabilities is essential.

It is interesting to notice that R&D and productization remain the main problem of companies of all ages. Only those companies that have yearly revenue of over two million Euros do not rank it as the main problem area. There might be two underlying factors behind this phenomenon. Firstly, the youngest companies are struggling to get their first R&D projects completed. Secondly, those companies that have already brought their first products to the market find that the prospected customers want to have modifications and further features in the products.

More professional project management can ease the potential problem of getting R&D projects completed. Typically, small companies developing new products are rather optimistic about the amount of time and resources needed to build a complete product, often falling into the trap of believing that once the code is written, the product is ready for mass marketing. Many young companies seem to have inadequate conception of productization. Finding appropriate delivery channels, ways of marketing the product and positioning the product to the market area some areas that have been neglected. To help companies in understanding the effort and time needed for productization, industry statistics as well as models of productization are needed.

The problem of making the product features meet customer needs fast is one of the very core competencies of any high-technology firm. Efficiency of the process of agreeing on the roadmap in which order to build different features many times may define the success or failure of the enterprise. Some of the potential ways how to improve the efficiency are that (1) the process is explicitly defined; (2) the customer and market intelligence feedback is fed into the process already in the early product development phase besides only knowledge on technical possibilities; and (3) top management participation in the process.

Even though the most efficient way to increase the level of R&D project management and product management is to have experienced people taking care of them, there are other possibilities for improvement. Collecting information of industry best practices and distributing the finding to small companies in Finland can also help them to manage products and R&D better.

7.2.4 Networking

Networking and partnering were considered crucial by our respondents. The availability of technology centers seems helpful in this respect. Partnering in software business is not easy, and issues like software development in company networks, and business and revenue sharing models require further study and development. Especially at difficult economic times small companies have credibility problem and by networking adequate resources can be attained. It is also evident that as a small nation, we must face the fact of our limited human resources. Creating new models for global development operations is of importance in parallel with flexible solutions needed for attracting skilled workforce into our country. Public interventions could be targeted to promote and facilitate international collaboration with key actors relevant for the internationalization of the Finnish software product companies.

7.2.5 International Operations

Many Finnish software product firms reported to be present and have sales on foreign markets. However, only quite a low share of revenue came from abroad on average. Moreover, when looking at the distribution of foreign revenue share, there is an apparent significant gap between initial sales abroad and full internationalization.

Internationalization unlocks high growth potential. Internationalized firms reported much higher revenue and growth expectations compared to their counterparts limited by the by the small domestic market. However, internationalization is also highly risky. Despite of the average profitability of domestic and international firms being similar, there were significant differences in their distributions. While domestic firms reported relatively balanced profitability, internationally operating ones formed two clusters of well profitable ones and ones in losses. Our analyses suggest that early internationalization can be very rewarding in terms of growth, but there is also high risk connected with that.

Generally, firms in Finnish software product industry find their products and services suitable for international markets and foreign markets attractive. The problems, preventing most of them from internationalization are the costs and risks associated with international expansion.

Overall, internationalization resembles a chasm for many of the firms. Crossing it can significantly expand growth potential and also enable access to new resource markets. However, firm can also fall during this crossing into serious financial instability endangering its viability.

The software product business is volume based and international expansion is necessary step for every ambitious and growth oriented firm. Necessity of internationalization accelerated by industry dynamics and saturation of Finnish market, combined with the risk associated with it indicates how crucial this step is for further viability of business. With respect to these, targeted internationalization programs oriented on financial bridging and risk redistribution should be considered.

7.3 Policy Implications

Finally, we have recognized some potential actions and issues that should be addressed to improve the success potential and growth of software product companies.

BUSINESS UNDERSTANDING AND MANAGEMENT SKILLS	
Policy implications	Managerial implications
• Create incentives for and facilitate the participation of experienced entrepreneurs and business executives in new ventures (e.g. mentors and business angels)	• World class benchmarking
• Training and improvement of management skills related to the field (basic, complementary, international sales, internationalizing software MBA)	• Training of managers
• Networking platform (universities, interpersonal, training) to promote learning within the clusters	• Board level networking
• Improved quality of consulting firms: tools and models are needed to support the development of the companies	• Information exchange between companies, sharing of best practices

FINANCING AND OWNERSHIP	
Policy implications	Managerial implications
• Improving the tax and legal environment and other support for private value added investors to stimulate the functioning of the risk capital market	• Improving the capability and willingness to take risk and target growth markets as well as accept external investors to support the growth
• Tax breaks for business angels	• Developing the 'investment readiness' of the companies i.e. making the companies more professional and accessible by external investors
• Removing the barriers for foreign investors to invest in Finnish venture capital funds and ventures	
• Improving the tax and legal environment and other support for private value added investors to stimulate the functioning of the risk capital market	• Improving the capability and willingness to take risk and target growth markets as well as accept external investors to support the growth

PRODUCTIZATON AND PRODUCT MANAGEMENT	
Policy implications	Managerial implications
• Higher innovation expectation	• Improvement of se processes so that with limited funds productization can be made and focusing on essentials
• Value lab: more thorough revision of early stage technology investment ideas	• Segmentation based on product essentials:
• Training of productization: a model that can be applied to different business situations is needed	• Marketing aspect: total offering and delivery concept
• Improved and increased services needed for productization	• Preparation for fast growth: flexibility in operations
• Branding and networking of technology programs internationally & finding "distribution" channels	• Market information: use already in the early phase of product development and venture capital information

NETWORKING	
Policy implications	Managerial implications
• Infrastructure for global networking. Public organizations and technology programs could facilitate the international networking of new ventures with global players in theindustry	• Critical mass and quality by networking
• Management and creation of systems: standards of orchestration	• Focus on globally best partners
• Distributor networking: industry specific network	
• Improvement of university & industry networking: researcher networking to international research community and international companies	

INTERNATIONAL OPERATIONS	
Policy implications	Managerial implications
• Born global support	• Position immediately to global markets and operations requirements
• Need for a practical internationalization model that can be applied to firms in different business situations	• Early stage identification of domestic & international
• Promoting the Finnish software product industry internationally in key markets	• Presence in international markets: being close to customers • Finding right markets for the product & company
• Born global support	• Position immediately to global markets and operations requirements

Three large exporting countries, India, Israel and Ireland are examples of very successful software exporters. One thing all these countries have in common is that there has been a national strategy to promote their software industries generally and software exports in particular. The presence of a national strategy for software exports is therefore recognized as a vital part of software export success (Heeks et al. 2002). All these countries have actively promoted and facilitated the internationalization of software product companies.

The detail of strategies for achieving the visions set varies. Common strategies have been governments acting to stimulate the supply of working and venture capital to software firms. All these three countries have used a raft of tax breaks, marketing subsidies, grants, loans, and a combination of both liberalization and promotional intervention. Also, all three countries have invested in software-related research and development directly via government and indirectly via tax breaks for private sector R&D.

In addition, a comparison to other software exporting countries that have not succeeded that well, to Russia, China and the Philippines revealed that either these countries had no national strategy at all or it had no focus.

Finland is a country of limited resources. Therefore, it would be vital for the industry to create a focused strategy to support activities of software product companies. According to the results of this survey, the focus of government strategy could be towards companies creating highly productized software. There have also been some initiatives towards this kind of approach in order to support the software industry.

Productization, risk capital, and internationalization are three interrelated, critically important issues that should be simultaneously improved to enable growth and creation of wealth and employment. Without sufficient availability of risk capital, it is hard for software product companies to focus on productization if their operations need to be financed by customer projects. Without success in internationalization, which is imperative for growth, wealth creation, and successful exits for investors, private investors will not have incentives to invest risk capital in software companies. Without sufficient level of productization, it is hard to enter and conquer global markets. Because of the Finnish market representing significantly less than 1 % of the world market (IDC 2003b, BSA 2003), any company willing to be a meaningful global player with for example a 10 % market share is by simple arithmetic forced to get more than 90 % of its

revenue from abroad (even if it already had a market share of 100 % in Finland). Courageous internationalization is imperative for tapping the growth and employment potential of the Finnish software product industry. Public and private sector should work hard together with their international counterparts to remove the barriers for internationalization success of the Finnish software product companies.

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APPENDIX I: RESEARCH METHODS

Sampling

Because software product business is not classified as a line of business or industry in Finland, defining the target group was a challenging task. We used following approaches in order to reach the target groups.

We used a commercial company Mailer Oy for selecting appropriate industry codes, which assumedly contained software product companies. We ended up to using Mailer instead of other commercial companies (i.e. Statistics Finland), because Mailer was providing industry codes on five-digit scale instead of normal three scale. The industry codes selected were thoroughly checked out by the experts.

Table. Industry Codes Selected for the Mailing

Industry code	Explanation
642021	Data transferring service companies
642022	Tele communication companies
64203	Software transfer service companies
72100	Computer hardware consulting companies
722001	Computer software companies
722002	Other computer service companies
722003	Computer consulting companies
723001	Computer service centrums
723002	Computer recording companies
724001	Database companies
724003	Network service companies

In earlier surveys (till the year 2001), the target group was defined by a company database gathered by the Centre of Expertise for Software Product Business. However, since it is not known, how well this database represents the Finnish software product business companies in Finland, we opted for another approach. In the year 2001 survey we used Statistics Finland to gather addresses. However, this approach resulted in mailing the questionnaire to some 4452 companies, because Statistics Finland only can offer industry codes on three-digit scale (72200 software developing, manufacturing and consulting).

This year we combined the contact addresses gathered by the Centre of Expertise for Software Product Business with the addresses received from Mailer. We mailed the questionnaire to all companies that were listed under the industry codes presented in Table above. In order to reduce "double-mailings" we checked out the company list and removed such listings, where the same company had two or more addresses. Overall, we mailed the questionnaire to 2028 companies. However, 57 envelopes were returned by the post because of false or changed contact information. Therefore the questionnaire was delivered to a total of 1971 companies.

We included those companies in the target population that had the minimum of 1 % of their total revenue acquired from their own software product business.

Carrying out the Survey

The implementation of this survey can be divided into four phases: planning the survey, gathering the data, analyzing the data and reporting the results.

Planning the Survey

Planning of the survey was done in December 2002-March 2003. The questionnaire used in the survey was designed in February-March 2003. Several software product business specialists were involved in the process of forming the questionnaire. The questionnaire was also tested in March 2003.

Gathering the Data

Gathering of the data was done in March-May 2003. The questionnaire was mailed in March and a follow-up mailing which was carried out in April 2003.

After the second mailing 142 companies had returned the questionnaire. Most of the large enterprises had not answered the survey because of the legislation of public limited companies. In order to gather at least the numerical data the major companies were phoned and/or their annual reports were studied. Information of 25 companies was gathered in other ways, mostly by phone but also using the Internet and companies 'annual reports.

Analyzing the Data

The analysis was done June-August 2003. SPSS (Statistical Package for Social Sciences) 10.x and 11.0x for Windows -software was used in the analysis. We used simple statistics like frequency counts, averages as well as regression and factoring among other statistical analysis tools.

We used correlations to describe linear dependencies of the variables. We used Pearson correlation if variables were measured at least on interval-scale and Spearman correlation if variables or only one of them was measured on ordinal-scale.

Reporting the Results.

The results were reported in July -September 2003.

Questionnaire

The questionnaire sent included a cover letter and a pre-paid return envelope. Each questionnaire also had a unique identification number, making the identification of respondents possible even if the contact information was left blank. In order to improve the response rate we promised to send all the respondents a summary from the results.

The questionnaire (Appendix A) totaled 8 pages, and had three introductory questions and six main sections: 1) the main software product and business related to it, 2) international business, 3) corporate financing and ownership, 4) general company information (revenue, personnel and development of business), 5) corporate strategy, product development and networking and 6) respondent demographics.

The first introductory questions defined company's own software product business, other software product business and other business activities and asked for the percentage of company revenue that originated from these, respectively. Since we sent the questionnaire to a superset of our target population, we included instructions to return the questionnaire even if the company did not have any software product business. Second introductory question asked the year the company had started its own software product business, in case it had. The third introductory question was stated in order to find out whether companies not already in software product business where to enter the business in 2003 or not.

The first part focused on the main software product and the business related to this product. We asked questions related to the number of customers, the degree of customizing, markets and end users, as well as the business models used by the companies.

The international business section asked on the importance and length of international business, as well as the most important export countries. The amount of personnel in foreign countries, internationalization strategies and distribution channels were also covered. We also asked the companies about their intention to growth their business in domestic or international markets.

The ownership and financing section asked on the ownership distribution of the company. In addition, capital loans and liabilities were asked. We also asked the form of external funding acquired and the intention of the company to acquire funding in 2002-2003.

In order to get basic statistics on the companies, we asked for information on revenue as well as profits and product development investments. We also asked about the allocation of personnel and possible challenges in recruiting. In addition, we asked about most and least important areas of development in the business.

In the corporate strategy, R&D and networking section, we asked questions about common strategy, importance of the product business and about the R&D activities. In addition, we asked about the use of knowledge intensive services and about the importance and barriers of the subcontracting in product development and software production.

Finally, we asked for information on the respondent, including position, tenure, and share in the company, as well as contact information.

The questionnaire ended with an open question for questions, improvement proposals and ideas regarding the questionnaire or other issues that the respondent might want to bring up.

We tested the questionnaire with four software product representatives before mailing it. We learned that it took some 30-50 minutes to fill in the questionnaire. We changed the wordings of several questions, as well as shortened the questionnaire based upon the feedback from the testing.

Evaluation of the Results

Reliability of the Study

The reliability of the construct was measured with the Cronbach alpha coefficients, and the values were in every section of the questionnaire general close to 0.700, which is normally considered as a good level for the reliability. Because of the relatively large amount of companies, it is quite hard to verify the answers companies have given. Often companies want to give more positive views of their situation than the actual condition is. Also, companies often tend to have very optimistic views on future that may not always be quite realistic. To assist in the interpretation of the data, we have presented the data and findings to industry experts in order to understand the phenomena better and validate the conclusions. These experts are consultants and analysts that study the sector.

Validity of the Study

Validity relates to how well questions asked measure the actual phenomenon –not something else. Questions that were not understood homogenously in the testing phase of the questionnaire were changed or removed. Even so, there were some questions in the final questionnaire that did not exactly measure the desired topic and therefore the answers from these questions were not used in the analysis. Also, we obtained secondary assessments of knowledge intensity from industry experts in order to reduce the chance of a systematic error. Overall, we believe that the validity of the study is relatively good. However, it seems that in the survey we did not reach very well companies of very small size for

some reason. This can bias the results, since if those companies not able to grow their business have not responded the survey, the results may seen too optimistic in general.

Response Rate

Overall, 261 companies participated in the survey. The overall response rate is 13.2 %. According to professional estimates, there were about 1000 Finnish software product companies at the end of 2002.

Thus, we approximately reached 17 % of the whole industry (166 software product companies). However, the sample is not a direct cut from the whole industry: the amount of large companies is oversized because of more accurate searching of the large companies. In addition, we did not reach the smallest companies as well as expected. There was a dramatic drop in the response rate as in the 2002 survey we reached approximately 25 % of the target population (228 responses).

Methodological Discussion

We ran into several methodological problems in the study, starting by the definition of the target population and sampling. Defining the target population is involved since it is hard to precisely draw a border between software product and software project business, although it is easy to describe archetypes of both. We relied on a fairly fuzzy definition of software product business, and the respondents' subjective estimates of whether they were in the software product business or not (or even in some cases whether they were about to enter the software product business within the near future). This has obvious weaknesses due to the fact that different respondents interpret the definition in different ways. Some companies, e.g. so called tailors identified themselves as a software product company, their answers in the survey indicated, that they necessarily did not have a software product yet.

A second problem is related to sampling. Since software product business is not classified as an industry of its own, it is hard to reach the companies that form the base population. We relied on sending the questionnaire to those superset of the companies under several industry classification codes, which were most likely to include majority of the intended population – because of financial restrictions, it was not possible to aim for 100 % coverage. In estimating the number of companies in the industry, we relied on the opinions of industry experts, the reliability of which is unknown.

According to the industry experts, there were 1000 software product companies in Finland at the end of 2002. Of these, we reached 166, or about 17 %, which can be considered fair. We therefore think that the results fairly well describe the whole population. The final sample contained an overrepresentation of large, well-known companies, which were contacted by phone to increase the number of respondents. We corrected for this overrepresentation when extrapolating. It is worth mentioning that largest 31 companies that we identified with industry experts counted for over 80 % of the total industry's exports and for over 57 % of the total sales.

The questionnaire contained a total of 8 pages, which is quite much, and may have decreased the response rate. We received several complaints from the respondents that the questionnaire was too long. Especially the ownership and financing part received the most criticism mainly because company's balance sheet was asked on a detailed level.

Suggestions for Future Research

The findings and limitations of this research suggest several areas where further research would be interesting and beneficial. First, this study is based on quantitative survey, where a typical respondent is at high executive position. This naturally narrows the areas covered in the survey, e.g. software

engineering and product development processes were hardly covered in this study. Also, the method of using quantitative survey does not enable to gain deeper understanding of actual processes and drivers in the companies, with case studies this knowledge could be dramatically improved.

This kind of data could be compared to other software product industry surveys conducted abroad, where further conclusions of the current state of the Finnish industry could be formed.

The original idea for the need of the software product industry research came in the mid- 1990s and one main reason behind this reasoning was to prove, that the software product industry is an industry with national significance or at least has the potential to become one. A question could be stated, whether the goals of this kind of survey should be refocused in the near future. The current "heavy" questionnaire is quite demanding for the busy CEOs and response rates have been dropping. By gathering the basic statistical information such as revenue and personnel amount from other resources (this would basically require an industry code of its own), this survey could focus more on a few chosen topics and hopefully gather deeper knowledge of these areas.

APPENDIX II: ONGOING RESEARCH PROJECTS RELATED TO THE FINNISH SOFTWARE PRODUCT INDUSTRY AND OTHER INTERNET LINKS

Research projects

- Internationalization capabilities, processes, and support mechanisms for creating successful global new ventures
  http://www.tuta.hut.fi/units/Isib/research/cgs/cgs.php
- Knowledge Intensive Business Services in software business
  http://www.soberit.hut.fi/kisa/
- Software engineering management system for small and medium-sized enterprises
  http://www.soberit.hut.fi/sems/
- Software subcontracting and distributed software development
  http://www.soberit.hut.fi/veto/

Other Internet links

- National Technology Agency (Tekes)
  http://www.tekes.fi/
- Finnish Software Business Cluster
  http://www.swbusiness.fi/