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Foreword

The economy is undergoing a new phase of globalization. The features of the current phase include increasing globalization of knowledge-intensive activities like R&D and headquarters. Knowledge-intensive activities are assumed to have significant positive spillovers to the rest of the economy, which explains the growing interest of policy-makers.

Compared to most other small economies, the internationalization of Finnish companies started relatively late. As late as the 1970s, Finnish companies' international activities consisted mainly of exports. Only a few companies had sales offices abroad, and even fewer production units. During the past two decades, the situation has, however, changed dramatically. Today, the large Finnish corporations are among the most internationalized in the world.

The 1990s saw a surge of foreign direct investment (FDI) in Finland. The value of outward and inward FDI increased significantly faster than foreign trade. R&D also started to become global. During the first decade of the 21st century Asian countries, India and China in particular, have become important target countries of FDI, including R&D investment.

All studies reported in this volume have been carried out as part of the MEFIS (Multinational Enterprises in Finnish Innovation System) program. MEFIS was a joint research project of ETLA, VTT – Technical Research Centre of Finland, Helsinki School of Economics (Department of Organization and Management), and Finpro in 2001 – 2003. During the MEFIS project nearly 20 research reports and discussion papers were published. MEFIS, in turn, is part of The Research Programme for Advanced Technology Policy (ProACT) initiated and funded in collaboration with the Ministry of Trade and Industry and the National Technology Agency, Tekes. We would like to thank the Ministry of Trade and Industry for their financial support. It has been a great pleasure to discuss the research findings in numerous workshops organized by ProACT.

Our sincere thanks go Tuula Ratapalo who put all the manuscripts into book form. We are also thankful to Anthony de Carvalho and Roderick Dixon for checking the language.

Helsinki, August 2004

Jyrki Ali-Yrkkö Raimo Lovio Pekka Ylä-Anttila

Table of contents

CHAPTER I

Introduction

Jyrki Ali-Yrkkö
&
Raimo Lovio
&
Pekka Ylä-Anttila

1 Introduction

Multinational enterprises in knowledge creation and diffusion

Multinational companies are important actors in the Finnish innovation system. The mere fact that the ten largest – all highly internationalized - corporations account for about half of all national research and development expenditure, gives an idea of their significance. Furthermore, the share of the top ten companies has been steadily increasing over the past couple of years.[1]

By far the biggest player is Nokia. The company's R&D expenditure in Finland in 2003 exceeded 1.5 bill. Euro, that is, about one third of the total domestic R&D spending and almost 50 per cent of the business sector R&D. Nokia's R&D staff world-wide is about 20 000, higher than the number of researchers in the whole Finnish university sector. In general, industrial R&D is heavily concentrated in large corporations.

Table 1.1 Companies with the largest R&D budgets

Company	R&D expenditure, mill. Eur	R&D of Net sales, %
Nokia	3290	11.2%
Metso	129	3%
ABB-yhtiöt	90	7%
Stora-Enso	89	0.7%
Kone	88	1.7%
Instrumentarium	86	8.3%
Orion	86	3.8%
L. M. Ericsson	83	56%
Wärtsilä	70	3.2%
Kemira	48	1.8%

Source: *Tekniikka & talous* 10.6.2004.

[1] See Hyytinen *et al.* (2003).

Obviously, large corporations constitute a very significant part of the Finnish national innovation system (NIS). They are important producers of new knowledge, and, on the other hand, heavy users of knowledge produced in other parts of the NIS. Most of the Finnish multinationals' R&D is still located in Finland, while their production is highly internationalized. Although foreign located R&D has been increasing, Finland is, at least for the moment, a relatively competitive location for industrial R&D. Finnish research and education system obviously offer some advantages over alternative locations.

Science-industry linkages and collaboration between business firms and research community has often been regarded as a stronghold of the Finnish innovation system.[2] Nokia alone has research contracts with more than hundred universities all over the world, including the most important Finnish universities and research institutions.[3] The interviews carried out for the studies reported in this volume show that the importance of industry-science linkages for larger Finnish firms has been on the increase throughout the last decade.

Research collaboration between business enterprises and universities does not mean a one-way knowledge flow from universities to firms. As reported by several recent studies, collaboration may benefit university research in many different ways, ranging from increased funding and scale effects to accession to new ideas and most recent data and tacit knowledge on factors affecting future developments of key technologies.[4]

Corporate R&D is internationalizing rapidly

A growing share of corporate R&D is carried out in foreign subsidiaries. Companies tap increasingly into the knowledge bases and innovation systems of other countries. There is, however, still a lack of accurate, up-to-date information on the extent and nature of companies' foreign R&D. The data gathered in the context of studies reported in this volume show that as much as over 40 per cent of all industrial R&D of the Finnish corporations is done abroad. The share is, however, clearly smaller than the share of foreign based production or marketing.

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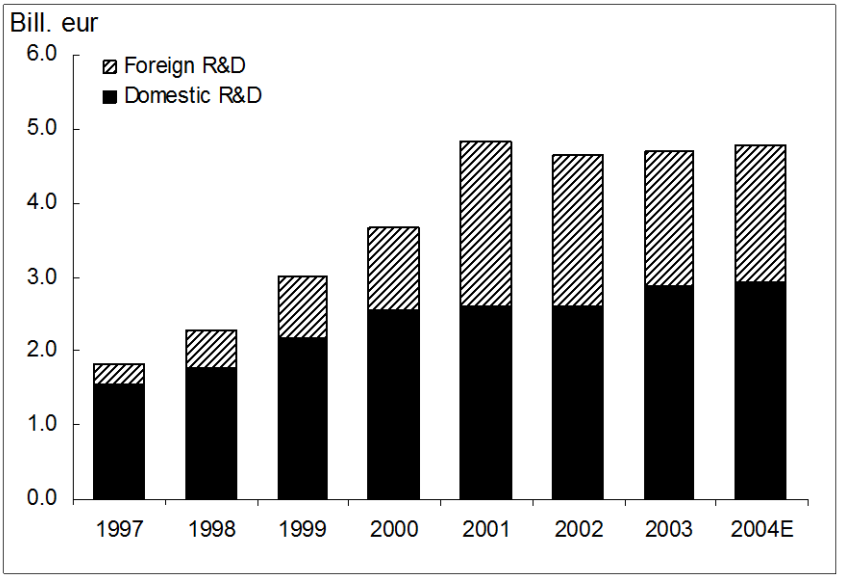
2 See Georghiou *et al.* (2003).
3 See Ali-Yrkkö and Hermans (2004), and Häikiö (2001).
4 See Nieminen and Kaukonen (2004).

Figure 1.1 **Industrial R&D expenditure by Finnish corporations, 1997 – 2003, Bill. Euro**



Source of statistics: The Confederation of Finnish Industry and Employers.

Increasing foreign R&D does not, however, imply the active relocation of R&D units. Rather, it is an outcome of mergers and acquisitions and reflects a need to have a certain amount of R&D resources close to production and markets.

Internationalization of business is a two-way street. At the same time as Finnish multinational – and in most cases technology-intensive – companies are expanding their production and R&D abroad, inward FDI is also increasing. A substantial part of the foreign investments are partly motivated by technological factors: Foreign firms are seeking assets that complement their knowledge base and strengthen their global competitiveness.[5] Previous research has shown that inward FDI has mainly benefited the economy as a whole. Increased foreign ownership has boosted productivity and intensified competition in the home market, and opened new market channels in exports. An in-depth case study at the local level – in the industrial town of Varkaus – reported in this volume, seems to confirm findings from earlier studies.

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[5] See Pajarinen and Ylä-Anttila (1999), and Ali-Yrkkö and Pajarinen (2004) Chapter IX in this volume.

During the past few years, the number of cross-border deals with Finnish high-tech SMEs as targets has increased substantially. Majority of these investments have been made in order to acquire advanced technologies or to benefit from local technology spillovers. The more patents an SME has, the more likely it is acquired by a foreign firm (Ali-Yrkkö, Hyytinen and Pajarinen 2004). What kind of challenges this poses for innovation policies is among the questions addressed in this book.

Internationalization of Finnish firms is likely to continue and even accelerate during the next couple of years. Small and medium size supplier companies are following in the footsteps of the larger ones. On the other hand, in some industries, for example, in biotechnology and IT, there are firms that start becoming international in the early stage of their development, that is, they are born global. Inflows of capital are likely to increase too. Competition among countries and regions for new high-tech companies – and increasingly for corporate headquarters and R&D units – is intensifying.[6] Hence, trends in the internationalization of business inevitably affect corporate R&D and innovation – and vice versa. New regions are entering the global R&D arena. In the forefront of this phenomenon are India and China who are actively attracting Western companies' research and development, and also Finnish companies' R&D investment is increasing in Asia more rapidly than investment in production. The key issues for the future are: Where will innovation locate, how the division of labor in R&D is changing between developed and developing countries?

Phases of internationalization – What's next?

Compared to most other small economies the internationalization of Finnish companies started relatively late[7]. As late as in the 1970s, Finnish companies' international activities consisted mainly of exporting from Finland. Only a few companies had sales offices abroad, and even fewer production units. During the past two decades the situation has, however, changed dramatically. Today, the large Finnish corporations are among the most internationalized in the world.

The 1990s saw a surge of foreign direct investment in Finland. The value of outward and inward FDI increased significantly faster than foreign trade. Outward FDI flows in relation to GDP rose on average to

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6 See Braunerhjelm (2004).

7 See, e.g., Braunerhjelm – Heum – Ylä-Anttila (1998).

around 10% in 1996 – 2003, while the corresponding figure in the 1980s was only slightly above 1 per cent.

One can distinguish three different stages of internationalization in Finland during the post war period: the export-led growth of the economy and the leading companies from the late 1940s to mid-1970s, internationalization of the economy and transformation of companies through foreign direct investment from the late 1970s/early 1980s, and finally internationalization of ownership as part of the global integration of markets for capital, goods, and technology. In the beginning of the 21st century the economy is entering a new era of globalization. Essential parts of this include an accelerated division of labor among different regions in the world economy, and offshoring services and software, as well as standard technological development.

Overview of the book

The book includes reports of eight studies, each addressing the role of multinational companies in the innovation system from different perspectives.[8] The first two articles by *Raimo Lovio* give a picture of the extent to which Finnish corporations have internationalized their production, R&D, and other activities. It turns out that while production and also R&D are highly internationalized, corporate management and governance are still to a large extent Finnish. While 80 – 90 per cent of the largest corporations' sales come from foreign markets, and two thirds of their personnel is outside Finnish borders, only some 20 per cent of management and governance is in foreign hands.

The article by *Jarmo Karesto* and *Katriina Knuuti*, and that by *Michael Lovejoy* deal with globalization of SMEs in high-tech industries. The former is about the biotechnology and the ICT, and the latter focuses on the ICT sector. The basic message is the industries are very different, and hence, their patterns of internationalization. Internationalization of Finnish SMEs in ICT is very much a story of going abroad in Nokia's footsteps and joining a global production network. In the biotech industry, the process of internationalization is just at the beginning and relates mostly to international R&D collaboration.

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8 All studies have been carried out as part of the MEFIS (Multinational Enterprises in Finnish Innovation System) program. MEFIS was a joint research program of ETLA, VTT – Technical Research Centre of Finland, and Helsinki School of Economics (Department of Organization and Management) in 2001 – 2003. During the MEFIS project, nearly 20 research reports and discussion papers were published.

The case study by *Jääskeläinen* and *Lovio* of foreign acquisitions at the local level – in the town of Varkaus – reveals that foreign ownership has primarily had a positive impact on the development of the business units acquired. This applies to employment and technological development. The study argues that multinational companies may lose a significant amount of knowledge and innovation potential if they fail to use the knowledge base of their local units.

The study of *Kivisaari* and *Lovio* also looks at the impacts of foreign acquisitions. Their focus is on medical technology companies of which a relatively large share has been acquired by foreign multinationals. The study illuminates the difficulties that especially the small and medium sized companies have in entering the global market in an industry that is dominated by large multinational corporations and where capital requirements are huge. Many of the acquired firms are former subsidiaries or production units of Finnish corporations who diversified into new high-tech industries and later sold these units. The study concludes that foreign acquisitions are a natural development in the companies' life cycle and in many cases the only alternative.

Ali-Yrkkö and *Ylä-Anttila* take a look at the location of headquarters in Finland. The potential relocation of headquarters has recently raised a debate in many smaller European countries, including Finland and Sweden. Both of these economies have fairly large multinational companies with a high foreign ownership share and multitude of overseas activities. These MNCs are the most probable candidates to relocate their headquarters (HQs). Like other knowledge-intensive activities, HQs are assumed to have significant positive spillovers to the rest of the economy through interaction with other advanced sectors and activities, which explains the interest of policy-makers. The data gathered for the study shows that only very few HQs are relocated independently of a merger or an acquisition (M&A). It looks like when a Finnish firm is merging with a foreign one the HQ is only in rare cases located in Finland. Taxation affects the location when two equals merge, but as such the level of taxation does not seem to have a major effect on FDI flows.

FDI always includes a major flow of knowledge. *Ali-Yrkkö* and *Pajarinen* provide an overview of the relationship between cross-border M&As and knowledge transfers, and make an empirical investigation with Finnish data. The results show that the number of cross-border deals with a Finnish SME as a target has increased substantially over the past few years. Due to acquisitions, some 1,500 patents were acquired in 1989-2001 by foreign companies. The authors raise the question of what kind of policy conclusions one should draw from this.

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CHAPTER II

The Globalization of Finnish Corporations – Similarities and Differences in Their Current Profiles

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ABSTRACT: *Traditionally, companies' internationalization profiles have only been classified according to the level of internationalization in terms of turnover and personnel. The present article aims to introduce more dimensions into the definition of the globalization profile of a company. The level and profile of globalization in Finnish companies is investigated using a new, experimental globalization index. The index consists of indicators for globalization in terms of ownership, management and governance, personnel, markets, and R&D activities. The article considers the level and profile of globalization in large Finnish corporations on the basis of data pertaining to 2002. In the sample there are 13 corporations that score above half of the maximum value on the globalization index. These companies exhibit the following characteristics: The most internationalized dimensions are the markets (in all, the foreign share is 93%), then the personnel (73%), and then the R&D activities (47%). The least internationalized dimensions are ownership (43%) and corporate management and governance (23%). The differences between the companies are smallest in the share of foreign markets, but all other aspects exhibit significant variations. Not a single company scores above average on all the criteria, and only one company below average on all criteria. The dimensions are thus, at least partly, independent of one another. Explaining diverse globalization profiles is the research challenge, which may later on lead to the development of improved globalization typologies.*

Keywords: *globalization, typologies and profiles of multinational companies*

TIIVISTELMÄ: *Perinteisesti yritysten kansainvälistymisen astetta on mitattu liikevaihdon ja henkilöstön kansainvälistymisellä. Tämä artikkeli tuo lisää dimensioita yrityksen globalisaatioprofiilin määrittämiseen. Artikkelissa käytetty kokeiluluonteinen indeksi koostuu indikaattoreista, jotka mittaavat yrityksen kansainvälisyyttä omistuksen, johdon, henkilöstön, markkinoiden ja T&K-toiminnan näkökulmista. Indeksillä on mitattu suurten suomalaisten yritysten globalisoitumista vuonna 2002. Tutkituista yrityksistä 13 yritystä saa yli puolet indeksin maksimiarvosta. Näiden yritysten osalta keskimäärin kansainvälistynein dimensio on markkinat (ulkomainen osuus 93%), sitten tulevat henkilöstö (73%) ja T&K-toiminta (47%). Vähiten kansainvälistyneitä dimensioita ovat omistus (43%) ja johtaminen (23%). Yritysten väliset erot ovat pienimmät markkinoiden kansainvälisyydessä, mutta kaikilla muilla dimensioilla erot ovat huomattavat. Yksikään yrityksistä ei saa kaikilla dimensioilla keskiarvoa ylittävää arvoa, ja vain yksi yritys saa kaikilla dimensioilla keskiarvon alittavan arvon. Indeksin dimensiot ovat näin ainakin osin riippumattomat. Haasteena on tutkia yritysten erilaisten profiilien taustalla olevia tekijöitä, koska tämä voi johtaa uusien hyödyllisten globalisaatiotypologioiden löytymiseen.*

Avainsanat: *globalisaatio, monikansallisten yritysten typologiat ja profiilit*

1 Introduction

Cross-national comparative research has revealed that multinational corporations originating in different countries are quite different in the way they operate (e.g., Harzing & Sorge 2003; Whitley 2001). In addition to national differences, there are also differences between multinational companies with the same country of origin. This can be seen, for example, in the recent volume *Our Path Abroad* (Mannio, Vaara & Ylä-Anttila 2003), which describes the internationalization process of 27 Finnish companies from the 1970s to the present day. The research presented in the book shows that there are many similarities in the internationalization patterns of Finnish companies in terms of timing, actions taken, and even problems. Yet there are also significant differences in the strategy, level, versatility, and successfulness of the internationalization of different companies. The book identifies four different – at least partly mutually exclusive – paths that companies may take to become international. These include (1) capitalization on domestically developed competencies on an international scale (e.g., Fiskars); (2) growth to an international scale by focused acquisitions (e.g., Kone); (3) internationalization linked with a refocusing of core business through acquisitions and divestments (e.g., Ahlstrom), and (4) organic growth as part of the rapid international growth of the industry (e.g., Nokia). The fact that the empirical evidence points to such different paths that companies may take to become international implies that at any given time, even within a single country, we can find companies with very different globalization profiles.

Traditionally, companies' internationalization profiles have only been classified according to the level of internationalization. For example, Luostarinen and Gabrielsson (2002) have divided the globalization of a company into four stages: internationalizing (up to 50% of turnover comes from abroad), internationalized (50% or more of turnover comes from abroad), globalizing (up to 50% of turnover comes from outside the home continent), and global companies (50% or over of turnover comes from outside the home continent). In addition to the distribution of turnover by source country, other commonly used indicators of internationalization include the distribution of production by country and the distribution of personnel by country.

The present article aims to introduce more dimensions into the definition of the globalization profile of a company. The level and profile of globalization in Finnish companies is investigated using a new, experimental globalization index. The index consists of indicators for globalization in terms of ownership, management and governance, personnel, markets, and R&D activities.

The article considers the level and profile of globalization in Finnish corporations on the basis of data pertaining to 2002. The corporations included in the study consist of the largest Finnish-owned companies in terms of foreign turnover, taking into account both exports from Finland and the sales of foreign subsidiaries. Companies with a foreign turnover of over 500 million euros were included in the sample. Finnish-owned corporations were defined as ones in which the ownership of foreign companies did not exceed 50% of the company stock in November 2003. Using these criteria, 23 companies were included in the study. Basic information on these companies is given in Table 1.1.

Table 1.1 Largest Finnish-owned corporations in terms of foreign sales in 2002 (sales, million euros; personnel at the end of the year)

Company	Industry/main product group	Foreign sales and its share of total sales	Total sales	Ranking[1]	Foreign personnel and its share of total personnel	Total personnel
1. Nokia	Telecommunications, mobile phones	29,663 (99%)	30,016	1	29,213 (56 %)	51,748
2. Stora Enso	Forest industry, pulp and paper	12,002 (94%)	12,783	2	29,177 (67%)	43,853
3. UPM	Forest industry, pulp paper	9,487 (91%)	10,475	5	15,706 (44%)	35,579
4. Metsäliitto	Forest industry, pulp and paper	7,864 (89%)	8,868	6	20,385 (67%)	30,247
5. Fortum	Energy production, electricity	7,113 (64%)	11,148	4	5,680 (43%)	13,118
6. Outokumpu	Metal, stainless steel	5,135 (92%)	5,558	9	14,637 (69%)	21,130
7. Metso	Engineering, paper machines	4,316 (92%)	4,691	10	17,923 (63%)	28,489
8. Kone	Engineering, elevators	3,959 (91%)	4,342	16	29,590 (83%)?	35,864
9. Wärtsilä	Engineering, diesel motors	2,434 (97%)	2,519	20	8,884 (71%)	12,459
10. Kemira	Chemicals	2,155 (83%)	2,612	18	5,696 (55%)	10,377
11. Huhtamäki	Packaging	2,134 (95%)	2,239	19	15,174 (95%)	15,909
12. Rautaruukki	Metal, steel	2,100 (73%)	2,884	15	5,371 (42%)	12,804
13. Ahlstrom	Fiber-based materials	1,718 (97%)	1,778	22	5,466 (83%)	6,585
14. Myllykoski	Pulp and	1,429	1,458	29	2,800	3,900

	paper	(98%)			(72%)	
15. Elcoteq Network	Electronics manufacturing services	1,427 (78%)	1,840	23	9,155 (90%)	10,176
16. Uponor	Housing and environmental technology	1,035 (91%)	1,137	36	4,801 (91%)	5,302
17. Amer	Sporting good equipment	992 (90%)	1,102	43	3,253 (83%)	3,939
18. Sanoma WSOY	Publishing	992 (42%)	2,358	25	5,889 (33%)	17,884
19. Orion	Pharmaceuticals	864 (53%)	1,629	54	1,322 (23%)	5,826
20. Fiskars	Engineering, office, garden and leisure equipment	688 (95%)	725	61	3,298 (78%)	4,206
21. KCI Konecranes	Engineering, cranes	634 (89%)	714	62	2,835 (64%)	4,441
22. TietoEnator	IT services	543 (43%)	1,271	40	4,868 (42%)	11,591
23. Valio	Food industry, dairy products	530 (33%)	1,600	30	488 (12%)	4,211
TOTAL		99,214 (87%)	113,747		241,611 (62%)	389,638

[1] Ranking among the 100 largest companies in Finland (*Talouselämä* 20/2003).

All the corporations included in the study were among the 65 largest companies operating in Finland, as measured by total turnover. In addition to the companies studied here, the 65 largest companies include 14 foreign-owned companies and 25 Finnish-owned companies with a foreign turnover of less than 500 million euros (mainly banking, insurance, and trading companies).

The article is organized as follows. The following section first explains and presents the globalization index used, and the overall scores that different companies get on this index. Then, the different factors making up the index are considered in more detail. Toward the end of the article, the differences in the globalization levels and profiles of Finnish companies are considered, and the potential reasons for these differences are discussed.

2 The globalization index

There are many potential ways to measure a company's level of globalization. In Finland, it has been customary to use the shares of foreign

turnover and foreign personnel as measurements. This is because these are figures routinely reported in companies' annual reports, even though there are considerable differences and omissions in the way this information is presented. For example, only some of the 23 companies studied provided detailed information on the distribution of their personnel by country. Most companies do not report on the number of personnel in counties in which they have few employees, or provide the information using a very rough classification (e.g., Europe, the US, and the rest of the world). The information provided in annual reports is unfortunately not detailed enough to accurately describe the geographical distribution of the companies' activities, which would be desirable from the perspective of the current debate on globalization. From the perspective of the globalization index, however, the information in most companies' annual reports is sufficient for gaining an overview of how far around the globe the Finnish companies' operations reach.

The statistics on multinational corporations by UN organizations use a third criterion (alongside foreign turnover and personnel) to measure globalization: the share of foreign invested assets. For example, the UNCTAD World Investment Report calculates a "transnationality index" for companies, which is the average of the shares of foreign turnover, foreign personnel, and foreign invested assets (UNCTAD 2001, 93). At present, very few Finnish companies publish information on the geographical distribution of their foreign invested assets, so this measure was not included in the globalization index used in the present study.

The foreign ownership of Finnish corporations grew very rapidly in the end of the 1990s. According to the existing studies, this rapid increase in foreign ownership has had significant impacts on Finnish companies' strategies, corporate governance systems, and the diversity of business areas (e.g., Tainio *et al.* 2001). In addition, the growth of foreign ownership forces companies to pay more attention to the management of their investor relations in central stock exchange centers such as New York and London. This, in turn, may influence the related decision concerning where to locate their corporate headquarters. These considerations provided the rationale for including the share of foreign ownership and presence in foreign stock exchanges as one dimension of the globalization index. This information is also readily available, as the foreign ownership of stock-listed companies can easily be monitored using companies' annual reports and the monthly reports of the Helsinki Stock Exchange.

The growth in foreign ownership and foreign acquisitions by Finnish companies has also impacted on the compositions of boards of directors and the executive boards of Finnish corporations. The number of foreign

nationals on these boards has increased considerably. Furthermore, there is a lively debate on the extent to which Finnish companies are moving their head office operations abroad. Some corporations have even considered moving their registered offices abroad. Thus, it seemed justified to include indicators on board composition and head office operations, insofar as they can be deduced from annual reports, in the globalization index.

R&D and other information-intensive operations are today increasingly central business functions. This makes it important to also investigate the internationalization of R&D activities. Unfortunately, companies do not currently publish information on the geographical distribution of their R&D activities in their annual reports. The relevant information has, however, been collected in the Mefis project (see Lovio 2002 and Chapter III in this volume), so these data were available for use in the globalization index.

In addition, it seemed interesting to include in the globalization index some indicators pertaining to the internationalization of corporate management practices. For example, whether the company uniformly uses a single operating model and a single product brand, or whether it is more of an owner of independently led subsidiaries. Including such factors in a quantitative globalization index is difficult, however. The information available from companies is too scarce and qualitative in nature. These issues are, however, taken up at the end of this article in connection with the discussion on the observed differences in the profiles of Finnish companies.

On the basis of the considerations presented above, an experimental globalization index was constructed. It measures the internationalization of a company's ownership (weight 18%), management and governance (18%), personnel (27%), sales (27%), and R&D operations (9%). The internationalization of ownership and management and governance are both measured using two indicators, the internationalization of company personnel is based on three indicators, sales are measured using six indicators, and there is one indicator for R&D operations (see Table 2.1). The boundary values of the different indicators have been selected so that they divide the sample of companies in a reasonable way. For another sample of companies, one might use different boundary values.

The globalization index is used in the present article mainly for the purpose of adding subtlety to the existing view on the internationalization of Finnish companies. Using the different factors in the index, we can study differences in the companies' pace of globalization on the different dimensions: which factors are globalized more rapidly, which in turn more slowly?

We can also study how different the globalization profiles of different companies are, and investigate the factors underlying these differences.

Table 2.1 The indicators and boundary values of the globalization index

Factor measured	Indicator	Boundary values
Ownership	Company shares quoted on foreign stock exchanges	0 = only in Helsinki or not at all 1 = also elsewhere in Europe 2 = also in New York
	Share of foreign ownership of company shares	0 = less than 25%, 1 = 25 - 50 %, 2 = more than 50%
Management and governance	Nationality of CEO and location of corporate headquarters	0 = Finnish and in Finland 1 = one or the other not Finnish/in Finland 2 = neither Finnish/in Finland
	Foreign membership on board of directors and executive board	0 = neither 1 = one or the other 2 = both
Personnel	Share of foreign personnel	0 = less than 33%, 1 = 33 - 66 %, 2 = more than 66%
	Number of countries in which more than 100 employees	0 = less than 5, 1 = 5 - 9, 2 = 10 or more
	Number of continents in which more than 1000 employees	0 = 1, 1 = 2, 2 = 3 or more
Turnover	Share generated in Finland	0 = more than 33%, 0,5 = 10 - 33 %, 1 = less than 10%
	Share generated in Scandinavia	0 = more than 50%, 0,5 = 33 - 50 %, 1 = less than 33%
	Share generated in the EU[1]	0 = more than 66%, 0,5 = 50 - 66 %, 1 = less than 50%
	Share generated in Europe	0 = more than 75%, 0,5 = 66 - 75 %, 1 = less than 66%
	Share generated in North America[2]	0 =less than 5%, 0,5 = 5 - 15 %, 1 = more than 15%
	Share generated in Asia or the rest of the world	0 = less than 5%, 0.5 = 5 - 15 %, 1 = more than 15%
R&D operations	Share located abroad	0 = less than 25%, 1 = 25 - 50 %, 2 = more than 50%

[1] The EU includes in this chapter the 15 member states in 2002 and 2003.

[2] North America includes in this chapter the US and Canada only. Mexico is not included.

3 The index values of the companies investigated in 2002

The maximum value of the index is 22 points (see Table 3.1). The highest points in the sample were given to Nokia and Stora Enso (18 points), Huhtamäki (17), and Kone (16,5), while the average score was 12 points. The highest-scoring companies were in the forest industry (Stora Enso, Huhtamäki, UPM, and Ahlstrom), in telecommunications (Nokia), or in the engineering industry (Kone, Metso, Wärtsilä, Fiskars, KCI Konecranes). Alongside these strong Finnish industries, high scores were also gained by Amer, Outokumpu, and Uponor.

Table 3.1 Values on the globalization index for corporations in the sample in 2002 (shading indicates scores above half of the maximum value)

Company	Total index score	Owner-ship	Management and governance	Personnel	Turn over	R&D
Maximum value	**22**	**4**	**4**	**6**	**6**	**2**
Nokia	18	4	2	5	6	1
Stora Enso	18	4	2.5	5	4.5	2
Huhtamäki	17	2	2	6	6	2
Kone	16.5	1	3	6	5.5	1
Amer	16	3.5	1	4	5.5	2
UPM	16	4	2	5	4	1
Metso	15	3	0	5	6	1
Wärtsilä	15	1	0	6	6	2
Ahlstrom	13.5	0	2	5	4.5	2
KCI Konecranes	13	2	2	3	5	1
Outokumpu	13	0	0	6	6	1
Fiskars	11.5	0	1.5	4	5	1
Uponor	11.5	1	2	4	4	0.5
Elcoteq	10	0	1	4	4.5	0.5
Metsäliitto	9	2	0.5	3	2.5	1
Kemira	9	1.5	0.5	4	2	1
TietoEnator	8	3	2	2	0	1
Myllykoski	7.5	0	1	2	3.5	1
Fortum	4.5	0	0	3	1	0.5
Rautaruukki	4	0	0	3	0.5	0.5
Orion	3	0	1	1	0	1
SanomaWSOY	1.5	0	0	1	0	0.5
Valio	0.5	0	0	0	0.5	0
Number of companies scoring above half of the maximum value	13	5	2	14	15	5

The total score of almost half of the studied 23 corporations (i.e., 10 companies) was below half of the maximum value on the index. Thus these companies cannot at present be considered multinational companies. Many of the corporations at the low end of the index are actually still almost domestic companies, which have expanded into neighboring countries, but not really beyond Europe.

The corporations' level of globalization on the different dimensions of the index varies in a manner that is intuitively easy to understand in a Finnish context: the markets are the most internationalized dimension (15 companies score above half of the maximum value). This is closely followed by the level of internationalization of production, which is measured by the number of foreign personnel (14 companies above half of the maximum value). Clearly less internationalization has occurred in ownership and R&D activities (5 companies above half of the maximum value). The least internationalized area is management and governance (2 companies above half of the maximum value).

On the different dimensions, scores that are above half of the maximum value are shaded in gray. The pattern of the shading indicates that there are at least some differences among the companies in terms of the different dimensions of globalization. This implies that there are qualitative differences in their globalization profiles.

In the following, each factor in the globalization index is reviewed in more detail, and background information is presented on the level of globalization of the companies on the different dimensions. This allows us to pinpoint some differences among the companies.

4 Internationalization of ownership

The foreign ownership of Finnish corporations grew rapidly during the 1990s. In 1990, less than 10% of the shares of Finnish companies listed on the Helsinki Stock Exchange were owned by foreigners; today, the share of foreign ownership is 60%. The growth in foreign ownership has been a result of the liberalization of foreign ownership in Finland in the mid-1990s, the increased listing of Finnish companies on foreign stock exchanges, the increased interest of foreign portfolio investors in successful companies all over the world, and the aim of the Finnish state to decrease its ownership in stock-listed companies (for more details, see Ali-Yrkkö & Ylä-Anttila 2001, Tainio *et al.* 2001, Mannio *et al.* 2003). After the stock market bubble burst in 2000, the share of foreign ownership stopped

growing in Finnish companies. From the current high level, the share of foreign ownership has only continued to grow in very successful companies.

Table 4.1 presents an overview of the internationalization of the ownership of the corporations included in the present study. In addition to the ownership index score, the table presents the share of foreign ownership in 2002, the exchanges on which the company is listed, and the largest owners. The table indicates that Nokia, UPM, Tietoenator, and Amer are the most clear-cut foreign-owned companies. In these companies, foreign ownership is 50%, the shares are traded in foreign exchanges in addition to Helsinki, and the shareholders do not include a single, visible large owner. The ownership of Stora Enso and KCI Konecranes is also very international. Their owners, however, include a few significant individual owners; in this respect, they depart from the typical Anglo-American ownership structure. Foreign ownership appears to be connected to a large size of foreign turnover (Nokia, Stora Enso, UPM, Metso) and mergers and acquisitions (Tietoenator and Amer).

Table 4.1 also indicates that despite the significant internationalization of the ownership of Finnish corporations, Finnish owners (the state, institutions, individuals, companies) still hold a strong position among the owners of many companies. The Finnish state is still an important owner (with a share of more than 5%) in six of the companies. Other institutional owners (foundations, insurance companies, co-operatives, and other companies) are important owners in 10 companies. Furthermore, private individuals own a significant share in six companies. Three of the companies are not publicly listed companies.

Furthermore, it is worth noting that the largest owners listed in the table do not include a single foreign investment fund. The ownership of foreign investment funds rarely exceeds the 5% limit in Finnish corporations. This has only occurred in a few cases for a limited period of time: for example, American investment funds have been large owners of Nokia and UPM for brief periods of time.

The current large differences in ownership structure will probably narrow down in the coming years. Ahlstrom has announced its intention to be listed as soon as stock prices start to rise. The Finnish state is also waiting for an upturn in stock prices to decrease its ownership in companies included in the sample. In addition, the Helsinki Stock Exchange is currently integrated with the Stockholm, Tallinn, and Riga Exchanges, so the shares of the companies listed on the Helsinki Stock Exchange have become international in this way. On the other hand, no new listings on the New York or London Stock Exchanges have been announced.

Table 4.1 Foreign owners' shares of the corporations' shares (31 Dec 2002[1]), %, exchanges on which the companies are listed, largest owners (shading indicates scores above half of the maximum value)

Company	%	Index score	Listed on exchanges	Largest owners (more than 5% of stock) 31 Dec 2002
Nokia	91	4	Helsinki, Stockholm, London, Frankfurt, Paris, NY	
Stora Enso[2]	73	4	Helsinki, NY, Stockholm	The Finnish state 11%, Knut och Alice Wallenberg's Foundation 7%
UPM	67	4	Helsinki, NY, London, Germany	
Tietoenator	66	3	Helsinki, Stockholm	
KCI Konecranes	66	2	Helsinki	Oras 22%, Henki-Sampo & Varma-Sampo 13%
Amer	55	3,5	Helsinki, London, partly NY	
Metso	46	3	Helsinki, NY	UPM 15%, the Finnish state 12%
M-Real (Metsäliitto)	35	2	Helsinki (London, Bavaria)	Metsäliitto Co-operative 39%
Kone	34	1	Helsinki	Stock controlled by Antti ja Pekka Herlin 37% (73% of shares with voting rights)
Uponor	31	1	Helsinki	Orkla AS 9%,
Huhtamäki	29	2	Helsinki	The Finnish Cultural Association 18%
Outokumpu	24	0	Helsinki	The Finnish state 40%, The Social Insurance Institution of Finland 12%
Fortum	20	0	Helsinki	The Finnish state 61%
Elcoteq	20	0	Helsinki	Antti Piippo 24%, Henry Sjöman 12%, Jorma Vanhanen 11%
Fiskars	18	0	Helsinki	Virala Oy Ab 10%, Oy Holdix Ab 7%, Duba AB 7%, Varma-Sampo 6%, Hambo Oy Ab 5%, Agrofin Oy Ab 5%
Orion	17	0	Helsinki	
Ahlstrom	14	0	---	The Heirs of Antti Ahlström Ltd 9%
Rautaruukki	13	0	Helsinki	The Finnish state 40%
Wärtsilä	9	1	Helsinki (London)	Fiskars Corporation 18%
Kemira	5	1,5	Helsinki	The Finnish state 56%, Henki-Sampo &Varma-Sampo 6%
Sanoma WSOY	1	0	Helsinki	Aatos Erkko 28%, heirs of Patricia Seppälä 9%, Robin Langenskiöld 5%, Rafaela Seppälä 5%
Myllykoski	---	0	---	The Björnberg family
Valio	---	0	---	Finnish dairy farmers' co-operatives

[1] If the ownership is recalculated according to ownership data for 31 Dec 2003, Amer and Huhtamäki get one point less on the index, whereas Outokumpu and Elcoteq get one point more. For the rest of the companies, the points remain the same.
[2] The foreign ownership of Stora Enso is only 45%, if Sweden is considered its second home country. If only Finland is considered its home country, the share of foreign ownership is more than 70%.

5 Internationalization of corporate management, governance and headquarters

The nationality of top management and the location of corporate headquarters have been interesting aspects of multinational companies for two main reasons. The location of corporate headquarters and the nationality of a company's directors have their influence on where strategic company functions such as R&D are located. The location of corporate headquarters also determines where the company pays its taxes, although taxes can also be influenced by the prices used in internal company transactions (see, e.g., Ali-Yrkkö & Ylä-Anttila 2002; Teollisuus ja Työnantajat 2002).

The registered offices of all the corporations studied are still located in Finland. Among these corporations, only Elcoteq has announced that it is considering transferring its head office to some other country. It is, however, becoming increasingly common to disperse the head office functions among a number of different countries. In Stora Enso, top management is permanently located in London. A few other countries have a "second head office" abroad, or they have located some head office functions (such as financial management), at least in part, in the financial centers of the world. Furthermore, the directors of different lines of business may be located abroad.

Among the corporations studied, Kone is the only one with a foreign chief executive officer (President of Kone Corporation).

Table 5.1 indicates that there are considerable differences in the internationalization of corporate governance and management in Finnish companies. The internationalization of boards of directors is a consequence of increased foreign ownership and mergers and acquisitions. Mergers (for example, Stora and Enso, Tieto and Enator) and large acquisitions have usually provided representatives of the acquired company with seats on the boards of directors. In Stora Enso, the Finns are a minority on the board of directors. The internationalization of executive boards, on the other hand, is a consequence of the entry of directors of acquired business units on the board. In this respect, the most international companies are Huhtamäki, Ahlstrom, Stora Enso, Tietoenator, and Amer. By contrast, the executive board of Nokia, which has grown organically, was purely Finnish for surprisingly long: until autumn 2003. In autumn 2003, two American directors were nominated to the board, and these were directors of functions – finance and enterprise solutions – that are mainly led from the US.

In addition to ownership structure and mergers and acquisitions, differences between companies appear to be due to differences in corporate cultures and traditions. For example, Metso, Outokumpu, and Wärtsilä have made many foreign acquisitions, and foreign investors own a large share of the company stock. In spite of this, their boards of directors and executive boards are purely Finnish. In the cases of Metso and Outokumpu, this is probably due to the old tradition of state-owned companies. In Wärtsilä, ownership has been largely tied to Fiskars and the Ehnrooth family, who have had a strong representation on the boards of both companies. Yet in the corporate culture of Kone, in contrast, family ownership has not influenced the fact that the company's management and governance score highest on the globalization index.

Table 5.1 Foreign membership on the boards of directors and executive boards in 2002 (according to annual reports published in 2003) (shading indicates scores above half of the maximum value)

Company	Headquarters abroad or foreign CEO	Index score	Foreign board of directors members, % of members	Foreign executive board members, % of members
Stora Enso	Top management permanently in London	2,5	58	45
Tietoenator	-	2	50	42
Huhtamäki	-	2	29	50
Ahlstrom	-	2	29	45
Kone	Foreign CEO (President)	3	33	38
UPM	-	2	45	7
Uponor	-	2	20	25
Nokia[2]	-	2	44	10
Amer	-	1	0	40
Fiskars[1]	-	1.5	0	38
KCI Konecranes	-	2	14	20
Myllykoski	-	1	0	20
Orion	-	1	0	11
Kemira	-	0.5	0	10
Elcoteq Network	-	1	0	6
Metsäliitto[1]	-	0.5	0	0
SanomaWSOY	-	0	0	0
Fortum	-	0	0	0
Metso	-	0	0	0
Outokumpu	-	0	0	0
Rautaruukki	-	0	0	0
Valio	-	0	0	0
Wärtsilä	-	0	0	0

[1] The figures for Fiskars include the membership of the board of Fiskars Brands Inc., and for Metsäliitto, the board of M-Real.

[2] In the figures for Nokia, the changes in the executive board made in autumn 2003 are taken into account.

6 Internationalization of production and personnel

Because very few corporations provide information on the geographical distribution of their production, the companies' production abroad had to be measured using the amount of personnel abroad as an indicator. For three companies (Huhtamäki, Uponor, and Elcoteq), this figure is currently more than 90% (see Table 6.1). Sixteen companies have more than 50% of their personnel abroad, and 62% of the total personnel of all the companies studied work outside Finland.

There are, however, significant differences between the companies in terms of the share of foreign personnel. Foreign acquisitions obviously increase the amount of production and the number of personnel abroad. For example, the current core business of Amer was constructed by acquiring Wilson in the US and Atomic in Austria. Another explanatory factor is the type of industry in which the company is involved. For example, 60% of the business of Kone currently consists of services, which requires the company to be present in all the countries that are important markets. Then again there are cases in which it does not make economic sense to transport the product for long distances. An example of this is the packages that Huhtamäki makes, which are produced as close to the markets as possible. In the case of Elcoteq, the large number of foreign personnel is connected to the aim to locate the company's production in countries with low labor costs.

The share of foreign personnel is relatively low in companies in traditional domestic market industries (especially Valio, Orion, and SanomaWSOY), which have started to internationalize quite recently. In addition, the forest industry companies – and among them especially UPM – are still characteristically domestic companies. This is due both to history (it is very expensive to transfer a paper mill), and the abundant wood resources available in Finland and neighboring countries.

It is perhaps slightly surprising that the share of foreign personnel is low even in Nokia, with just a slight majority of personnel abroad. The shipping costs for mobile phones are relatively low, and they do not require service operations. Nokia has acquired hardly any foreign companies. In addition, Nokia has outsourced most of its component production, in which there has in recent years been a significant move from Europe to Asia and South America. Most of Nokia's own personnel work in research and development, and the majority of them still work in Finland (Lovio 2002).

Table 6.1 Share of foreign personnel of total company personnel, and distribution of total personnel by continent in 2002 (shading indicates scores above half of the maximum value or above the average of all companies)

Company	Index score	Foreign personnel, %	Europe, % (Finland included)	North America, %	Rest of the world, %
Huhtamäki	6	95	67	20	13
Uponor	4	91	77	17	6
Elcoteq	4	90	61	0	39
Kone	6	83	68	16	16
Ahlstrom	5	83	82	15	3
Amer	4	83	41	46	13
Fiskars	4	78	43	55	1
Myllykoski	2	72	na	na	na
Wärtsilä	6	71	75	4	21
Outokumpu	6	69	76	18	6
Stora Enso	5	67	83	15	2
Metsäliitto	3	67	99	0	0
KCI Konecranes	3	64	na	na	na
Metso	5	63	67	17	16
Nokia	5	56	66	13	21
Kemira	4	55	87	5	8
UPM	5	44	87	10	3
Fortum	3	43	97	2	1
Rautaruukki	3	42	98	1	1
TietoEnator	2	42	100	0	0
SanomaWSOY	1	33	100	0	1
Orion	1	23	98	1	1
Valio	0	12	96	4	0
ALL COMPANIES		62	80	11	9

In 2002, 20% of the personnel of the corporations studied worked outside Europe. The share of European personnel is less than 50% only in Fiskars and Amer. In addition, the share of European personnel is less than 70% in Huhtamäki, Elcoteq, Kone, Metso, and Nokia. When looking at all the companies, the share of personnel in North America is 11% and the share of the rest of the world is 9%. Huhtamäki, Kone, Amer, Nokia, and Metso are the most evenly globalized companies, with an above-average share of personnel outside Europe, both in North America and elsewhere (mainly in Asia).

Table 6.2 presents a more detailed picture of the geographical distribution of the personnel of the corporations studied, insofar as it could be calculated on the basis of information provided in the annual reports. According to the data presented in the table, the most important coun-

tries include Sweden, Germany, the UK, and France in Europe, the United States in North America, and China in Asia.

Table 6.2 The most important location countries of foreign personnel in the corporations studied in 2002[1]

Region	Country	Number	%	Number of companies
Western Europe	**Total**	**99,907**	**62**	
Of which	Sweden	28,420		14
	Germany	24,832		16
	Great Britain	12,483		13
	France	8,108		10
	The Netherlands	6,631		9
	Norway	4,857		8
	Austria	3,506		5
	Italy	2,810		5
	Denmark	2,673		9
	Belgium	2,267		7
Eastern Europe	**Total**	**14,201**	**9**	
Of which	Hungary	5,185		4
	Estonia	3,593		6
	Russia	2,655		11
North America	**Total**	**27,395**	**17**	
Of which	USA	24,726		13
	Canada	2,669		5
Asia: developed industrial countries	**Total**	**1,265**	**1**	3
Of which	Australia	1,000		
Asia: developing countries	**Total**	**13,793**	**8**	
Of which	China	10,147		7
	India	1,917		2
Central and South America	**Total**	**4,132**	**3**	
Of which	Brazil	2,110		2
	Mexico	1,803		3
Africa	**Total**	**73**	**0**	1
TOTAL		**160,766**	**100**	

[1] Of the total foreign labor force (241,611 employees), it was only possible to infer the exact location of 160,766 employees on the basis of the information given in the annual reports.

There has recently been a heated debate in Finland on the so-called China syndrome, referring to the flow of jobs to developing countries (e.g., Teollisuus ja Työnantajat 2003). It is true that the role of many developing countries has grown recently. Yet it is also still the case that the majority of the personnel in the companies studied are located in developed, industrialized countries. These countries (Western Europe, North America, Japan, and Australia) host 87% of the personnel of the companies studied. Thus, the share of low labor cost countries is only 13%.

The most important low labor cost countries for Finnish companies include Hungary, Estonia, and Russia in Europe, China and India in Asia, and Brazil and Mexico in the Americas. A survey by the Confederation of Finnish Industry and Employers (Teollisuus ja Työnantajat 2003) found that Russia is the most important country of operation for Finnish companies (almost 14,000 employees). The differences in the findings are due to the different samples: the survey included companies not included in the present study. The survey by the Confederation of Finnish Industry and Employers found that 54% of the employees of Finnish companies working in Eastern Europe, Asia, and South America worked in production, 41% in sales, marketing, and maintenance, and 5% in research and development. The number of foreign R&D personnel has been on the increase especially in China.

7 Internationalization of the markets

Compared with the production and personnel of the companies, the corporations' markets are clearly more internationalized. The share of turnover generated abroad is 99% in Nokia, and it is more than 90 per cent in many other companies. Table 7.1 indicates that the share of foreign turnover is less than 50 per cent in only three companies.

The table shows that the markets of the Finnish corporations are still mainly in Europe. The share of European markets in less than 50% in only four companies: Fiskars, Amer, Metso, and Wärtsilä, which thus fulfill the criterion for global companies by Luostarinen and Gabrielsson presented in the introduction (50% or more of turnover comes from outside the home continent). The majority of the companies (16 companies) are in the category of "globalizing", and these include four of the most global companies as measured by the globalization index. A few (3 companies) would be classified as "internationalizing". It thus seems that the criteria used by Luostarinen and Gabrielsson do not provide a fully adequate classification, at least of the companies studied in the present article. For example, the global distribution of turnover seems to be more

even in Nokia, Huhtamäki, Outokumpu, and Metso than in Amer, Fiskars, and Wärtsilä, in which the turnover generated outside Europe is mainly from either North America or from Asia.

Table 7.1 Share of foreign turnover of total corporate turnover and distribution of turnover by continent in 2002 (shading indicates scores above half of the maximum value or above the average of the companies)

Company	Share of foreign turnover of total company turnover	Index score	Share of Europe (including Finland)	Share of North America	Share of rest of the world
Nokia	99	6	54	17	30
Myllykoski	98	3.5	77	21	2
Ahlstrom	97	4.5	61	28	11
Wärtsilä	97	6	49	7	44
Huhtamäki	95	6	54	29	17
Fiskars	95	5	32	65	3
Stora Enso	94	4.5	69	19	11
Outokumpu	92	6	66	17	17
Metso	92	6	47	25	28
Kone	91	5.5	61	29	11
UPM-Kymmene	91	4	76	14	10
Uponor	91	4	67	24	9
Amer	90	5.5	37	51	13
KCI Konecranes	89	5	56	28	16
Metsäliitto	89	2.5	86	3	10
Kemira	83	2	83	6	11
Elcoteq Network	78	4.5	69	3	28
Rautaruukki	73	0.5	97	2	2
Fortum	64	1	76	14	10
Orion	53	0	93	4	3
TietoEnator	43	0	100		
SanomaWSOY	42	0	100		
Valio	33	0.5	90	3	7
ALL COMPANIES	87%		68	15	17

Table 7.1 also indicates that the markets of the Finnish corporations are more diverse than their production. The share of markets in Europe (68%) is smaller than the share of personnel in Europe (80%, see Table 7.1). Instead, the share of Asia, Africa, and Central and South America of the markets (17%) is clearly larger than the share of the personnel located in these regions (9%). Thus, even though the Finnish companies have production and personnel in developing countries, this share is clearly smaller than the share of the companies' turnover generated in those countries.

8 Differences in globalization levels and profiles

The previous analysis has focused on the different factors in the globalization index, except for the R&D factor, which is discussed in another article in this volume (Chapter III). That article indicates that only four of the companies studied (Amer, Ahlstrom, Stora Enso, and Wärtsilä) have more than 50% of their R&D operations abroad. The article also shows that the increase in foreign R&D operations has, until the present, been largely due to foreign acquisitions. Finnish companies still seldom establish new R&D units abroad.

All in all the analysis has shown that the globalization of Finnish corporations is an extremely multidimensional phenomenon. Depending on which aspect of globalization we consider, different companies appear to be the most globalized. Thus, it appears to be best to use a multidimensional index, if we want to organize the companies in an overall 'correct' ranking. The globalization index employed in the present study is one possibility, which seems to work fairly well for the companies studied here. More importantly, the present study indicates that the companies have diverse globalization profiles. Explaining this diversity is the real research challenge, which may later on lead to the development of improved globalization typologies.

If we define multinational corporations as ones that score above half of the maximum value on the globalization index, then there are 13 such corporations in the sample. Table 8.1 presents a summary of these companies' characteristics on the dimensions measured in the globalization index. These companies exhibit the following characteristics:

- The most internationalized dimensions are the markets (in all, the foreign share is 93%), then the personnel (73%), then the R&D activities (47%). The least internationalized dimensions are ownership (43%) and corporate management and governance (23%).
- The differences between the companies are smallest in the share of foreign markets (varying between 99% to 89%), but all other aspects exhibit significant variations: personnel (95% - 44%), R&D (83% - 30%), ownership (91% - 9%), corporate management and governance (52% - 0%) and presence outside Europe (59% - 13%).
- Not a single company gains above-average scores on all the criteria (shaded fields), and only one company (Outokumpu) is below average on all criteria. The dimensions are thus, at least partly, independent of one another, and the companies have different profiles. For

example, Nokia is extremely global on three criteria (markets, ownership, and presence outside Europe), but it is below average in terms of the globalization of its personnel, R&D activities, and top management composition.

Table 8.1 Foreign shares of different indicators for the most globalized Finnish corporations in 2002 (shaded figures are above the average of the companies)

Company	Score on globalization index	Foreign markets, %	Foreign personnel, %	Foreign R&D, %	Foreign owners, %	Foreign board members, %	Personnel outside Europe, %
Stora Enso	18	94	67	70	73	52	17
Nokia	18	99	56	45	91	22	34
Huhtamäki	17	95	95	na	29	40	33
Kone	16.5	91	83	38	34	36	32
Amer	16	90	83	83	55	20	59
UPM	16	91	44	31	67	26	13
Metso	15	92	63	30	46	0	33
Wärtsilä	15	97	71	56	9	0	25
Ahlstrom	13.5	97	83	79	14	40	18
KCI	13	89	64	Na	66	17	na
Outokumpu	13	92	69	33	24	0	24
Fiskars	11.5	95	78	Na	18	19	57
Uponor	11.5	91	91	Na	31	23	23
Average		93	73	47	43	23	31

The previous sections have introduced a number of factors that explain the differences in the corporations' globalization profiles. In order to gain a more detailed understanding of these explanatory factors, the correlations between the different factors in the globalization index were calculated (see Appendix 1). On the basis of the analysis, the following features were identified as central factors explaining the differences in globalization profiles:

- *Company size (in absolute terms).* It is obvious that company size is positively related to most globalization indicators. As companies outgrow their domestic markets, size increases the necessity and potential for

globalization. It has also been traditionally believed that in order to be global, companies need to be relatively large, or that globalization increases the size of companies. On the other hand, there has been much discussion recently on new small and medium-sized companies that are "born global". And in fact, in the group of companies studied, share of foreign turnover and foreign personnel were not correlated with the absolute size of the company (as measured by turnover). Instead of the absolute size of the company, its *relative size with respect to its markets* would most probably explain the level of globalization better. Finnish companies today are more *focused on their core business*, which means that they need to develop significant international operations in order to grow. Market share could be used as a measure of a company's relative size, but this information is not available for all the companies.

- The data indicate that company size, and especially the size of foreign turnover, is connected with an increase in *foreign ownership*. This is because as a company grows, it becomes necessary to broaden its ownership base, and on the other hand, large companies are more attractive to foreign portfolio investors than small companies. The large share of foreign owners, in turn, leads to an increase in foreign members on the *boards of directors,* which is manifested in the high correlation between these variables.

- *Growth and profitability.* A company's growth and profitability are obviously in themselves often direct factors influencing its globalization, but this factor has a specific impact especially on the increase in foreign ownership. A company's rapid and profitable growth increases investors' interest in the company, which often increases the share of foreign ownership. For example, the share of foreign ownership among the companies studied in 2003 grew most in the successful companies, Kone and Tietoenator (in both companies, foreign ownership grew by 7 per cent in 2003).

- *Types of company growth.* Companies can grow organically or through acquisitions. When a company grows through foreign acquisitions, its personnel, R&D operations, and executive board internationalize faster than in the case of organic growth. In addition, most of the foreign R&D units in Finnish companies have been gained as a result of foreign acquisitions. The composition of the companies' executive boards is also closely connected to the composition of their boards of directors. This is related to growth by mergers, leading to the need to gain representatives of the merged companies onto the executive boards and boards of directors of the new company.

- In extreme cases, the company is entirely a result of mergers and acquisitions. Such a company is represented by Amer in the present sample. Amer has, however, acquired companies in the same field of business (sports equipment), and has gradually attempted to strengthen its own brand (Amer Sports). The companies studied here do not include any examples of a pure investment company.

- *Industry type.* If the company is in a mass-production industry based on raw materials (such as the paper and metal industry), most of its production is located according to the availability of raw materials. If the company produces global, relatively standard products, its production can be located in a few individual countries (e.g., Nokia). If the company's products require a significant amount of customization and services (e.g., Kone) or it is purely a service company (e.g. Tietoenator), it needs to be present in all its main markets. The relative costs of transporting a company's products have a similar impact: the larger the share of shipping costs, the more the company is geographically dispersed (e.g., Huhtamäki). Furthermore, if a company is focused on simple, labor-intensive sub-contracting production, this will direct it toward globalization and locating its units in countries with low labor costs (e.g., Elcoteq), whereas a large share of R&D personnel tends to keep the company's operations in developed industrialized countries, including Finland (e.g., Nokia).

- *Level of internationalization.* Even though we can problematize a simple typology of internationalization based on phases (domestic, within the continent, and finally global), the data presented here indicate that the higher the level of foreign turnover and personnel, the more likely it is that the company has substantial business operations outside Europe.

- *Historical factors.* Noteworthy historical factors in the present data include the company's ownership structure (significant state or family ownership wards off foreign investors). The corporate culture, too, may favor keeping top management under Finnish control. Expensive investments in production plants form an obstacle to relocating the company's production. Moreover, a large acquisition may change the company's profile overnight.

All in all, the analysis indicates that the globalization profiles of Finnish corporations are quite unique. Hence, it seems difficult and artificial to classify the companies in a limited number of company types. Taking a single dimension makes it easy to produce a classification (e.g., by geographical distribution of production), but this classification is not very illustrative of the company, and may even be misleading.

The best typology might be achieved by taking the nature of the company's business and industry as a starting point, and adding some other dimensions. The nature of the company's business, that is, the kind of product it produces and the kinds of production factors that are crucial to its production, determines the pattern in which the company globalizes. This basic dimension is further nuanced by the growth pattern of the company, its speed of growth and profitability, as well as company size. In addition, historical factors need to be taken into account. Developing typologies of companies, however, is not an end in itself. Which kind of typology is most useful depends on the aims of the study (e.g. Siitonen 2003).

9 Globalization and the ”subsidiary economy”

The previous analysis indicates that the companies studied here can be considered as being fairly globalized. Yet successful globalization has its downside. As the Finnish companies have become more globalized, they have focused on the kind of business in which they have the best opportunities to succeed. In this connection, they have frequently sold off business operations that are not compatible with their core business. If new Finnish owners cannot be found for these business operations, then they are sold to foreign companies. Thus, the globalization of Finnish companies has evolved in parallel to an increase in the number and share of foreign-owned companies in Finland. Foreign direct investments in Finland have grown in conjunction with Finnish direct investments abroad (see Mannio *et al.* 2003, 16).

The increase in the foreign ownership of companies and business operations in Finland has led to a discussion about whether globalization is turning Finland into a ”subsidiary economy”. In this discussion, it is often forgotten that globalization always works both ways. The increase in the foreign ownership of companies and business operations in Finland would be a cause for concern, if it were not related to a concomitant increase in the globalization of Finnish companies. The data presented in this article, however, indicates that this is not the case. The 23 companies in the study employed 240,000 people abroad, which is 60% of their entire personnel. According to official statistics, foreign owned companies employed 176,000 people in Finland in all sectors, and in industry 73,000 people (Statistics Finland 2001).

Finnish corporations thus employ more people abroad than foreign companies do in Finland. At least in this respect, globalization has remained under control from the Finnish perspective.

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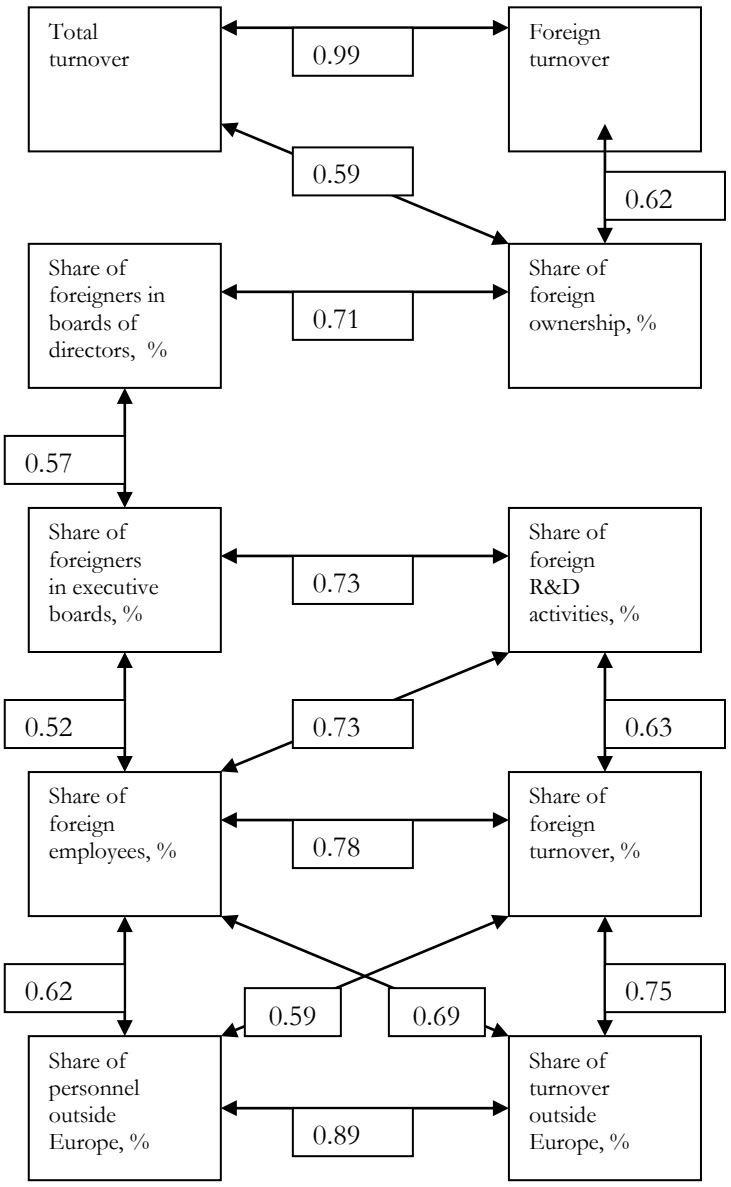
Appendix 1.

Correlations between different indicators for globalization. The figure includes correlations over + 0.50 in the sample of 23 Finnish corporations with a foreign turnover of over 500 million euros.



	Total turnover	Foreign turnover	Share of foreign turnover, %	Share of foreign personnel, %	Share of foreign owner-ship, %	Share of foreigners in boards of directors, %	Share of foreigners in executive boards, %	Share of personnel outside Europe, %	Share of turnover outside Europe, %	Share of foreign R&D, %
Total turnover	X									
Foreign turnover	0.991866	x								
Share of foreign turnover, %	0.241289	0.310956	x							
Share of foreign personnel, %	-0.11878	-0.05501	0.781278	x						
Share of foreign ownership, %	0.593039	0.621693	0.284504	0.107935	x					
Share of foreigners in boards of directors, %	0.454641	0.481151	0.173798	0.110758	0.713518	x				
Share of foreigners in executive boards, %	-0.17248	-0.12542	0.279705	0.516744	0.297177	0.567158	x			
Share of personnel outside Europe, %	-0.01831	0.045938	0.594783	0.623646	0.244038	-0.09165	0.280871	x		
Share of turnover outside Europe, %	0.074633	0.134128	0.746932	0.691985	0.248992	0.002348	0.366767	0.894966	x	
Share of foreign R&D, %	0.038084	0.106839	0.639765	0.728482	0.414189	0.383475	0.730444	0.432821	0.634069	x

CHAPTER III

Internationalization of R&D Activities of Finnish Corporations – Recent Facts and Management and Policy Issues

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ABSTRACT: *There are no accurate, up-to-date statistics on the extent and nature of Finnish companies' foreign R&D activities. Thus, the first part of this article attempts to review the most recent available data. After the overview of the current situation, the article turns to consider the internationalization of R&D operations first from the perspective of the companies, and then from the perspective of Finnish national technology policy. The final section studies Finland's situation through the international literature. The empirical evidence indicates that Finland is, at least for the moment, quite competitive as a location for R&D operations. Research has not been transferred abroad, either. Yet as companies' markets and production become international, it is absolutely necessary for them to have R&D resources abroad. Such resources are mainly obtained as a result of business acquisitions, but in some cases, also by establishing new units abroad. For the most internationalized large companies, R&D management has turned into the management of a multinational R&D network. Topical issues, both internationally and in Finland, include the streamlining of rapidly developed R&D organizations, implementation of the centers of excellence model, and the development of informal models of interaction between research units. In the international literature review, the management and organization of multinational R&D projects emerged as perhaps the most interesting issue for many companies. A recurrent issue in the international literature is that the diversity of international R&D units should be put to good use. This means not only exporting technology, but also importing it. The hypothesis in this article is that this interactive model should come quite naturally to Finnish multinational companies because of their traditional role of technology importer.*

Keywords: *Cross-border R&D, multinational R&D networks and projects.*

TIIVISTELMÄ: *Suomalaisten yritysten ulkomaisesta ~~T~~t&k-toiminnan laajuudesta ja luonteesta ei ole olemassa hyviä tuoreita tilastoja. Artikkelin alussa kootaan asiaa koskeva empiirinen tieto. Nykytilanteen kartoituksen jälkeen suomalaisten yritysten ulkomaista t&k-toimintaa tarkastellaan ensin yritysten ja sitten Suomen kansallisen teknologiapolitiikan näkökulmasta. Viimeisessä jaksossa Suomen tilannetta punnitaan kansainvälisen kirjallisuuden esiin nostamien asioiden suhteen. Artikkelin empiirinen aineisto osoittaa, että toistaiseksi Suomi on säilyttänyt hyvän aseman yritysten t&k-toiminnan sijaintimaana. Suomalaisten yritysten ulkomaisten t&k-yksiköiden synnyn taustalla on välttämätön kansainvälistyminen. Uusia yksiköitä perustetaan edelleen etupäässä yritysostojen yhteydessä. Yrityskauppojen seurauksena kansainvälistyneimmillä suomalaisilla yrityksillä entinen kotimainen t&k-toiminnan johtaminen on muuttunut monikansallisen t&k-verkoston johtamiseksi. Ajankohtaisia haasteita ovat nopeasti kasvaneen t&k-verkoston rakenteen virtaviivaistaminen, osaamiskeskusmallin käyttöönotto sekä vuorovaikutuksen syventäminen t&k-yksiköiden välille. Kansainvälisen kirjallisuuden valossa monia yrityksiä eniten kiinnostavien kysymysten joukossa on monikansallisten t&k-projektien joh-*

taminen. Toinen kirjallisuudessa nouseva teema on kasvaneen t&k-verkoston erilaisuuksien hyödyntäminen. Artikkelin hypoteesi on se, että suomalaisille monikansallisille yrityksille vuorovaikutteisten toimintamallien käyttöönoton pitäisi sopia hyvin, koska aivan viime vuosiin saakka suomalaiset yritykset ovat keskittyneet teknologian tuontiin eivätkä niinkään sen vientiin.

Avainsanat: *ulkomainen t&k-toiminta, monikansalliset t&k-verkostot ja projektit.*

1 Introduction

Finnish companies' R&D operations started to internationalize much later than their markets or production. In the past few years, however, the R&D operations have internationalized at a growing rate. This has brought on changes in the companies as R&D management has turned from the management of a few domestic R&D units to the management of an extensive international R&D network. From the perspective of Finnish technology policy, the growing internationalization of R&D operations has also raised some concern. For example, some have questioned whether the Finnish innovation environment has lost its competitiveness and failed to encourage Finnish companies to invest in R&D in their own country. There is also concern about whether the growing foreign R&D operations are displacing R&D here in Finland.

Companies' research and development are becoming international in many different ways. These include the increased international contacts of companies' Finnish researchers, foreign researchers' immigration to Finland, joint international projects, foreign outsourcing of research services, memberships in foreign research institutions, etc. The main focus in the present article is on the establishment and management of foreign R&D units, but it is worth noting that this is only one aspect of the internationalization of technology development.

There are no accurate, up-to-date statistics on the extent and nature of Finnish companies' foreign R&D activities. Thus, the first part of this article attempts to review the most recent available data. The data used include previous studies, national statistics and investment surveys by the Confederation of Finnish Industry and Employers. In addition, data have been collected directly from the most important companies, using publicly available documents on their R&D activities, as well as interviews with the corporate R&D directors in 11 large corporations. These companies were selected on the basis of the size of their R&D invest-

ments and the extent of their international operations. The persons interviewed are listed in Appendix 1.

After the overview of the current situation, the article turns to consider the internationalization of R&D operations firstly from the perspective of the companies, and then from the perspective of Finnish national technology policy. The final section studies Finland's situation through the international literature.

2 The extent and nature of Finnish companies' foreign R&D operations

2.1 What is the scale of the foreign R&D operations?

The previous detailed investigation of Finnish companies' foreign R&D operations was in 1998 (Koskinen 1999; the findings were also published in the overview *Tiede ja teknologia* 2000, 66-77). This investigation was based on information from 19 Finnish companies employing the largest numbers of foreign personnel, as well as from other research-intensive companies. The foreign research and development operations of Finnish companies have also been investigated in the investment surveys by the Confederation of Finnish Industry and Employers (most recently, Teollisuuden ja Työnantajain Keskusliitto 2003a). The newspaper *Tekniikka & Talous* has also published lists of the companies with the largest R&D operations in Finland (most recently, *Tekniikka & Talous*, June 9, 2003). A history of Nokia, the overwhelmingly largest Finnish investor in research, published information on the location of the company's R&D operations up until the year 2000 (Häikiö 2001). Using these analyses as a background, an overview can be constructed of the development of Finnish companies' foreign R&D operations, even though all the statistics include inaccuracies. There is no perfectly reliable statistical source on the topic.

Table 2.1 presents a compilation of the available data for 1993 – 1998. The table indicates that in 1993, Finnish companies had about 2,000 employees in R&D operations abroad. Among these, Nokia alone employed 1,500. The share of foreign R&D expenditure in the large companies was 28%. By 1998, the foreign R&D personnel had grown threefold, to more than 6,500 employees, with Nokia's share being 3,500 employees. The foreign share of R&D expenditures was 31% in the large companies, and it was 26% in all the research-intensive companies.

Table 2.1 Data on the foreign R&D expenditures (million euros, in current prices) and R&D personnel of Finnish companies in 1993 -1998

Company subset		1993	1995	1997	1998
Large industrial companies (19 companies)	- foreign R&D expenditures	157	224	347	537
	- foreign share, %	28	26	26	31
	- foreign R&D personnel	1,760	3,010	4,512	5,916
	- foreign share, %	22	24	27	30
Among the above, Nokia	- foreign R&D personnel	1,437	1,790	2,215	3,817
	- foreign share, %	35	25	22	29
Other companies	- foreign R&D expenditures				46
	- foreign share, %				9
	- foreign R&D personnel				643
	- foreign share, %				7
All companies	- foreign R&D expenditures				584
	- foreign share, %				26
	- foreign R&D personnel				6,647
	- foreign share, %				23

Sources: Koskinen 1999, *Tiede ja teknologia* 2000 and Häikiö 2001.

The development of foreign R&D operations after 1998 can be monitored using the investment surveys by the Confederation of Finnish Industry and Employers. According to these, the Finnish companies' foreign R&D operations grew especially rapidly in 2000 and 2001. In 2003, the number of foreign staff employed in R&D operations was 9,000, when it had been slightly more than 6,500 in 1998. The foreign share of industry R&D expenditures grew to 46% in 2001, and has remained at that level these past few years (see Table 2.2).

The information published by Nokia and other large companies, however, indicates that the figures obtained in the investment surveys of the Confederation of Finnish Industry and Employers are too low. Nokia itself reports that its foreign R&D personnel was 7,100 employees in 2000, even though the investment survey for the same period reported that the entire foreign R&D workforce was slightly more than 6,600 employees. On the basis of information collected directly from companies for the present study, the 16 largest Finnish companies employed 10,100 foreign R&D staff (see Table 2.4). If we take this figure as a starting point, then it is safe to assume that the largest Finnish companies employed 10,500 foreign R&D staff in 2003. This is about six times as many

Table 2.2 Finnish companies' foreign R&D expenditures (million euros, in current prices) and R&D personnel in 1999-2003

	1999	2000	2001	2002	2003
- Foreign R&D expenditures[1]	842	1,141	2,225	2,259	2,278
- Foreign share, %[1]	28	31	46	46	46
- Foreign R&D personnel[1]	6,649	6,670	8,272	8,763	8,719
- Foreign share, %[1]	19	19	23	23	23
- Foreign R&D personnel in Nokia	5,826[2]	7,142[2]	7,500[3]	7,800[3]	7,900[3]
- Foreign share, %	34[2]	37[2]	40[3]	40[3]	40[3]
- Adjusted estimate of the foreign R&D personnel in Finnish industrial companies[3]			10,100	10,400	10,500
- Foreign share, %[3]				37	

[1] Based on the investment survey by the Confederation of Finnish Industry and Employers.

[2] According to Häikiö (2001).

[3] Author's estimate (cf. Table 2.4).

as in 1993. The Confederation of Finnish Industry and Employers reports the foreign share of R&D expenditures as being 46%, and the author of the present study estimates the foreign share of R&D personnel to be about 37%.

2.2 Industries and companies active in foreign R&D operations

The foreign R&D operations of Finnish companies are heavily concentrated in certain industries. Table 2.3 indicates that according to the survey by the Confederation of Finnish Industry and Employers, 90% of the foreign R&D personnel were in the metal and electronics industries.

In fact, the foreign research operations are concentrated in a relatively limited number of companies. One can estimate that Nokia's share of the Finnish companies' foreign R&D expenditures and personnel is about 75%. When speaking of Nokia, however, one must bear in mind that, in fact, most of the company's research investments consist of ordinary product development expenditure on new products.

Table 2.3 The share of foreign R&D investments of Finnish companies by industry in 2003, % (on the basis of the investment survey by the Confederation of Finnish Industry and Employers)

Industry	R&D expenditures	R&D personnel
Metal and electronics	95.3	89.4
Forest industries	4.0	6.4
Chemicals	0.5	3.9
Others	0.2	0.3
Total	100.0 (2 278 million euros)	100.0 (8 555 employees)

The remaining 25% of the R&D investments are also made by a small group of companies. All in all, the companies presented in Table 2.4 are together responsible for 95% of all the foreign R&D investments by Finnish companies. Apart from the companies mentioned in Table 2.4, mainly Huhtamäki, Uponor, and Fiskars make substantial foreign R&D investments (as well as TietoEnator and Jaakko Pöyry, which however do not report their R&D expenditures separately in their annual reports).

Even though Nokia is overwhelmingly the largest investor in R&D, it is not the most international one, relatively speaking. Among the companies listed in Table 2.4, Amer, Ahlstrom, Stora Enso, Partek, Wärtsilä, Instrumentarium, and Metsäliitto have a larger share of foreign R&D expenditures than Nokia. In contrast, in Fortum and Rautaruukki the foreign share of R&D expenditures is very small.

If we compare the foreign share of each company's research expenditures with the foreign share of its personnel, we gain an illustrative measure of how internationalized the company's R&D operations are compared with the company's overall level of internationalization. Of the companies in Table 2.4, only three companies have a larger share of foreign R&D expenditures than that of its foreign personnel. These companies are Orion, Stora Enso, and Amer. In the case of Orion, the large share of foreign R&D is explained by the purchasing of foreign research services, as the share of the company's own foreign R&D staff is very small. In the case of Stora Enso, the explanation lies in the large R&D units of what used to be Stora in Sweden. By contrast, Amer's foreign R&D is conducted in its acquired foreign subsidiaries, Wilson and Atomic. The share of foreign R&D in comparison with the share of foreign personnel is low in Rautaruukki, Outokumpu, Kone, and Metso.

Table 2.4 Foreign and domestic R&D expenditures and personnel of the most relevant large Finnish companies in 2001, and R&D expenditures in 2003

Company	R&D expenditures 2003 million EUR	R&D expenditures 2001 million EUR	R&D expenditures in Finland 2001 million EUR	R&D expenditures abroad 2001 million EUR (%)	R&D personnel 2001 in all	R&D personnel 2001 in Finland	R&D personnel 2001 abroad
Total of companies in this table	4,597	3,845	2,140	1,705 (44%)	26,115	16,279	9,716
Nokia	3,760	2,985	1, 642	1, 343 (45%)	18,600	11,500	7,100
Others in all	837	860	498	362 (42%)	7,515	4,779	2, 616
Metso	129	150	105	45 (30%)	1,450	1,000	450
Wärtsilä	70	82	36	46 (56%)	550	220	330
Instrumentarium[2]	86	67	31	36 (54%)	590	328	262
Partek[3]	48	48	20	28 (58%)	370	160	190
Kone[3]	41	42	26	16 (38%)	244	130	114
Outokumpu	48	57	38	19 (33%)	636	393	243
Rautaruukki	17[1]	19	18	1 (5%)	231	218	13
Stora Enso	90	92	28	64 (70%)	575	195	380
UPM	46[1]	45	31	14 (31%)	479	375	104
Metsäliitto	27	30	16	14 (47%)	180	90	90
Ahlstrom	33	29	6	23 (79%)	200	40	160
Orion	86	84	54	30 (36%)	990	950	40
Kemira	48	39	32	7 (18%)	590	370	120
Fortum	38[1]	53	53	-	280	280	-
Amer	31	23	4	19 (83%)	150	30	120

Sources: information provided by the companies and estimates by the author. Company information is partly based on annual reports. There are some differences between companies in how the figures are calculated. The figures are merely indicative especially in terms of the R&D personnel.

[1] In 2002.

[2] Instrumentarium was acquired by General Electric in autumn 2003.

[3] Partek was acquired by Kone in 2002. The figures for 2003 for Kone pertain to the Kone Elevators and Escalators Division and for Partek, to the current Cargotec Division in Kone.

In general, a variety of factors influence the share of foreign R&D. Important explanatory factors include at least the company's industry and the nature of its business, the overall internationalization of the company, and the way in which it has occurred (foreign acquisitions usually increase the share of foreign R&D operations). Furthermore, the extent to which the company's products are based on global technologies has an effect; that is, how similar the technology used in the company's products is in its different markets and product groups. The more similar the technology, the easier it is to concentrate R&D operations in the company's home country. For example, Kone has considerably standardized its products in recent years globally, which explains why the share of R&D conducted in Finland is so large in the company.

2.3 New units and foreign acquisitions as factors increasing foreign R&D

Foreign R&D operations are created in two ways: on the one hand, companies can set up new R&D units (greenfield investments), and on the other, they can obtain R&D units through foreign acquisitions.

According to Koskinen (1999, 26), only 22% of the R&D units established in large Finnish companies before 1993 were new units. Between 1994 and 1998, the share of new units grew to 39%. Räsänen (1999, 59) has indicated, however, that this growth was a consequence of R&D units established by one company, that is, Nokia. Thus, most of the foreign R&D units in other companies are the result of foreign acquisitions.

The past few years have not changed this situation, quite the contrary. The R&D investments by Nokia during 2000 and 2001 grew mainly in the countries and the units that had been established in the late 1990s. Only in Brazil was a new R&D unit established, after which Nokia had R&D centers in 15 other countries besides Finland at the end of 2001. Since then the R&D operations have been concentrated in fewer countries. Today, Nokia no longer has R&D centers in Sweden, Spain, South Korea, Malaysia, or Brazil. A new R&D unit has been established in India (see Table 2.5). Alongside the R&D units, the research investments of Nokia Ventures Organization grew rapidly in 1999 and 2000 through business acquisitions especially in the US. In 2003, however, the turnover of Nokia Ventures Organization fell to less than half of its peak value.

In the other companies, all the foreign R&D units are still mostly the result of foreign acquisitions. In the interviews with company representatives, only a few entirely newly established R&D units were mentioned (for ex-

ample, the Kone unit in India and Orion's new research unit in England). New foreign research units are usually gained in connection with business acquisitions. It also appears to be a common practice in companies to streamline the R&D activities of the acquired company and align them more closely with the needs of the corporation, which often means that the operations are downsized to some extent, at least in the short term. Furthermore, the poor economic outlook in the past few years has increased the need in companies to downsize their operations, which unavoidably has also affected the R&D units.

This characteristic manner in which Finnish companies' foreign R&D units come into being has two important consequences. Firstly, the foreign units are created by acquiring new foreign R&D resources rather than by relocating existing R&D resources from Finland. Secondly, the location of the new foreign units is largely determined by the location of the acquired companies.

2.4 In which countries are the foreign R&D units located?

According to data from Statistics Finland, the foreign R&D expenditures of Finnish companies were distributed in 1998 in the following manner. The share of expenditures in Europe was 67%, that of North America 29%, and that of Asia and Australia, 4%. The most important individual countries were the United States (27%), the UK (16%), Germany (15%), and Sweden (13%) (*Tiede ja teknologia* 2000, 68-70).

The investment survey by the Confederation of Finnish Industry and Employers reported that in terms of R&D expenditures, the share of Europe – more precisely, the 15 EU member countries – decreased in 1999-2000, whereas the share of North America and Asia increased. In 2003, the share of the EU was 54%, that of North America 37% and that of Asia, 9% (TT 2003).

In 2003, the Confederation of Finnish Industry and Employers made a separate survey of the development of foreign operations in Finnish companies in general, and specifically in the developing markets. The developing markets were defined as countries in Asia (including Japan), countries in South America and, for example, Russia. According to this survey, the respondent companies had 43,000 employees altogether in these countries in 2002. Of these employees, 5% or 2,150 employees worked in R&D. Of these, about 1,150 were located in China (including Hong Kong), and 270 in Japan or Russia. There were very few employees in R&D in any of the other countries (Teollisuuden ja Työnantajain Keskusliitto 2003b).

Table 2.5 presents the countries in which the R&D units of the 16 largest Finnish investors in research are located in 2003 (each country can host more than one unit). According to the table, the most important countries include the United States, Sweden, and Germany. They are followed by Italy, the UK, and France. Among the important technology countries, Japan has only one Finnish R&D unit (Nokia). Only Nokia, Kone, and Kemira have R&D units outside the OECD countries.

Table 2.5 Countries of location of the central R&D units of large Finnish companies in 2003

Country	Nokia	Metso	Kone	Wärtsilä	Ahlstrom	UPM	Kemira	Stora Enso	Instrument	Orion	Outokumpu	M-Real	Amer	Rautaruukki	Fortum
USA (11 companies)	x	x	x		x	x	x	x	x	x			x		
Sweden (10)	x	x	x				x	x	x		x	x		x	x
Germany (8)	x	x	x		x	x		x	x			x			
UK (5)	x	x				x	x			x	x				
Italy (4)		x	x	x	x										
France (4)		x		x	x	x									
Netherlands (2)			x	x											
Switzerland (2)		x		x											
India (2)	x		x												
Canada (2)	x	x													
Austria (1)													x		
Spain (1)				x											
Hungary (1)	x														
Poland (1)							x								
Denmark (1)	x														
Japan (1)	x														
Australia (1)	x														
China (1)	x														
Brazil (1)			x												

The previous review thus indicates that the foreign R&D units of Finnish companies are very clearly concentrated in six countries. These countries are the United States, the four largest EU member countries (Germany, the UK, France, and Italy), and Sweden. A number of reasons make this focus in terms of countries quite understandable. Firstly, these countries are among the most important export countries for Finland. Secondly, these are also the countries in which large Finnish companies also have most personnel and production (cf. Chapter II in this volume). Thirdly, the overall investment in R&D in these countries is world-class. Furthermore, the share of foreign-owned companies is relatively large in these countries, and thus foreign R&D operations have become an established practice (OECD 2001).

Finnish companies included in the study also have some R&D units in Denmark, Austria, Switzerland, the Netherlands, and Spain. These countries are also relatively important export countries for Finland, and they include countries in which the companies studied have production units. In terms of R&D expenditures, the Netherlands and Switzerland are the most relevant.

Finnish companies have few R&D units in Japan, even though the national R&D investments in Japan are the second largest in the world, right after the United States. This can be understood in terms of the overall insular nature of the Japanese economy, and the absence of foreign acquisitions. Furthermore, the costs of R&D operations are relatively high. Russia is another country with few Finnish R&D operations, even though the country is an important export market for Finland, and Finnish companies have also started to invest in the country. Furthermore, Finland has a long tradition of scientific and technical research co-operation with Russian scientists. Thus, one might predict that the stabilization and growth of the Russian economy would rapidly increase Finnish companies' interest in R&D activities in the country, as well.

In recent years, there has been a strong increase in Finnish companies' R&D operations in China. Until now, this has been mainly due to large new R&D units established by Nokia. The company interviews, however, confirmed that many other companies are looking into ways to make better use of the R&D resources in China. Even though the earlier investments in China were purely based on the cheap labor and rapidly growing markets in the country, quite recently the utilization of the R&D competence available in China has emerged as a new justification for investments there. The same situation is also developing in India.

In the 2002 survey by the Confederation of Finnish Industry and Employers, Finnish corporations were asked to evaluate the impact of different factors ("extremely positive effect – no effect – extremely negative effect")

on their decisions to locate new production companies in different countries. The potential locations studied were Western Europe, North America, Eastern Central Europe and Russia, and Asia. One of the potential factors was "conditions for R&D operations". In the companies' responses, this factor was evaluated to have a slightly negative effect in North America, no effect in Western Europe, a slightly positive effect in Central Europe and Russia, and a markedly positive effect in Asia (Teollisuuden ja Työnantajain Keskusliitto 2003b). This finding implies that Finnish companies will probably establish new R&D units mainly in Asia and perhaps in Eastern Central Europe and Russia. In North America and Western Europe, potential new R&D units will most probably appear only as a result of new acquisitions in these regions.

2.5 Different types of foreign R&D operations

The literature usually divides foreign corporate research units into the following three categories:

- Support units for local marketing and production (support unit)
- Development units for technology localization and selective development (development unit)
- The largest units, usually with global responsibility for a specific area (R&D center)

Table 2.6 Motives for R&D activities in foreign-based R&D units in major companies and in other large and medium-sized companies in 1997, % (% motive important or very important) (Koskinen 1999, 29-30)

Motive	Major companies, %	Others, %
Providing support to local production and marketing	93	75
Getting into closer contact with important market	86	76
Acquiring technology	74	39
Good availability of skilled R&D personnel	69	37
Close connections with local universities and research institutes	54	32
Presence of competitors	50	36
Co-operation with local enterprises	24	44
Local regulations and technology policy	24	15

The study by Koskinen (1999, 27) indicated that the Finnish companies' foreign research units in 1998 were mainly on the support unit level (46%) and on the development unit level (41%). The share of R&D centers was only 13%. This distribution was also evident in the responses companies gave to questions about the motives for running foreign R&D units, and about their co-operative relations (see Tables 2.6 and 2.7).

Table 2.7 The most important co-operation partners for foreign-based R&D units of major companies in 1997 (Koskinen 1999, 33)

Partner	Share, %
R&D center of the group	62%
Customers	55%
Group's other R&D units and affiliates in Finland	52%
Group's other R&D units and affiliates outside Finland	39%
Universities and research institutes in the host country	31%
Subcontractors	22%
Strategic alliances	10%

The interviews with company representatives conducted for this article produced the following overall reasons for the existence of foreign R&D units:

1. Providing support for local marketing and production, and help in solving immediate problems. This is the purpose for which most of the small R&D units operating in connection with production and marketing companies exist.

2. Localization of technology (processes and products) in a more demanding sense:

- Localization of the corporations' global products (adaptation to local standards, languages, user interfaces, etc.)
- As an alternative to the previous solution, the corporation may use a number of different, locally developed technologies, and have the best R&D competence (usually as a consequence of business acquisitions) located in the country in which the technology was originally developed.

3. Utilization of foreign expertise:

- Identification of customers' needs and development of solutions in co-operation with customers.
- Co-operation with providers of machinery and equipment (e.g., the paper industry's co-operation with developers of printing machines).
- Co-operation with authorities (adaptation of products to local standards and official requirements) may serve as grounds for conducting research in target countries, as such research has greater credibility than research conducted elsewhere.

4. Utilization of good R&D resources:

- On the basis of lower costs: R&D services can be obtained more cheaply abroad than in Finland. For the moment, this has only rarely been the case. The viable alternatives are usually more expensive than Finland.
- On the basis of the lack of Finnish experts: Some types of expertise do not exist in Finland at all, or only to a very limited extent. The know-how for technology developed in Finland is usually readily available, but this is not necessarily the case for the technologies of foreign acquired companies.
- On the basis of world-leading expertise: The top researchers in the world are usually somewhere other than in Finland, usually in the countries of the companies' leading competitors.

5. Strengthening the company's overall presence in the target country:

- Companies themselves may want to be present in a country that is central to the development of the technology, for example in order to create networks with leading technology-developing institutions. For example, a presence in Japan is often justified on such grounds.
- The target country wants or explicitly requires foreign companies to operate R&D facilities in addition to production plants. For example, China emphasizes this in its policy.

The reasons for the existence of Finnish companies' foreign R&D units are usually combinations of the above-mentioned factors. The crucial factor that needs to be acknowledged is that there often is no viable

domestic alternative to foreign research. The evolution of foreign R&D operations is a natural and inevitable consequence of the internationalization of the companies' business and their production. It also needs to be emphasized that due to the different kinds of functions of the foreign R&D units, there are obvious grounds for locating them in different countries.

3 The challenges of managing international R&D networks

Managing international R&D networks presents a relatively new challenge to Finnish companies. In order to gain an in-depth view of these challenges, and identify the ones that are central in a Finnish context, the technology directors of 11 Finnish companies were interviewed for this article. Information was collected from a further five companies using a questionnaire and existing documents. In the interviews, information was collected from the technology directors on the extent and forms of the companies' R&D organizations. The technology directors were also asked to identify the main problems in managing an international R&D network from their own company's perspective. The persons interviewed are presented in Appendix 1, and information on the companies they represent can be found in Tables 2.4 and 2.5. The 16 companies in question were among the largest Finnish companies in terms of foreign turnover in 2001 (and still are, even though Partek and Instrumentarium no longer are independent companies), and were the ones with R&D expenditures of more than 15 million euros.

3.1 The contexts for managing R&D networks are diverse, but the views presented are similar

The international R&D networks of the companies studied are quite diverse. There are differences in the scale of the R&D operations, the role of corporate headquarters, and the importance of foreign R&D in the company.

In terms of the scale of its R&D operations, Nokia clearly stands out among the other companies. In this company, R&D management includes the task of organizing the work of 18,000 people in 10 countries and more than 50 units. In the other companies, it is a matter of organizing the work of 200 – 2,000 people in 2 to 5 countries and 4 to 20 units.

Another basic difference is the role of corporate headquarters. In some of the companies studied, the corporation is mainly an owner of independent subsidiary companies, and R&D is clearly led within these companies. One example of such a company is Amer, in which research is conducted totally in the subsidiary companies (Wilson/USA, Atomic/ Austria, Suunto/Finland), and corporate headquarters do not play a significant role. A slightly similar situation prevails in the companies with very independent divisions in different industries, in which corporate level R&D operations mainly serve a coordinating function. Such companies include, for example, Metso (paper machines and stone crushing machinery) and Kemira (water chemicals, paint, fertilizers).

In more focused companies, the corporate level has an important role in research, and this is often reflected in the fact that the company clearly has one leading research center (Nokia/Helsinki, Kone/Hyvinkää, Orion/Espoo, Outokumpu/Pori). Wärtsilä and Fortum are also quite close to this model, even though they do not have such an obvious leading research center.

There are also visible differences in the degree of internationalization of research in the companies. Among the companies studied, the share of foreign research was more than 50% in Amer, Ahlstrom, Stora Enso, Partek, Wärtsilä, and Instrumentarium. In Metsäliitto, Nokia, Kone, Outokumpu, Metso, and UPM, the share of foreign R&D was between 50 and 25%. Orion, Kemira, Fortum, and Rautaruukki have very little foreign R&D of their own. Ahlstrom is the only one of the companies with its most important research center outside Finland. Ahlstrom's Research and Competence Center is based near Lyon in France.

The R&D organizations of the companies represented by the technology directors interviewed are thus quite different from one another. It was interesting to note in the interviews, however, that there were hardly any differences among the technology directors' views on the challenges in managing an international R&D network, or on the competitiveness of Finnish R&D. There were some differences, depending on the current situation of the company, in which issues were considered the most significant challenges. Yet the directors' general views were very convergent, for example, on the development needs in Finnish technology policy in the face of growing internationalization. Thus in the following, the findings of the interviews are not reported by company, but the viewpoints of the interviewees are dealt with as a group.

3.2 The need to improve co-ordination, division of labor, and interaction

The interviews with the technology directors raised a number of general issues in organizing an R&D network. Many of these are characteristically issues that require constant reflection, and cannot thus be solved once and for all.

Relations between the corporation and the R&D units: Issues pertaining to coordination and centralization at the corporate level are on the agenda in many companies. How close should the co-ordination at the corporate level be? Should the corporation have a single, central research unit? How should global responsibilities be defined for important, generic research issues? In many companies, research is markedly decentralized, but the corporate level is represented by different kinds of regularly meeting committees and persons in charge of resolving overarching research policy issues and allocating resources. Such solutions aim to avoid too much fragmentation and duplication of research, and to promote information exchange within the corporation.

Interaction and division of labor among the R&D units: We are no longer in a world in which R&D units in the different countries merely apply the technology developed in the corporation's own country – in contrast, corporate technologies are developed in parallel fashion in many different countries and research units. Thus, it is not only the relation between the R&D units and the corporate level that is important, but also the interaction and division of labor among the R&D units. Many companies have attempted to solve this problem of interaction by constructing an international network of research and competence centers. Companies also attempt to turn some of their R&D units into larger and more important centers of excellence, in which competence on specific issues is focused. Nokia has about ten centers of excellence; the other companies usually have 2 to 4. The centers of excellence are responsible for diffusing information in their fields of responsibility to all units in the corporation.

The relation between major research projects and the research units: In some companies, a practice has been developed in which research related to the same program, project or new product is conducted in parallel, but concertedly, in a number of different units. The closer the project is to product development, the more important it becomes to utilize the competence of multiple units to serve the requirements of the project.

The relation between research and business units: Enhancing the relation between business and research units is related, among other things, to

the more general issue of how much of the research should be conducted according to the "science push" principle, and how much according to "market demand". In high tech industries, research usually has such a powerful position that there is ample interest in and demand for research, but in basic industries, research units also need to raise the business units' level of interest in long-term development issues. On the other hand, people responsible for business operations usually are of the opinion that research should be more market-oriented. In quite a few companies, the relations between the central R&D organization and the business units are organized so that a significant proportion of the funding does not derive from the corporate budget, but from research commissions by business units. For example, 70% of the funding of the Nokia Research Center derives from research funded by the business units.

External co-operation of the company's R&D network: In addition to the interaction within the company, companies need to find the best solution for creating network relations with other companies, research institutes, publicly funded research projects, and the standards-setting bodies and projects for different technologies. This broad field did not receive a central focus in the interviews, however. Perhaps the most significant issue raised was the concern about the slowness and bureaucracy of EU research programs, which has decreased business interest in them.

Many of the interviewees thought that it is impossible to find the optimally efficient solution to organizing the above-mentioned five types of relations. For example, many companies have discovered that the distance between Europe and the United States, and also the distances among European countries, are so great that the "optimally best matrix solutions do not work", if chains of responsibility become too complicated. Thus, in real life, a variety of compromises and practical solutions have to be made, "instead of theoretical organization models".

Thus, alongside the task of developing organizational models, it is important to ensure that the actual interaction among the international and multi-cultural research personnel functions as a natural bottom-up process. This, in turn, requires hands-on learning through joint training, development projects and research processes. The fact that Finland is a small country used to be considered one of its central benefits in technology development: "everyone knew everyone". In corporations that have suddenly become international, it takes some time to recreate a similar situation within the multinational corporation. Staff rotation among units and countries is a practice that is being developed in many companies in order to improve interaction and information flows.

In many companies, it was considered important, but difficult, to get experienced foreign researchers to come to Finland. The low pay level and the high tax rates do not attract foreign researchers from the large OECD countries. Providing sufficient compensation is considered expensive in the companies. On the other hand, many interviewees stated that the compensation in itself was not the most difficult issue, but that it was more difficult to convince researchers in the leading OECD countries about the overall attractiveness of Finland (the climate, language and culture, distance, organizing life for family members). In Finland, only Nokia Research Center in Helsinki hosts a significant number of foreign researchers.

In order to attract foreign researchers to Finland, the interviewees considered it crucial to develop international training in Finland in the fields that are important for Finnish companies (e.g., the forest cluster). This would ensure, internationally, the development of competent researchers with a positive attitude toward Finland.

3.3 Surmounting differences in national culture and interests

In the interviews with the technology directors, there was a general agreement that there are clear differences among the business and R&D cultures in different countries, and that it is important to learn to recognize and manage them. Even though these differences in national culture may sometimes feel like old-fashioned clichés (the practical and silent, straightforward Finns, the discussion-oriented Swedes, the hierarchical Germans, the pedantic Swiss, the number-oriented Americans, the independent-minded French, the patience-requiring Japanese, the political Chinese, etc.), it seems obvious that they are real concerns for management, especially in the aftermaths of business acquisitions. The creation of a genuinely multicultural corporate culture that invokes commitment is a slow and difficult process, which is even more difficult for relatively small and unknown Finnish companies.

In addition to differences in national culture, multinational companies also need to strike a balance among competing national interests. Creating a division of labor among the units in different countries, relocating research, replacing national technological solutions with global ones, and adopting technology developed elsewhere in general, are all issues that in the short term easily clash with national or local interests and feelings of self-esteem. The personnel in a foreign – or alternatively,

domestic – R&D unit may feel threatened if their responsibilities appear to be decreasing or radically changing.

It is important for corporations to surmount the differences in national culture, and also the explicit conflicts of interest. Corporations need to gain and maintain the best local research and development workforce and secure their help in creating a beneficial interaction with the host country and the local research environment.

In the most common host countries of Finnish companies' foreign R&D units, there is actually a long tradition for the presence of foreign-owned R&D units. Thus, they seldom encounter strong nationalist emotions in these days. The increase in foreign-owned R&D units outside the major OECD countries is still a different matter in this respect. Many developing countries may be extremely eager to gain new R&D units along with production plants (e.g., China), whereas other countries may be extremely concerned about the loss of local R&D units to foreign companies (e.g., Norway).

The company interviews indicated that overcoming national differences and interests is in general easier the more renowned Finland's competence is in the field of technology in question. Finland has an especially good reputation in the fields of the forest cluster and telecommunications technology. Few would deny the expertise, in their own field, of Nokia or the three large Finnish forest industry corporations. In this respect, Finnish companies in the engineering industry and chemicals are in a more difficult position.

3.4 Making use of scale, leading edge and diversity

The Finnish corporations that have successfully become international are in a totally different situation in the present decade than they were ten years earlier. The companies are, or at least try to be, among the leading global companies in their focused fields of business.

For one, the companies' R&D resources have doubled very rapidly, and have often grown even much more than that. One of the questions occupying the interviewees was how to make efficient use of this increase in the scale of R&D. Is enough research being done, or perhaps even too much? What should the relation be between the company's own and outsourced research in this new situation? How extensive should the research be, or should one only focus on the most important fields? How does one combine creativity and efficiency in an R&D

organization that has suddenly become huge? How does one ensure the productivity of R&D investments?

At the same time, the companies' R&D operations have entered a qualitatively new situation. As leading-edge companies in the world, the Finnish companies need to take on the role of technology developer, instead of their earlier one of applying new technology developed by others. This qualitative transformation from applying adopter (or even copier) to creator of new knowledge and organizer of international leading-edge research was experienced by many of the technology directors interviewed as a profound and challenging change.

In many of the interviews, taking on the role of leading technology developer was considered to entail the important task of utilizing the diverse R&D competence accumulated in the new company operations abroad. The multi-nationalizing companies have accumulated technological competencies that are different from the Finnish competencies and perspectives. Successful encounters among the diversity of different national units can create the excellence that is expected of a truly global company. In principle, it was believed that Finnish companies at least have a good attitudinal propensity to respect and benefit from diversity, when compared with American companies. In fact, the Finns are more used to importing than to exporting technology, at least in comparison with the large OECD countries. In future, a similar positive attitude will be required with respect to, for example, countries in Eastern Europe and Asia.

4 Finland's national interests and the challenges for technology policy

It has previously become clear that developing research in Finland alone is not a viable alternative for corporations that are growing into multinationals. In the most advanced multinational companies, the division between domestic and foreign is no longer even a relevant perspective. In such companies, Finland is positioned as one country of operation alongside others, and the issue is to learn how to manage a genuinely multinational R&D organization.

From the perspective of Finland's national interest, however, it is important to identify the consequences of our companies turning into multinationals. Which of the consequences are potential problems, and how can these be resolved? Obviously, a central issue is how competitive Fin-

land is in the eyes of the technology directors of large companies when they decide where to locate their new R&D units.

The technology directors interviewed thought, perhaps surprisingly unanimously and clearly, that Finland is highly competitive as a location for R&D operations. In quantitative terms, the interviewees were fairly satisfied with the availability of research resources. The lack of information technology experts, which was a problem in the late 1990s, appears to have been solved. The interviewees found the most evident lack of experienced experts to be in the fields of medical technology and biotechnology.

In qualitative terms, the interviewees considered Finnish researchers' level of competence to be generally high. For example, in the case of the forest cluster, the interviewees emphasized the continuing high social status of the field, resulting in its ability to attract high-quality students. The situation is more problematic in the fields of the metal and engineering industries, in which Finland is not so strong, and which have somehow gained a grey "basic industry" image. Special strong points of Finnish R&D personnel mentioned by the interviewees included their practical attitude and their proficiencies in specialized development work. By contrast, the Finns' lack of extensive and in-depth competence in the basic natural sciences was identified as a typical weakness.

In most companies, the alternative to Finland as an R&D location would be a Western European country or the United States. In these countries, however, the salaries of research staff are clearly higher than in Finland. Thus, Finland is very competitive in terms of labor costs. Until now, it has been extremely rare to use Eastern Europe or Asia as a cheaper alternative for R&D. Potentially, software engineering was viewed as one of the tasks in which foreign contracting may grow rapidly.

The statistics on research and development operations confirm the technology directors' views of Finland as a highly competitive location for R&D. As a rough, simple measure for anticipating potential problems, we can track whether the growth in the relative share of foreign research affects the absolute amount of research investments in Finland. Tables 4.1 and 4.2 indicate that this has not, at least yet, been the case. The investments, personnel, and person-years of work in business R&D have continued to grow in the past few years, even though economic growth has been slow. According to Table 4.1, research investments have decreased in 2000-2003 only in the food industry and in electrical, gas, and water utilities. In these industries, however, the developments are not due to increased foreign R&D by Finnish companies, but rather to the growth of foreign-owned businesses in Finland, and the overall poor outlook of these sectors.

Table 4.1 Business R&D investments in Finland by industry in 1995 - 2003, million euros in current process

Industry	1995	1997	1999	2000	2001	2002	2003*
Companies, total	1,375	1,919	2,644	3,136	3,284	3,375	3,380
Industrial companies, total	1,116	91,542	2,162	2,539	2,602	2,617	2,635
Food industry	55	50	54	63	60	50	50
Textile, leather and apparel	7	10	13	13	15	11	14
Wood processing industries	63	73	76	87	93	97	111
Chemicals	183	197	226	257	288	321	271
Metal and engineering industries	219	282	339	350	400	367	371
Electronics	564	904	1,421	1,725	1,701	1,732	1,777
Other industrial companies	26	26	37	44	45	39	41
Electricity, gas and water utilities	13	30	28	20	29	14	16
Construction	10	16	25	32	25	40	42
Wholesale and imports	12	26	42	58	53	76	79
Transport, storage and telecommunications	44	70	111	107	133	114	126
Information technology services	43	42	94	123	189	229	209
Research and development	72	91	111	136	125	176	162
Other business services	47	65	51	105	112	90	90
Other sectors	18	36	21	17	17	19	22

Source: Statistics Finland

Table 4.2. R&D personnel and person-years of work in Finland, 1991 - 2002

	1991	1993	1995	1997	1999	2000	2001	2002
Personnel	24,835	19,678	24,243	29,139	36,406	38,169	37,971	39,239
Person-years	15,028	15,180	17,798	22,302	27,818	29,384	30,090	30,321

Source: Statistics Finland.

This generally favorable picture may, however, be too positive to allow us to detect potential problems on the horizon. A central issue, according to the interviewees, is that the relation between the companies they represent and the Finnish innovation system is inevitably changing as their business becomes more focused and internationalized. The increasing focus on specific business areas implies that the companies will not necessarily continue to take an interest in the whole range of Finnish R&D competence outside their own core field. Thus, we may have to question whether the emerging Finnish multinationals will continue to interact with the overall Finnish innovation system and generate their competence within it, or whether their attention will turn exclusively to co-operation with foreign partners, for example, if attractive partners cannot be found for co-operation in their narrow fields of focus.

The increase in focus strategies and internationalization in large companies may decrease the number of fields in which corporations engage in research co-operation in Finland. For example, the company representatives suggested that, in this new situation, they may have difficulties in maintaining an extensive and steady volume of orders for public-sector research units in less-important fields. Will new small and medium-sized companies fill this gap? As for now, the internationalized companies were willing to accept the fact that Tekes, the National Technology Agency, and other public research funds required applicant companies to network with newer and smaller companies and thus serve to develop a more extensive domestic knowledge-base. Thus, public funding is not only directed to the existing 'Nokias', but also to the upcoming 'Nokias'. In this connection, however, the interviewees also raised the question of whether public funding agencies would be prepared to support Finnish companies' development projects that involved the procurement of foreign research services.

The current trend is for large internationalized companies to encourage their subcontractors to internationalize, as well, in order to be able to provide the same services at all locations. In the case of national universities and research institutes, this raises the question of whether they, too, should go international, so as not be considered merely local partners. The solution, according to the interviewees, might be an intensive international networking and co-operation, rather than the actual foreign expansion of research and educational institutions.

The focus strategies of large Finnish companies have created space for foreign companies in Finland. This might serve as an alternative route for channeling Finnish know-how into the international market, although the foreign companies may not have such a long-term commitment to

Finland as the domestic companies. In the past few years, the foreign R&D investments of Finnish companies have been about 2,200 million euros per year. There are no accurate figures available on the R&D investments of foreign-owned companies in Finland. A study by Statistics Finland reported the figure of 320 million euros in 1998. Information collected by the newspaper *Tekniikka & Talous* reported the investments as being about 400 million euros in 2002. The interviewees believed that Finns should focus on increasing these investments by foreign-owned companies in Finland in order to safeguard its future interests.

5 Finland's situation through the international literature

The previous sections have focused on describing the internationalization of Finnish companies' R&D operations on the basis of statistics, company examples, and interviews with technology directors. In order to elaborate on this picture, this final section will review the recent international literature on the globalization of R&D operations. Comparing the present findings with topics and findings in the contemporary international literature helps to identify special Finnish characteristics, and also to see if there are any emerging issues that may become important in Finland in the future.

The research topics discussed in the following concern the location of R&D units, current topics in developing international R&D organizations and issues in cultural diversity. These appeared to be the central topics identified in a search of the literature, which provided more than 40 relevant articles published in 1999-2003. In general, research on the internationalization of R&D operations began in the 1970s, increased significantly in the 1990s, and has expanded very rapidly in the past few years (for a good review, see Niosi 1999). The research rarely deals with Finnish companies; only a few articles mention Finland. The most commonly studied companies are from the US, Japan, and Sweden.

5.1 Entry model and locations of foreign R&D units

A central observation pertaining to Finland was that foreign R&D units are usually the result of business acquisitions, and that there are few greenfield investments. The literature review indicated that the entry model issue is not such a popular topic in the current literature; it also

seems that it is more common for foreign companies to establish R&D units as greenfield investments (Belderbos 2003). The lack of attention to this issue is also due to the kinds of data typically used, which do not necessarily provide information on the origins of the R&D units.

Patents are a popular type of data in the current research (US patents or European EPO patents). Patent databases can be used to find out the home country of the persons indicated as inventors, and thus deduce the location of the significant innovation activities of different companies (e.g., Patel & Vega, Guellec & van Pottelsberghe de la Potterie 2001, Belderbos 2001). According to Cantwell and Janne (1999), it appears that foreign R&D units from small countries like Finland make innovations in a focused manner in the same fields as they do in their domestic country (expansion of existing competence), whereas the research of large, developed countries becomes more diversified abroad (acquisition of new competence).

Le Bas & Sierra (2002) studied how patents by foreign R&D units of companies originating in different countries were distributed among different fields of technology. For each company, they first defined the fields of technology in which it was strong and weak in its home country. Then they defined for each potential R&D host country, whether it was strong or weak in these fields. According to their study, patents by multinational companies' foreign R&D units (which was about 20% of the patents by the companies studied) were mainly focused in fields of technology in which both the company is strong in its home country, and the host country is also strong (48% of the patents). In this study, Finland and France are the only countries in which the majority of the companies' patents (54%) are in fields in which the company is strong in its home country, but the host country is weak. This is considered a weakness by the authors, and an indication that Finnish companies are following a myopic strategy. The study was based on EPO patents in 1994-1996. Four companies represented Finland in the data. In interpreting these findings, it is worth noting that at that period, the internationalization of Finnish companies was just beginning, and the data are very limited. Furthermore, the findings can be interpreted as reflecting the acquisition strategy of Finnish companies: Finnish companies have made acquisitions in fields in which they themselves are strong, acquiring competitors that were not equally strong.

Many studies have compared the ways in which US, Japanese, and Swedish companies locate their R&D units (e.g., Grandstrand 1999; Kumar 2001 and Jones & Teegen 2003). There are apparent differences between these countries, but the more important observation from these

comparisons is that there are quite a few other influential factors besides the technological level of the company and the host country. In the studies, such factors have included the size of the market, the availability of R&D resources, cost factors, etc. The articles also emphasize the same observation as has been made here concerning Finland: R&D units are very diverse, and are thus located in different countries even though most of the foreign-owned R&D units are still located in the large OECD countries.

In a recent article, Jan Hendrik Fisch (2003) emphasizes the incremental, historical development of companies' R&D locations. According to him, companies have not, until now, been able to locate their foreign R&D units in an optimal, rational manner. The company representatives emphasized that "organizational power and inertia had so far prevented the desired R&D allocation across countries and their R&D networks were still in a phase of adaptation" (Fisch 2003, 1394). This observation is also very valid for Finnish companies.

5.2 Developing the organizational structure for international R&D

Traditionally, companies' international R&D organizations have been studied from the perspective of the evolution of the dynamics between corporate headquarters and subsidiaries (e.g., Asakawa 2001a and 2001b). Finding the right balance between integration and autonomy of foreign R&D units has been considered a central problem. Adequate integration is necessary in order to enable information exchange and research focus, yet on the other hand, local units need to have autonomy and commitment to the local research environment, which are crucial for their innovativeness (Håkansson & Nobel 2001). Studies have found that different companies solve this problem in different ways (Chiesa 1999, Furu 2001 and Su 2002). To make a sweeping generalization, companies today favor models that emphasize subsidiaries' autonomy in terms of decision-making while reinforcing the efficiency of information exchange. At the same time, it is underlined that local units may be more progressive than headquarters in some aspects. Thus in the new global context, multinational corporations need to transform from teachers into learners; they must act globally, but think locally (Doz, Santos and Williamson 2001; see also Pearce 1999). This model was previously recognized as being well suited to Finnish companies; the Finns are more accustomed to importing than exporting technology.

Recent research has also attempted to surmount the headquarters-subsidiary dichotomy by investigating the communication mechanisms between headquarters and subsidiaries in more detail. Guido Reger (1999) divides these mechanisms into four groups (1) structural and formal mechanisms (coordinating bodies, standardization, planning & budgeting, and control of results); (2) hybrid/overlaying mechanisms (multinational teams, projects, and platforms); (3) informal mechanisms (communication, socialization by creating a general organizational culture); (4) internal markets (contract research). His analysis indicates that all these mechanisms can be used; which mechanism is the best depends on the issue at hand. On the basis of studies by Howells (2000) and Persaud, Kumar & Kumar (2002), one might perhaps claim that the role of hybrid and informal mechanisms becomes more important after the company has managed to establish working structural and formal mechanisms. The observations in the present article indicate that this is the stage in which most Finnish companies are at present.

In fact, many studies have found that the structures of multinational companies' R&D networks change considerably as a consequence of their expansion. Alexander Gerybadze and Guido Reger (1999) conclude that "distributed R&D activities and globally-dispersed innovation processes resulted in overly complex and unmanageable organizational architectures", as a consequence of which transnational corporations have tended to consolidate and streamline their organizations since the mid-1990s. Oliver Gassmann and Maximilian von Zedtwitz (1999 and 2003), however, emphasize on the basis of their empirical analyses that "since effective changes in behavioral orientation require considerable time, successful quantum leaps in multinational R&D organizations are next to impossible".

The most clearly discernible international trend is that the process of internationalization in research and technology has been accompanied by an increasingly selective focus on a very few locations and the concentration of innovation activities in worldwide centers of excellence (Meyer-Krahmer & Reger 1999). As examples of this trend, Reger (2004) presents the Philips center of excellence model, Zander (2002) the ABB model and Birkinshaw (2002) compares the models of ABB, Alfa Laval, and Ericsson. In the light of the previously presented data, the most advanced Finnish companies are constructing similar networks at the same time as they have refocused and partly downsized R&D units in acquired companies.

Another new area of interest in the literature focuses on horizontal project teams (cf. the previously-mentioned hybrid/overlaying mecha-

nisms). More and more companies are putting together their research and development projects using a model in which the project leaders can select the best resources and persons from any research unit in the company. A special issue of *Journal of World Business* (edited by Atamer & Schweiger 2003) has collected experiences of managing such projects, mainly in Europe (see also Chiesa 2000, Moenaert *et al.* 2000, Gassmann & von Zedtwitz 2003). Among the Finnish companies, Nokia is clearly the most advanced in creating such a structure. The interview with the Nokia representative also indicated that Nokia considers its central R&D advantage to be specifically in the efficient operation of multicultural project teams, which is based on the Nokia corporate culture, and the commitment and successful rotation of personnel. The special issue of *Journal of World Business* emphasizes that successful teams require, as a foundation, a more fundamental shift from coordination-based structural organizational designs to human-interaction-based designs (Atamer & Schweiger 2003, 81).

In the interviews, the Finnish company representatives placed much emphasis on the observation that there are, at least superficially, significant cultural differences among companies and researchers from different countries. This issue has also been studied internationally, although the literature search did not find an extensive literature pertaining to this issue in international R&D in particular. Yet there is extensive research on national differences in general. There have also been studies on the extent to which companies from the United States select the location of their R&D units on the basis of national cultural traits (Jones & Teegen 2001, Jones & Davis 2000). Studies have also compared how successful companies from different countries are in a specific host country. For example, Alice Lam (2003) has compared the abilities of Japanese and American companies to operate in the R&D networks in the UK. From the Finnish perspective, however, the most interesting studies are perhaps those that have focused on cross-cultural management in multinational project groups (e.g., Smeds, Olivari & Corso 2001). According to Sylvie Chevrier (2003, 141), three kinds of cross-cultural practices emerged from a comparative study of European project groups: (1) drawing upon individual tolerance and self-control, (2) entering into a trial-and-error process coupled with relationship development, and (3) capitalizing on transnational corporate or professional cultures.

Two overall impressions emerged from the small-scale review of the current international literature in the field. In terms of the research itself, it appeared that the researchers have a hard time keeping up with the pace of corporate change. Quantitative research data (e.g., patents), in particular, are easily so outdated that they do not provide an accurate

picture of the current situation. On the other hand, the statistical and interview data collected for the present study give the impression that Finnish companies are, quantitatively speaking, somewhat behind in the internationalization of their R&D organizations when compared with the companies from other OECD countries dealt with in the foreign studies. On the other hand, the articles did not reveal any totally new or surprising issues when compared with the topics raised by the technology directors interviewed, or emerging from the other Finnish data used.

6 Conclusions

It is often claimed that industrial research is very rapidly internationalizing, and that this is largely because it is becoming difficult to find competent and competitively-priced people in Finland. The internationalization of research is also often spoken of as if research were migrating over the border.

The findings presented in this article indicate that this way of speaking is misleading. Finland is, at least for the moment, quite competitive as a location for R&D operations. Research has not been transferred abroad, either. Yet as companies' markets and production become international, it is absolutely necessary for them to have R&D resources abroad. Such resources are mainly obtained as a result of business acquisitions, but in some cases, also by establishing new units abroad. Of course, as the R&D operations of Finnish multinational companies become international, it is important that this is counterbalanced by increased research in Finland by foreign multinationals. Increasing attention should be placed on attracting foreign R&D units to Finland. Likewise, a current concern should be to increase the number of foreign students and researchers in Finland.

The foreign R&D units of Finnish and other multinational companies are heavily concentrated in the large OECD countries. In the future, however, it seems that Finnish companies will also be increasingly interested in China, India, and Russia, especially in terms of greenfield investments. The present study also emphasizes the point that the functions of foreign R&D units vary, and thus they may be located in quite different kinds of countries (e.g., some on the basis of the technological competencies available in the country, some on the basis of large markets, and some on the basis of the availability of cheap R&D services).

For the most internationalized large companies, R&D management has turned into the management of a multinational R&D network. In

this context, Finland appears as one potential location for R&D resources – albeit in many cases still the most important individual one. Managing such a network and integrating it into the business units' operations is a challenging management issue, all the more so as the role of technological competitiveness in overall business competitiveness is continually growing. Topical issues, both internationally and in Finland, include the streamlining of swiftly grown R&D organizations, implementation of the centers of excellence model, and the development of informal models of interaction between research units. In the international literature review, the management and organization of multinational R&D projects emerged as perhaps the most interesting issue for many companies. In this respect, the most advanced Finnish company is Nokia.

A recurrent issue in the international literature is that the diversity of international R&D units should be put to good use. This not only means exporting technology, but also importing it. The hypothesis in this article is that this interactive model should come quite naturally to Finnish multinational companies on the basis of their traditional role of technology importer.

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Appendix 1.

The corporate R&D managers interviewed.

Hannu Ahjopalo, Executive Director, Instrumentarium 12.11.2001
Lars Gädda, R&D Director, M-Real, November 2001.
Esa Heinonen, R&D Director, Orion Pharma, 4.3.2002.
Markku Karlsson, Senior Vice President, Metso, 22.11.2001
Ilkka Kartovaara, Technology Director, Stora Enso, 5.2.2002.
Pekka Kemppainen, Senior Vice President, Kone, November 2001.
Matti Kleimola, Group Vice President, Wärtsilä, 14.1.2002.
Matti Lievonen, Executive Vice President, UPM-Kymmene, 26.2.2002.
Erkki Ormala, Technology Director, Nokia Oyj, November 2001.
Pekka Peura, R&D Director, UPM-Kymmene, 4.1.2002.
Raimo Rantanen, Technology Director, Outokumpu, 14.3.2002.
Hannu Toivonen, Technology Director, Kemira, 27.3.2001.

CHAPTER IV

The Globalisation of the Production Network: The Case of the Development of the Finnish ICT Electronics Companies in the USA's Dallas-Fort Worth Region of Texas

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ABSTRACT: *Beginning in the early 1980s and extending into the early 1990s, Nokia established ties to the USA's Dallas – Fort Worth (DFW) Region in Texas when it established joint-venture mobile phone manufacturing subsidiaries with Fort Worth-based Tandy Corporation in the Republic of Korea and the City of Fort Worth, respectively. As the demand for mobile phones grew in the USA, Nokia found it necessary to build a distribution center and larger mobile phone plant in DFW. In order to shorten the supply chain serving these U.S. operations, Nokia asked partners in its Finnish-based production network to move to DFW in the mid-1990s. Several of these companies promptly located to DFW, and they were later followed by not only companies in Nokia's and their own networks, but also by Finnish ICT electronics companies that serve other segments of the electronics and telecommunications industries. Virtually all of these companies clustered together in DFW, which coincidentally is the major center for the U.S. telecommunications industry. After an uneven start, they began to share information about the new business environment and in some instances even cooperate, initially on an informal basis, but more formally in recent years.*

TIIVISTELMÄ: *Tässä artikkelissa tarkastellaan Nokian ympärille keskittyneen yhteistyöverkoston syntymistä ja kehittymistä Yhdysvaltoihin. 1990-luvun alussa Nokia perusti Dallas-Fort Worth:in alueelle matkapuhelin- ja matkapuhelinverkkotehtaan. Lyhentääkseen toimitusaikojaan Nokia pyysi 1990-luvun puolivälissä useita sen suomalaisia yhteistyökumppaneita perustamaan omat tehtaansa DFW-alueelle. Moni yritys seurasi kutsua ja perusti tehtaan USA:aan. Nokian yhteistyökumppaneiden lisäksi myös jotkut muut suomalaiset elektroniikka- ja tietoliikennealan yritykset ovat perustaneet yksiköitä samalle alueelle. Perustamisen alkuaikoina yritykset vaihtoivat tietoja uudesta liiketoimintaympäristöstä ja siinä toimimisesta. Lisäksi monet yrityksistä ovat tehneet myös yhteistyötä toistensa kanssa.*

1 Introduction

As Nokia's business grew in the telecommunications sector in the 1990s, the company found it necessary to move part of its production operations into foreign markets to be nearer to customers and partners as the demand for wireless communications products expanded. One of these location was the Dallas – Fort Worth (DFW) area of Texas.

DFW is approximately 8395km from Helsinki. Nokia's expansion to this distant region in Texas has been described as being partly coincidental.[1] This is true, but there are sound reasons for Nokia to be in DFW.

When thinking of 'Dallas' one conjures up images of mythical Texas oilmen, such as J. R. Ewing in the popular 1980s television series, as well as the fantasized images of cowboys and the open prairie. These images are indeed influenced by local history, and one can even find characters and places appearing similar to these today. However, 'Dallas,' as the term is incorrectly applied to the entire local region in Northeast Texas, is seen by those in the know as a "digital dynamo" and "silicon prairie."[2] [3]

Nokia's business in DFW expanded rapidly in the 1990s. In order to make its supply chain more efficient, Nokia found it beneficial to invite some of the supply and service vendors to Texas that had helped support the company's success in Finland. Several of the companies readily accepted Nokia's invitation and others would follow later.

At the ribbon-cutting ceremony at Nokia's new Alliance distribution center in 1995, Jukka Valtasaari, the Finnish Ambassador to the United States, told the press:

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1 Möttölä, M., "Fast growth for Nokia deep in the heart of Texas," *Helsingin Sanomat*, 21 October 2000.

2 The Greater Dallas Chamber of Commerce referred to Dallas as a "Silicon Prairie" and "high-tech hub" in 1998 when it presented a package of materials for presentation to Finnish visitors to the 1999 EUROTEX trade event.

3 The Federal Reserve Bank of Dallas cites studies identifies studies that establish Dallas as a "digital dynamo" in Walker, M., "Talking Tech in Texas," *FBR Dallas Hot Topics*, February 2000.

"The U.S. is not the easiest place for a foreigner to operate. The culture is totally different. You come here and you have to figure the whole thing out – how the country operates. Therefore, companies tend to come in clusters." [4]

The purpose of this paper is to explore the development of the Finnish information and communication technology (ICT) electronics community in DFW, including information on how they collaborated in order to operate more efficiently. This is important, because these companies, some of which work for Nokia and some of which do not, have been and still are at the forefront in adapting to rapid and deep changes in the global electronics landscape. Interestingly, many of them seem to have found a place in DFW, which has not been immune to the creatively destructive nature of some of these changes. Although not formally joined, they are positioned in DFW as a 'virtual' production network that has a potential outside of Nokia's commercial horizon.

The following sections include both desktop research as well as personal interviews. In both areas, the words of the individuals that have investigated and/or taken a hand in shaping the destiny of the Finnish ICT electronics network in DFW is presented. In addition, a spatial and economic description of DFW's landscape is provided in order to view the operating environment in which the Finnish companies found themselves. Information is also presented that serves to clarify important terms as well as to highlight important research and opinion that is related to what has happened in DFW.

2 Definitions

The Finnish ICT companies in DFW represent a significant value chain, and as suggested above, even outside of Nokia they have the potential to be viewed as a 'virtual' production network.

Table 2.1, below, provides convenient definitions of both a "value chain" and a "production network."

In considering the proposition of a virtual production network, there has sometimes been confusion among some members of the Finnish ICT community in DFW over the definition of a "production network." Part of the confusion seems to rest in the idea that production

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[4] *The Business Press*, 10-16 February 1995.

means manufacturing. However, Zysman (2003) observes "*the meaning and not just the role of manufacturing has evolved. The term production, as the act of producing something, can encompass a range of products, digital as well as physical, and also delivery platforms that provide services.*"

Table 2.1 Value Chain vs. Production Network

Name	Products	Metrics	Other Names
Value Chain	The sequence of productive – i.e., value-added – activities leading to and supporting end use	The bundles of activities that various actors do, or do not, engage in	• Supply chain • Commodity chain • Production chain • Activities chain • Product pipeline
Production Network	A set of inter-firm relationships that binds a group of firms into a larger economic unit	The character and extent of inter-firm relationships	• Value network • Supply-base

Source: Sturgeon, 2001

3 Literature review[5]

Evidence began to emerge in the 1990s suggesting a "new model of industry organization" in the electronics industry (Sturgeon, 1997). This model focuses on functional specialization versus vertical integration. And it takes advantage of external economies by subcontracting with outside suppliers that possess "core competencies" which exceed those that were previously kept in-house.

Sturgeon (1997, p. 4) states:

"At the most basic level of firm-to-firm contracting, external economies are created when one firm "outsources" or "subcontracts" an activity to another firm that had previously been performed "in-house." The totality of the external linkages created by contracting relationships in larger amalgams of firms have been described as "production networks."

[5] Much of the work in this section is derived from the author's unpublished master's dissertation, *Globalisation, production networks and technopoleis: An assessment of Nokia's impact on Oulu, Finland*, University of London, 2001.

Finnfacts (2/2001), in reporting that two out of three Finnish industrial companies are participating in production networks, states: "No other factor can explain the rapid growth in industrial production of the past few years as new investments have been relatively scarce and there have been few production bottlenecks."[6]

Kogut et al. (1993) state: *"Because social and political relations are significantly delimited by national boundaries, [production] networks tend to consist of a high density of relations with actors within the same nation."*

While the precise number and full identities of Nokia's production network partners in Finland is closely guarded, it could be inferred from the work of Ali-Yrkkö (2001) that there were about 300 companies in 2001 in Nokia's first-tier network in Finland.

It is important to note that the nature of the outsourcing relationship in Finland has changed from ad hoc, arms-length transactions to cooperative strategic partnerships, as indicated in Table 3.1. Strategic partnerships involve trusted key suppliers in the intimate details of a company's product design and production planning.

Table 3.1 Levels of corporate cooperation in Finland, 1993 - 2000, as a percentage (%)

	1993	1996	2000
Strategic Partnership	18	24	34
Annual agreement	47	44	33
Project-based	21	20	20
One-time	14	12	12

Source: *Finnfacts* (2/2001)

Ali-Yrkkö (2001) finds that Nokia began establishing strategic partnerships in manufacturing in the early 1990s and in R&D in the early 2000s.

Kogut et al. (1993) find that closely tied network relationships tend to lead to an increase in future relationships, which has the following implications:

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6 *Finnfacts*, 2 - 2001, p. 1.

"First, because information is determined by previous relations and in turn influences the subsequent propensity to do subsequent relations, the structure of the network tends to replicate itself over time. The early history of cooperation tends to lock in subsequent cooperation.

Second, this pattern of replication implies that subsequent decisions need not be optimal in a global sense. Firms and managers do not search a network for all possible partners, but tend to respond to signals in their neighborhoods."

Pajarinen et al. (1998) state:

"In recent years we have experienced an expansion of company networks: rather than expanding through mergers and acquisitions, companies make cooperative agreements. The building of these corporate networks continues and business activities will become more dispersed geographically."

In commenting on the globalization of the electronics industry, Dieter (1997) suggests:

"In essence, electronics firms are breaking down the value chain into discrete functions and locating these functions wherever they can be carried out most effectively, where they are needed to facilitate the penetration of important growth markets, and where this enables the firm to generate closer, faster and more cost effective interaction between different value chain stages across different locations."

For the Finnish companies in Nokia's network that began to arrive in the USA in the mid-1990s, it is important to note that Borrus (1997) finds that U.S. electronics industry production networks had been shifting to the China Circle and Singapore as early as the 1980s. A cold and foreboding reality to these networks can be seen in his description of them: "open, fast, flexible, formal and disposable."

Capitalism's tendency toward creative destruction in order to seek increased profits has been recognized for sometime (Schumpeter, 1962). However, in a world of uncertain business footings, some places manage to hold on to the companies that establish themselves in their area (Markusen, 1999).

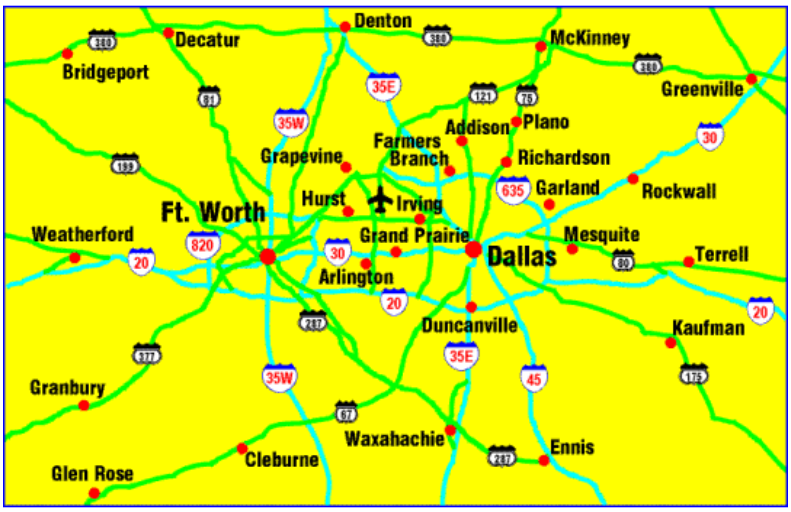
Zysman (2003) suggests:

"When production changes very rapidly, jobs can be dislocated or altered. However, if production doesn't change, then those jobs become commodities and are vulnerable to innovation abroad or moving abroad…the question…is how to adapt to the changing logics of production."

4 Spatial overview of the Dallas – Fort Worth (DFW) Metroplex

The Dallas – Fort Worth Metroplex ("DFW"), as it is correctly termed, is the largest consolidated metropolitan area in the State of Texas, with a population of 5.9 million. DFW's geographic footprint covers 12 counties in Northeast Texas, as shown in Figure 1, and its metropolitan area amounts to 995km^2. DFW is anchored by the cities Dallas, with a population of 1.2 million in the east, and Fort Worth, with a population of approximately 550 thousand in the west. Seven other cities/suburbs in DFW have populations greater than 100,000 and 57 cities/suburbs have populations ranging between 10 and 100 thousand.

Figure 4.1 Dallas – Fort Worth Metroplex



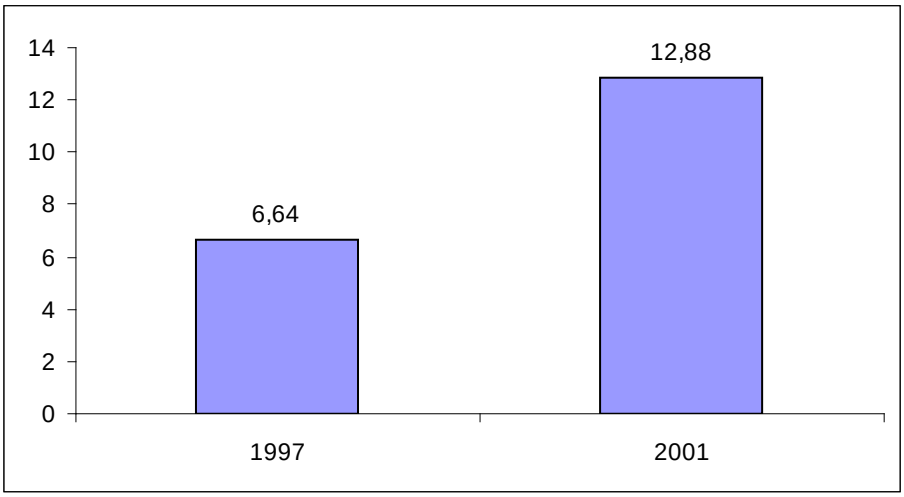
The neighboring and sometime rival cities of Dallas and Fort Worth were informally unified in 1974 when the Dallas – Fort Worth (DFW) Airport was opened. Today, DFW Airport is the third busiest airport in the USA behind Atlanta and Chicago, and it is ranked 6th in passengers and 24th in cargo worldwide. Its southerly central location in the USA allows the business traveler to travel roundtrip to each coast in a single day. The airport also has direct flights to a number of international destinations, including Europe, Canada and Latin America.

'Unification' is also facilitated by four major U.S. interstate highways connecting to DFW, both north and south (IH-35 & IH-45) and east

and west (IH-20 and IH-30). From DFW's somewhat central location in the USA, these highways provide ground logistics links to other regions in the USA and North America.[7]

As an economic region, the City of Dallas has traditionally been the transportation and marketing center of North Texas, and the City of Fort Worth, also nicknamed "Cowtown," has traditionally been the major center for Texas' agricultural industry. However, in the 1990s, DFW emerged as a "high-tech hub," especially as shipments from the Texas-based communications industry soared in the 1990s (See Figure 4.2).

Figure 4.2 Texas Communications Industry, Value of Shipments, 1997 and 2001 (Billion USD)



Source: State of Texas

According to the Federal Reserve Bank of Dallas, DFW holds the third largest number of high-tech jobs in the USA, behind San Jose, California, and Boston, Massachusetts, and DFW's growth rate in high-tech employment exceeded San Jose's between 1990 and 1996. In 1999, the Milken Institute gave DFW's economy a number two ranking in its list of the top ten U.S. "Tech Poles." And today, while DFW's high-tech

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[7] IH-35 ("the NAFTA Highway)," for example, splits north of DFW Airport, passing through both the cities of Dallas and Fort Worth, and reconnects south of the Metroplex. This highway provides a major transportation link between the USA and Canada and Mexico. Local Finnish companies have utilized it as a link between DFW and factories in Mexico.

employment has suffered from the economic recession, the region still has the highest concentration of telecommunications-related firms in the USA. [See Appendix for a description of established major ICT firms in DFW.]

Key cities in the DFW ICT industry landscape are Dallas, Richardson, Irving and Fort Worth. The City of Dallas itself does not have a large number of ICT firms, but it is home to electronics industry pioneer Texas Instruments, which is the largest wireless IC manufacturer in the world. The City of Richardson encompasses the region named by the local chamber of commerce as Telecom Corridor®, which is home to over 600 telecommunications-related companies, including subsidiaries of Alcatel, Ericsson, Fujitsu, Nortel and Samsung. The City of Irving, where DFW airport is located, is a regional headquarters for Nokia and the logistics and long-distance headquarters for Verizon, the USA's largest wireline and wireless carrier. The City of Fort Worth has had high-tech employment in defense-related aerospace by such companies as Lockheed Martin and Textron Bell, but it is also the long-time home of RadioShack®, formerly Tandy Corporation, which is the largest retailer of mobile phones in the USA. And it has the "7500-acre, master-planned business, aviation and industrial trade development," known as "Alliance," which is the home for Nokia Mobile Phone's U.S. assembly and distribution operations.

The foundation for the Alliance Development began in the 1980s when the U.S. aviation authorities were looking for a relief runway for DFW Airport. Out of this sprung the first purely industrial airport in the Western Hemisphere, which is utilized as a hub by Federal Express as well as other air logistics interests. Alliance is a designated foreign trade zone, and its logistics purposes are well served by major highway and rail connections. Aside from Nokia, a number of companies maintain distribution centers at Alliance, including Motorola.

5 Nokia and Tandy Corporation

In the October 2003 issue of *Insinööri*, K-P. Wilska, head of Nokia in the USA, recalled that his greatest accomplishments were getting Mobira [Nokia] into the USA and establishing a factory in Korea.[8] The roots of

[8] The January-February 2002 issue of *Global Supplier* reported that Nokia's Korean factory manufactured its 100 millionth handset in November 2001.

this success can be found in the relationship that he formed on behalf of Nokia with Tandy Corporation.[9]

Nokia is credited with establishing its mobile business in the USA as early as 1980, when Nokia-Mobira Cellphone established a sales office in Largo, Florida, and a head office in New Jersey near AT&T.[10] (Høberg-Peterson et al. 1999) Nokia's CEO at the time, Kari Kairamo, pushed Mobira's hesitant executives to develop a U.S. presence, because he believed that this Nokia subsidiary was better positioned than Nokia's other units to succeed in the USA.[11] [12] K-P Wilska recalls: *"Entering the U.S. market was not included in our plans, but Kairamo gave us a little nudge – and it was not a very little one at all."* [13]

A major obstacle, however, was that Mobira's global sales were small, and Nokia was unknown in the USA. Looking back in 1994 on Nokia's entry into the USA, K-P Wilska said: *"We didn't have the money to do it all ourselves."* [14] Fortunately, Nokia understood "the benefits of strategic partnering" (Van der Heijden et al. 2002).

A representative from the British company Plessey met with K-P Wilska, who was then head of marketing for Mobira, at the Telekom fair in Geneva in 1983 and informed him of a company that wanted to enter

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[9] The story of Nokia's 50/50 alliance with Salora and the creation of the early wireless terminal pioneer Mobira as well as Nokia's ultimate full control of the venture, which eventually led to all of Nokia's phones being tagged with the Nokia brand, has been summarized elsewhere. (E.g., Paija 2001) Here we will discuss Mobira's and later Nokia's involvement with the DFW-based Tandy Corporation, and hereafter utilize the name Nokia as the point of reference for the Finnish relationship with the American company.

[10] In the 1980s, additional sales office would be established by Nokia-Mobira in Los Angeles, Detroit and New Jersey.

[11] Alkio, J., "Number one in the promised land of brands," *Helsingin Sanomat*, 7 April 2002.

[12] The then head of Mobira, Jorma Nieminen, explained in 1984 to American business readers the basis of Nokia's U.S. entry: "When an investor in Silicon Valley opens his garage door to show off his latest ideas, he has 50% of the world market in front of him. When an investor in Finland lifts his garage door, he faces 3 ft. of snow."

[13] Alkio, J., "Number one in the promised land of brands", *Helsingin Sanomat*, 7 April 2002.

[14] Van der Heijden et al. (2002), *The Sixth Sense: Accelerating organizational learning with scenarios*, Wiley Europe.

the mobile phone business.[15] The company was Tandy. It had over six thousand RadioShack® stores in the USA that were reportedly minutes away from over 90 percent of all U.S. consumers. Tandy understood U.S. consumer electronics markets, but it lacked wireless technology. This chance encounter ultimately resulted in Nokia and Tandy agreeing to join forces in the mobile phone business.

Jyrki Alkio wrote in the 7 April 2002 issue of *Helsingin Sanomat*: "Wilska could not have hoped for a better partner even in his dreams. Tandy was the world's largest distribution channel for consumer electronics" *Forbes* magazine called the partnership "an inspired pairing" in its 12 September 1994 issue, noting that Nokia had learned its skills in Scandinavia, where technological innovation was imperative." Edward Juge, the director of product planning at Tandy Corporation, said in the summer of 1984, "Mobira is down the road a bit on engineering. We know something about manufacturing in the Far East and marketing in the U.S."[16]

Nokia and Tandy Corporation founded TMC Company Limited in South Korea as a 50/50 joint venture in 1984. Jyrki Alkio reports that the Korean factory was established because Tandy did not believe that phones manufactured in Nokia's European plants could be competitively priced for the U.S. market.[17]

Business Week reported in its 2 July 1984 issue that Nokia aimed to capture 20 percent of the U.S. market. The magazine also reported Tandy's Edward Juge saying that pricing would be one of the key factors in achieving market share, and the magazine went on to note that Tandy Corporation had "a reputation for low-cost production."

In a September 1994 *Forbes* magazine article, the president of Nokia Mobile Phones, Pekka Ala-Pietilä, recalled: *"For Tandy, the first priority was cost; then it was cost; and then it was cost; and then came something else."* [18]

K-P Wilska added in 2002:

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[15] Alkio, J., "Number one in the promised land of brands", *Helsingin Sanomat*, 7 April 2002.

[16] "A mobile phone maker finds a hookup in the U.S." *Business Week*, 2 July 1984, p. 40.

[17] Alkio J. (2002), "Number one in the promised land of brands," *Helsingin Sanomat*, 7 April 2002.

[18] Meeks F. (1994), "Watch out, Motorola," *Forbes*, 12 September 1994, p. 192.

"We were Finnish engineers, looking at matters from an engineer's viewpoint. Tandy emphasized the cost level, and how costs must be pressed down. There we learned a new way of thinking: even if a product can be sold for a good price, it does not necessarily need to be expensive to manufacture." [19]

6 Nokia's move to DFW

In the summer of 1992, Nokia Mobile Phones and Tandy Corporation announced that that they were forming a joint-venture company (TNC Company) to manufacture mobile phones in the USA. Fort Worth, Texas, the location of Tandy Corporation's corporate headquarters, was ultimately chosen as the site of the new factory, which would manufacture analog AMPS standard phones and the new digital standard, TDMA phones for the U.S. market.[20] The new factory would initially employ 125 people.

At the time of the announcement Nokia's CEO Jorma Ollila, said:

"The main reasons for starting production in the U.S. are the fast-growing need for additional capacity in a booming market, and the introduction of new digital standards with quickly growing volumes.

It is of great importance for both Nokia and Tandy to have an efficient production unit in North America, which is the biggest single market area for mobile telephones." [21]

In 1992, Nokia was the world's second largest manufacturer of mobile phones, and its U.S. sales were growing as shown in Figure 6.1. While Nokia's management had decided to adopt the uniform 'Nokia' brand for its phones, the company was still relatively unknown in the USA.[22]

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[19] Alkio J. (2002), "Number one in the promised land of brands," *Helsingin Sanomat*, 7 April 2002.

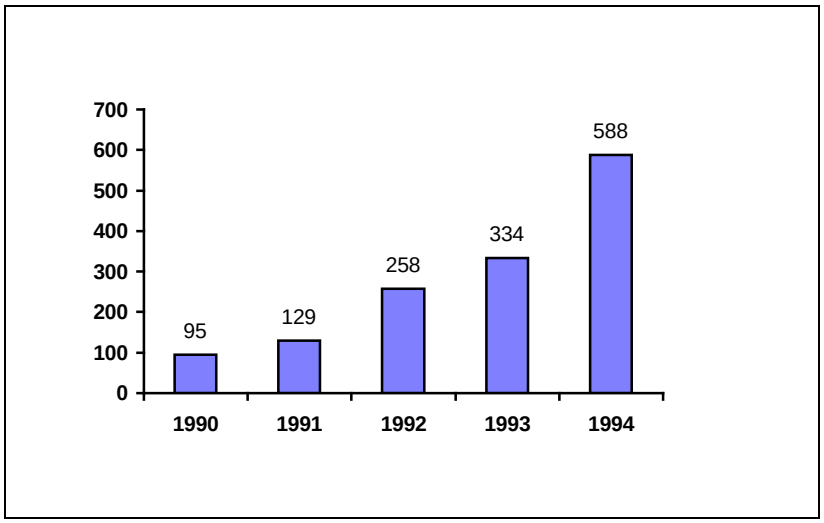
[20] The U.S. did not follow Europe and much of the rest of the world in adopting the GSM standard and left its wireless markets open to competing mobile digital technologies – i.e., GSM, TDMA and CDMA.

[21] "Nokia and Tandy start production of mobile telephones in Texas." *Business Wire*, 18 July 1992.

[22] *Cellular Marketing* (February 1993), in discussing Nokia's large advertising and marketing campaign in the USA to build brand recognition, cites one executive who

In 1993, Tandy Corporation began divesting portions of its operations with the intent of focusing on its RadioShack® retailing business. Nokia approached Tandy with an offer to buy out Tandy's shares in the Korean and American joint ventures and Tandy agreed to sell, with RadioShack® remaining a large customer for Nokia phones.[23]

Figure 6.1 Nokia's net sales, North America, 1990 - 1994 (Million EUR)



Source: Nokia Annual Report 1994

John Roach, Tandy's Chairman and CEO, stated in July 1993:

"Nokia approached Tandy after Tandy announced its plan to divest most of its manufacturing activities. While the Tandy-Nokia joint venture had not been a part of the original divestment plan at Tandy, it is highly consistent with Tandy's objective of only retaining manufacturing that is closely related to its RadioShack division and concentrating Tandy's strategic focus on retailing." [24]

Jorma Ollila stated Nokia's position:

"Taking full ownership of these two modern and strategic factories shows our serious and full commitment to the cellular telephone industry. The Fort Worth opera-

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said that part of the effort was to let the market know that Nokia is "not just another Japanese company."

23 The *Fort Worth Star Telegram* reported in its 11 April 1995 issue that the selling price for the Fort Worth plant was $31.5 million.

24 "Tandy sets cellular sale to Nokia," *Electronic News*, 12 July 1993, p. 11.

tion supports our activities in the Americas, where more than one million phones manufactured by Nokia were sold in 1992. The two companies, TMC Company Limited and TNC Company, have played a major role in our global manufacturing network. Their position will be strengthened by full ownership integration into the Nokia Group." [25]

In August 1994, Nokia Mobile Phones announced that it was building a 13,192m^2 distribution facility at Alliance Airport, employing 200 people by December of the same year.

K-P Wilska stated in a Nokia Mobile Phones press release:

"This distribution center is testimony to Nokia's growth in the cellular [mobile] industry and our commitment to the U.S. market. Because we ship phones around the world, we need a central distribution center that offers us good connections to our customer's markets. The combination of air, rail and highway access – all located in one development – provides us with the best methods of shipping products to our customers in a timely fashion." [26]

Later in November of the same year Nokia announced that it was also building a new 26,189m^2 manufacturing plant at Alliance that would open in late 1995 and employ approximately 2000 people.[27]

The Alliance location was chosen, according to K-P Wilska, because:

"The success of [Nokia's] products in the U.S., Fort Worth's location as a center of transportation and commerce, and the areas' abundance of skilled and educated employees, make this an ideal investment decision for us. We look forward to many years of mutual growth and prosperity with the people of the area." [28]

The need for building a new plant was that Nokia Mobile Phones had outgrown its first plant in Fort Worth. Nokia officials said the new plant would allow the company to produce "several hundred thousand" phones per month versus one hundred thousand per month at the old

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25 ibid

26 Nokia Mobile Phones, Press Release, 1 August 1994.

27 Nokia was given a ten-year tax abatement by the City of Fort Worth in exchange for agreeing to employ at least 50 percent of the workers at the Alliance plant with Fort Worth residents.

28 Nokia Mobile Phones, Press Release, 3 November 1994.

plant.[29] K-P Wilska told a local Fort Worth paper: *"We must keep ahead of the demand for cellular phones. Our sales are growing at a double-digit rate."* [30]

Nokia quickly learned the marketing skills that Tandy formerly offered. As a result, the USA would become Nokia's largest market by the new millennium, where it would achieve a dominant 40 percent market share and be recognized as one of the world's most recognized brands. In building this position, Nokia Mobile Phones' factory at alliance would become the largest mobile phone plant in the world.[31]

In November of 1993, Nokia Telecommunications (Nokia Networks) announced that it was establishing a subsidiary in DFW to handle U.S. customer operations, business development and standardization. In April 1995, the company announced that it was going to establish a plant, most probably in DFW. Jyrki Salo, the head of the U.S. subsidiary, said at the time: *"We are established here and we know the area, and we are happy with our operations here."* [32] Nokia Telecommunications ultimately would take over the original manufacturing facilities of Nokia Mobile Phones as the latter expanded into its new facilities at Alliance.

Nokia was clearly pleased with DFW and especially Fort Worth and Alliance.

Quoted in the Fort Worth area publication, *The Business Press* (10-16 February 1995), K-P Wilska said: *"Nokia chose Fort Worth over other cities because of the lucrative packages offered by Alliance, the city of Fort Worth and the State of Texas, such as training allowances for new employees and city tax abatements."* Wilska went on to say: *"The way the local labor market has been, we've really good experience getting quality people for our work force here."* Wilska added: *"If there is a company doing assembly work or distribution work wanting to come into the United States, they really should give serious consideration to Fort Worth."* [33]

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29 *The Business Press*, 10-16 February 1995.

30 ibid

31 The Finnish Minister of Trade & Industry was told during a 1998 trip to the USA that the full capacity of NMP's Alliance plant was 1.6 million cellular phones per month. Nokia had 14 production lines at the time in the plant, producing approximately 300 different mobile phone models.

32 Kirkpatrick, J., "Nokia may put second plant in D-FW area," *Dallas Morning News*, 11 April 1995, p. 1.

33 In the later 1990s, Nokia would build a multi-building corporate campus in Irving, Texas, to house management, R&D and various administrative functions. Nokia's

Given Nokia's rapid expansion in DFW during the 1990s, it made sense for Nokia to shorten its supply chain and to internationalize its production network. Anssi Räty, who was head of NMP's manufacturing in DFW, told the press during the announcement of Nokia's new factory that another reason for selecting Alliance Airport as a location was because there was *"room for our vendors to relocate their businesses close to our operations to allow us to become more efficient in our inventory management."* [34]

7 "The Finnish are coming"

The formal internationalization process of locating some of the Finnish firms in both Nokia Mobile Phones' and Nokia Telecommunications' production networks to DFW appears to have begun in 1994.[35] An article in the *Dallas Business Journal* in early 1995 reported that during November 1994 the Texas Department of Commerce circulated a request for information to industrial real estate brokers in DFW, which indicated that Finnish companies were looking for manufacturing space.[36] In the same article, K-P Wilska confirmed that several of Nokia's suppliers were considering moving to DFW, saying that the suppliers would like to maintain their relationship with Nokia as it grows in the USA, *"and we would like to have them as close to us as possible."*

Firms that formally showed an active interest in locating to the USA at this time are shown in Table 7.1.

Table 7.1 First wave of Finnish electronics companies to consider the USA

Company / Location in Finland	Product/Service
Efore, Espoo[37]	Power Supplies

name and the Finnish and American flags were prominently displayed at this location for all of DFW to see.

34 Pennington, A. (April 1995), "Site Selection's 1994 top deals: gobs of global jobs," *Site Selection.*

35 Informal discussions may have begun earlier.

36 "It's the Finnish invasion," *Dallas Business Journal*, 10 February 1995.

37 Efore was then known as Finlandia Interface.

Electrobit, Oulu	R&D
LK Products, Kempele	Microwave Devices
JOT, Oulu	Manufacturing Equipment
Perlos, Nurmijärvi	Plastic Phone Covers
PMJ Automec, Lohja	Manufacturing Equipment
Salcomp, Kemijärvi	Chargers
Solitra, Oulu	Electronic Components

As these firms explored their options with locally established Finnish commercial resources in the USA, Jaakko Barsk, Trade Commissioner at Finland Trade Center (FTC), Houston (Texas), proposed the formation of a consortium, which would locate the Finnish companies at a common real estate location. The idea behind the proposal was that a combination of Finnish companies would have a greater economic impact on the local community and result in local government incentives similar to those that Nokia obtained in Fort Worth. There would also be the possibility to share certain administrative costs.

The ostensible geographic focus for the proposed consortium, which was publicly titled "The Finland Teletech Program," was DFW and Houston, Texas, as well as the states of Mississippi, Arkansas, Iowa and Alabama. In order to solicit interest, Jaakko Barsk and Chuck Dale, Assistant Trade Commissioner at FTC, Houston, gave estimates to local government officials about the employment and real estate needs of the anonymous incoming Finnish companies as shown in Table 7.2, below.

Table 7.2 Estimated operating requirements for The Finland Teletech Program

Operating Milestone	Local Employees	Finnish Employees	Factory Square Meters	Office Square Meters
Start Up	154	15	7 339	604
Year One	560	21	11 566	929

Source: Finpro

The Texas Department of Commerce appears to have been aggressive in its pursuit of the Finnish companies, presenting to FTC, Houston, in January 1995 a competitive analysis, *How Texas Compares with Arkansas, Iowa and Mississippi*.

Efore, Perlos, JOT, LK Products, Salcomp and Solitra expressed an interest in FTC, Houston's program. And an analysis of incentives and industrial sites was completed on 23 November 1994 for the DFW Metroplex cities. Jaakko Barsk and Chuck Dale presented findings from the analysis at a group meeting in Helsinki with all of the companies on 12 December 1994, and it was concluded that the cities of Fort Worth and Mineral Wells, Texas, were the most interesting locations for the six Finnish companies.[38]

FTC, Houston, renamed the next phase in the effort to "Metroplex Partners Program," and subsequently met with officials in the cities of Fort Worth and Mineral Wells as well as business officials at the Alliance Development on 20 December 1994. The purpose of the trip was to advise the cities that they were under consideration by the Finnish companies and to learn more about what incentives were available. Unfortunately, the effort began to unravel at this point.

Mika Kettula, the head of JOT's business in the USA from 1995 to 2000, remembers that the companies in the consortium were *"moving at different speeds and needed to be in different places"* in early 1995. In January, Salcomp had confirmed its interest in locating to the Alliance development, but stated that it would not need a facility until the 4thQuarter of 1995, and later Efore said that it was postponing the start of production in the USA. In February 1995, Solitra asked FTC, Houston, to investigate the state of Minnesota as an option. And on 30 March 1995 LK Products' board delayed the move to the USA and cancelled the company's participation in the consortium.[39]

Matti Jääsalo, who was head of Perlos' business in DFW from 1994 to 2001, recalls that the consortium wasn't working because everyone had different needs. Perlos was in a "terrible hurry" to establish its plant. Nokia wanted them to establish it without delay.[40] It was taking too much time for all the companies to review and negotiate options. Nothing was happening. Other choices or options were too late. Perlos decided to lease a 3,705m^2 facility at the Alliance development near NMP's new factory.

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38 Elektrobit also asked for a copy of the analysis of the Metroplex cities.

39 Nokia sold L-K Products to the British company Filtronic plc in 1998.

40 K-P Wilska would later indicate to the *Helsingin Sanomat* (21.10.2000) that Perlos was the most important subcontractor in the DFW area.

On 15 April 1995, FTC, Houston, organized the last general meeting of the consortium in DFW to meet with the Jenkens & Gilchrist law firm,[41] Texas Commerce Bank,[42] the real estate broker Cushman & Wakefield, officials from the State of Texas and a representative from the Dallas Chamber of Commerce among other parties. The Finnish companies that participated directly in these meetings were Solitra, JOT, Perlos, Salcomp and newcomer Elektrobit, with Efore and PMJ Automec represented by proxy.

Unfortunately, with Perlos' decision to independently locate to the Alliance development, LK Products' departure from the consortium, Salcomp's and Efore's decisions to delay their U.S. production, and Solitra's subsequent announcement that it was locating to Hutchinson, Minnesota,[43] the original intent of the consortium was moot. There was not enough critical mass to secure favorable local government incentives.

In June, JOT informed FTC, Houston, that it was forced to move ahead without the Teletech group and to find its own facility in DFW. The following month, FTC, Houston, informed Elektrobit that the Metroplex Partners Program was cancelled, and the trade center was prepared to assist the Finnish companies with their business activities in the USA on an individual basis.

The good news was that Efore later changed directions, and asked FTC, Houston, to begin to map potential subcontractors and suppliers in the fall of 1995, and after an uncertain start, there were now three Finnish firms actively establishing operations in DFW in 1995 with more just behind.

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41 Edward F. Walker, Honorary Consul of Finland in Dallas since 1991 is a shareholder in the law firm of Jenkens & Gilchrist and is responsible for the firm's real estate practice in the DFW Metroplex.

42 Now known as J. P. Morgan Chase.

43 ADC Telecommunications, Inc., which is headquartered in Minnesota, acquired Solitra in 1996.

8 First wave of Nokia's production network locates to DFW

Matti Jääsalo remembers the demand for mobile phones declining in 1995 and 1996, and Perlos' senior management questioning whether they should be in DFW. But as Nokia's sales began to soar, Matti says that management eventually understood.

Perlos knew how to automatically assemble plastic components, and most U.S. suppliers in the area didn't appear to do that at the time.[44] Perlos was well positioned to grow with Nokia. From its first 3,716m^2 facility employing 10-15 people in late 1995, Perlos expanded into a 16,722m^2 facility employing 300 people by June 1999.

Matti describes the growth: "Rented first place, then rented a second place and then built a third place – all of this happened in three years."

Matti says that Perlos sent an experienced 6+ working force of Finns to establish the Perlos factory at Alliance. Each person had a complete knowledge of his respective area – e.g., plastics, automated assembly, etc. As president of the U.S. operation, Matti was the only generalist in the group.

Efore hired Kimmo ('Kim") Heinonen, who had been working in the United Kingdom, to establish its company in DFW. Kim and an existing Efore purchasing manager, Matti Kauppi, arrived in DFW in early 1996 to establish the new factory. Suitable space was hard to find in DFW because of the expanding market. Nevertheless, an old Siemens facility that appeared at the time to be a larger than necessary was eventually located in Irving. Aside from some U.S. customs difficulties, there were no major obstacles in establishing an Efore plant in DFW, according to the person who would become president of the U.S. Efore subsidiary.

Efore also looked outside of the company to hire a president for its U.S. operation. In August 1996, Ismo Linden joined Efore in DFW. He had worked in the USA before. He would play an early role in linking DFW to Finland as well as in trying to create a local Finnish business association.

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[44] In the 1990s, the largest concentration of U.S. plastic injection molding companies was located in the states surrounding the great lakes region in the north-central states of Ohio, Michigan, Indiana, Illinois and Wisconsin.

JOT did consider moving to the Alliance Development, but eventually settled on a location in Irving, Texas. This was an interesting choice, because in the original teletech consortium's analysis of Metroplex cities, Irving was found to have limited incentives and limited available factory space. However, close access to DFW Airport was a major resource from a marketing standpoint.

Rather than sit idly by during the slow period in 1995 and 1996, Mika Kettula started attending trade shows, where he not only introduced JOT's handsome white painted equipment to the American electronics manufacturing industry but also found an experienced local marketing and sales professional, Pat O'Brien.

Pat O'Brien remembers being troubled that he wasn't given the Nokia account when he joined JOT in January of 1996. But, he realized that this was for the best since it forced him to find other clients. His hard work paid off, and JOT was able to develop a growing client list across the USA.

Tekniikka & Talous reported in its 28 August 1997 issue that the greatest demand for JOT's products seemed to be, aside from Finland, in North America. Business was so good that Jorma Terentjeff, JOT's CEO, decided to move to DFW in 1997 with his family in order to investigate opportunities for expanding the business, including the possibility of taking JOT public in the USA.[45]

While JOT was only taken public in Finland and not in the USA, one decision that was made was to establish a factory in Irving, and hire Kimmo Heinonen away from Efore to set it up.

Mika Kettula told *Site Selection* magazine in September 2000 that Irving was chosen because it *"has met all of our expectations,"* saying that [the] *"community supported us so much that we had no reason to look elsewhere when we decided to expand."*

Jouni Saastamoinen first traveled to Texas in 1995 when Elektrobit was considering whether to establish an office in DFW. Elektrobit Inc. was established in 1996, and Vesa Raudaskoski was hired away from Nokia Telecommunications to manage the new company, which was to be headquartered in Redmond, Washington. An Elektrobit subsidiary, Nemo Technologies, was later established in DFW in 1997, and Jouni Saastamoinen

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[45] Jorma Terentjeff's company, Teknoventure, purchased about 25 percent of JOT's stock in 1994.

moved to DFW in 1998 to manage it. In 2001, a local Elektrobit office was established in DFW at the existing Nemo Technologies office.

Salcomp decided not to establish production in DFW, opting instead to open a customer service center in Irving during 1997, which is currently located near Nokia's campus. All Salcomp products sold in North America come from somewhere else. Salcomp did open a factory in Mexico during 1999, but today its only manufacturing facility in the America's is in Brazil. Nokia is Salcomp's biggest customer, but the company also has five of the top six carriers in the USA as clients.

While not part of the original Teletech group, Orbis, a company specialized in electronics & RF testing and machine vision services, began investigating DFW at roughly the same time as the others. Nokia Mobile Phones had asked them to come to DFW to support machine vision systems on the production line. Orbis' Pekka Hartikainen made one trip in 1995, two trips in 1996 and two trips in 1997. In August 1997, Orbis International Technologies Inc. was established in DFW, operating out of Pekka's bedroom until April 1998 when it established a formal office in Irving. Pekka recalls that Orbis moved cautiously, and it took months to set things up since Orbis had "0" knowledge about the local environment, and it did not initially seek any information from the Finnish companies that were already established locally. In 1998, Tommi Rainola became the head of Orbis' operation in DFW when his employer, Oulu-based contract manager Utron, sold his department to Orbis.

PMJ Automec (PMJ) took a different route than the other companies. It invested in a local company in Grand Prairie, Texas, Global Automation, whose founder came from the Robotics Institute at the University of Texas at Arlington. It later bought the entire company, and in 2001, PMJ acquired Cincorp, which had its offices and manufacturing in Colorado.

PMJ sent temporary Finnish technical personnel through the years to train the local technicians, and it has also had three Finnish general managers, either in DFW or Colorado, according to Kent Dixon, PMJ's local DFW sale representative. Everyone else in DFW was locally hired.

PMJ would ultimately close its offices in DFW, and move its U.S. headquarters to Colorado, because that is where its production was located due to the Cincorp acquisition. Regardless, PMJ has been actively pursuing sales relationships in DFW with Perlos, Eimo and Efore.

One of PMJ's local DFW-area employees would later join Orbis as Director of Sales & Business Development for electronics manufacturing services (EMS) in the Americas.

9 The Finnish network deepens – second wave of Finnish companies

Timo Vilmunen, Sales Director at Nivala-based precision sheet metal manufacturer Mecanova, visited DFW in April 1998. Mecanova's senior management had taken notice of the activities of some of the company's international customers, and Timo was ordered to Texas to find out what was going on in DFW. Timo called upon Michael Elkins at Nokia, Jorma Terentjeff at JOT and Matti Kauppi at Efore. After providing price and delivery estimates for its mechanicals, Mecanova was encouraged to establish a presence in DFW, especially by Jorma Terentjeff.

Electronics-related sheet metal shipments in Texas increased by 336 percent between 1992 and 1997, rising in sales from $53 million to $231 million. While there were numerous sheet metal manufacturers operating in or selling into the DFW Metroplex – i.e., twenty-four local and fourteen outside companies – the sharp rise in demand was making it hard for local companies to make timely deliveries, much less maintain buffer stocks at their premises. JOT, keen to maintain the quality of its products as well as to initiate a "just-in-time" inventory capability, decided to play an active role in bringing a second level of Finnish contract manufacturers to DFW.

In addition to encouraging its sheet metal supplier Mecanova to move to DFW, JOT also asked Nivala-based Elektronet to come along as well. Elektronet was part of JOT's production network in the Oulu region, providing contract assembly services. It made sense for Elektronet to internationalize its activities to DFW, because JOT was in the process of establishing local manufacturing operations. The head of Elektronet's business in DFW, Esko Kiviniemi, remembers thinking that it was a good time to internationalize, because JOT's U.S. operation was growing fast.

Mecanova and Elektronet reached an agreement where Esko Kiviniemi would represent both companies in DFW, with Timo Vilmunen visiting periodically to meet with Mecanova's clients. They moved into a space in Irving that was leased by WeCan, another company from the Oulu region that had moved to DFW to provide cable sets to Nokia Telecommunications. Mecanova maintained buffer stocks of mechanical components at the Irving facility, and Esko handled any local requirements.

Mecanova and Elektronet intended to eventually establish full production and assembly capabilities in DFW. There were plans for Mecanova's

sister companies, Mecapinta and Mecaplan, to join them in DFW and operate out of a joint facility with a shared director of marketing and sales.

10 Third wave of Finnish companies arrives in DFW

Elcoteq established its electronics manufacturing services (EMS)operation in DFW in February 1998. Elcoteq was opening a plant in Monterey, Mexico, and it employed 15 people in the office in Irving to handle sales and marketing, accounting and sourcing. Ilkka Pouttu, who headed this early effort, says that DFW is absolutely the right place to be, because DFW is the telecommunications center of the USA.

DFW is Elcoteq's headquarters for the Americas. Douglas Brenner joined the company in 2002, and he is the senior executive over this region.

Beginning in January 2001, Elcoteq established an engineering services operation in DFW. Juha Jussila-Song says the idea is to offer customers the outsourcing option to "industrialize" their new product ideas from a "manufacturability and testability" standpoint. This service is captured in the term, new product introduction (NPI). As part of this offering the plan was also to establish an NPI center in the USA. In this regard, Elcoteq recently acquired NPRC in Carrollton, Texas, which is close to Telecom Corridor®, and established it as Elcoteq Inc., NPI Center Dallas.

In 2002, Elcoteq upgraded its plant in Monterey, Mexico, so that it could offer prototype and pilot production. Elcoteq plans to go after innovative product ideas in the USA, develop them into tangible products and funnel them into its global manufacturing network. The seriousness of Elcoteq's intent was evidenced by the fact that until recently its head of global quality and operations, Reijo Itkonen, was based in Irving.

Another of Nokia Mobile Phones' suppliers in Finland, plastics injection molder Eimo, began to actively evaluate the possibility of establishing operations in the USA in 1999, gathering information on business formation, taxes, etc. Eimo believed that the DFW market might have reached the saturation point as far as existing injection molders. Eimo also believed that the best strategy for entering the USA would be through an acquisition or merger with an existing U.S. company positioned in the injection molding and/or tool making business rather than a 'green field,' startup operation.

After going through the process of investigating injection molders and tool makers that were positioned in states that could not only service Nokia in Texas but also Ericsson in Virginia and Motorola in Illinois, Eimo elected to purchase one of Nokia's existing suppliers, Triple S, that was supplying NMP's Alliance plant from Georgetown, Texas, just north of Austin. Eimo shifted the production in Georgetown to Alliance so as to be closer to the Nokia factory, but the U.S. headquarters remained in Triple S's original home, Portage, Michigan.

Most of Eimo's U.S. employees, including senior management, were from Triple S; however, Eimo did send Jouko Hakala to act as Senior Manager, Sales, Fort Worth Facility. With Eimo's 90 percent acquisition by the giant Taiwanese EMS company, Foxconn, the positions of Finnish personnel in the organization is uncertain.

Premix, a manufacturer of electrically conductive compounds, established a local office in DFW in 1999, and Peter Ristikangas moved to DFW to run Premix' U.S. sales office. Premix was looking for a location in the USA that had good air connections. Chicago was considered, but Irving was chosen because it had easier traffic. Premix was also considering setting up production in the USA, but not at this early stage.

Peter did not utilize the local Finnish companies to assist in setting up Premix' local office, but Peter did use the established local professionals that had been serving the Finnish community, and he also utilized the Irving Chamber of Commerce. In the reverse direction, Peter assisted Aplac Solutions in finding office space when they were looking to move to DFW.

Peter says that it took longer than he thought to establish local customers. Peter decided to return to Finland in 2001, and Premix found local sales representatives in Chicago and later Wisconsin. Premix is still a Texas company, but they established their production plant in Wisconsin in 2003, because that is were their sales representative resides.

Aplac Solutions (Aplac), a circuit-design software spin-off from Nokia, established itself as a State of Delaware corporation n 1999. Heikki Rekonen, President of Aplac, visited DFW in April 2000 and established a virtual office at FTC, Houston, that spring. In August 2000, Aplac opened an office in Irving with two Finnish expatriates, one of whom was Heikki.

Aplac's main reason for establishing an office in the USA was that half of Aplac's customers and market were in the USA. Initial locations for consideration were San Diego, California; Silicon Valley, California; Los Angeles, California; and DFW. Aplac also thought about the state of Illinois to be near Motorola. Aplac selected DFW because of the cost, its

central location and available support from local Finns. The latter was especially important for family reasons and not just to get information from other Finnish companies.

Heikki Rekonen discovered that Aplac could not share customers with the other Finnish companies, and he felt that Aplac was somewhat isolated. It was Aplac's R&D tools vs. the other Finnish companies' production inputs.

NetHawk, headquartered in Oulu, primarily offers products to test mobile telecommunications networks. It decided that it needed to establish a U.S. office in order to service its clients more quickly from the same time zones.

NetHawk was aware of the development of a Finnish ICT community in DFW from the activities of Elektrobit and JOT, but it also considered setting up offices in Silicon Valley, Atlanta and the U.S. East Coast.

Hannu Impola began gathering infomation on setting up a NetHawk office in DFW during 2000, and in 2001, he moved to DFW to become president of NetHawk Inc. Hannu utilized contacts at Efore, Nemo Technologies and JOT as well as the established local service providers to gather information on setting up NetHawk's DFW operations.

Hannu believes that DFW is the place to be located. *"It is a telecom hub, centrally located, with a big international airport."*

Savcor Coatings manufactures EMI shielding coatings that are utilized on phone covers. Savcor established manufacturing at Alliance in 1999 in order to service Nokia Mobile Phones. Savcor is closely connected to the Finnish phone cover supply network at Alliance because of the Nokia operation.

11 First efforts to establish cooperation among the Finnish companies

When the first wave of Finnish companies arrived in DFW, they pretty much relied on Nokia or local professional services contacts rather than sharing information with one another. The second wave of companies, Mecanova, Elektrobit and WeCan, all received local advice from Kimmo Heinonen at JOT as well as from JOT's local contacts, but the first two companies were part of JOT's production network, and WeCan was coming from the same region of Finland. In the third wave, companies such as Elcoteq and Premix handled things on their own when they first arrived.

Perhaps the most important local contact is the Finnish Honorary Consul and attorney, Edward Walker. His law firm has worked with all of the local Finnish electronics companies in DFW, helping them with such matters as local company formation, taxes and visas. He also helped advise them on other resources, such as accountants, real estate brokers, human resource consultants and international bankers.

From Edward Walker's recommended contacts as well as those initiated on their own, the Finnish companies were able to develop a competent group of local service providers, which are still in place today.[46]

Jouni Saastamoinen remembers that an unofficial forum developed in DFW, which Edward Walker credits the Finnish spouses for creating. At the peak period there were probably 44 Finnish families living in the Coppell area. Jouni said that as you socialized and gathered around the pool it was only natural that business would come up. This informal forum also helped people adjust to American culture. Today, there is a similar cluster of about 19 expatriate Finnish families in the Rosemont Apartment complex in Irving.

Jouni said it was important to have a godfather in DFW. When Hannu Impola moved to DFW, Jouni said he shared a lot of information with NetHawk. It was not just business information but also information on how to get a social security card, which you need to get a driver's license and in turn to get a bank account.

Tommi Rainola said that Orbis tried to collaborate with local Finnish companies at least two times, but it didn't work because of global issues. Later, Orbis tried a joint local effort with Efore and Mecanova, but Vesa Vihavainen at Efore says that the Orbis offering did not match with the contract manufacturing business that Efore and Mecanova were pursuing.

Tommi Rainola does recognize one of the key godfathers when he arrived. It was Ismo Linden at Efore, who was willing to help all of the arriving Finns. Ismo Linden's efforts on behalf of the local Finnish companies would take a more formal direction in DFW.

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[46] Lonnie Land has worked with Efore, JOT, Orbis, Elektrobit, NetHawk and Elcoteq on local human resource administration. Shannon Ray was the local controller at JOT, and when JOT downsized its DFW operation, she joined JOT's auditor, Colburn & Peterson, bringing in JOT's vendors Mecanova and Elektronet as clients as well as Nemo and Elektrobit after the JOT merger. Edward Walker recommended banker, J.P. Morgan Chase, because they were the only full-service international bank in DFW that had a mechanism that allowed the Finns to quickly establish local credit.

Ismo remembers Nokia being active in the Fort Worth Chamber of Commerce but less so in Irving. Ismo decided to join the Irving Chamber of Commerce in order to be a good corporate citizen. As he participated in chamber activities, he commented that Irving had much in common with Espoo. From this comment came the idea of Espoo joining together in the City of Irving's "Sister Cities Program," which was actively promoted by the Mayor of Irving on a trip to Finland. Today, the Irving Chamber maintains its link with Espoo and provides its facilities to local Finnish organizations wishing to hold formal meetings.

In his discussions at the Irving Chamber of Commerce, Ismo also wanted to establish a more formal local Finnish business organization. Ismo recalls the issue being raised many times but some of the Finnish companies did not have the resources to allow them to work on establishing such an organization. Ismo met with members of the local Finnish business community in order to get to know each of the firms, but unfortunately the timing was not right and an organization did not get started while he was in DFW.

A business partnering effort was also proposed to the Finnish community by Markku Lento. He had moved to DFW with Nokia but decided to establish a local consulting company at the end of 2001 that would offer joint marketing services to Finnish companies that either did not yet have business in DFW or did not have the resources to adequately develop business outside of Nokia. He met with various Finnish companies to explain his concept. Upon hearing what he had to say, Orbis suggested that he go to work for them as the president of their U.S. subsidiary, which he agreed to do.

12 "The great Telecoms crash"

Nokia urged some of its production partners to move to DFW if they wanted to do business with Nokia in the USA; however, Nokia made it clear from the very beginning that if they were going to come to DFW they could not depend solely on Nokia for their livelihood.[47]

The underlying basis for Nokia's position was stated by the president of Nokia Mobile Phones, Matti Alahuhta, in *Finns in Business 1999*:

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[47] Matias Möttölä reports in the 21 October 2000 issue of *Helsingin Sanomat* that K-P Wilska was still warning Finnish manufacturers not to locate to the USA if Nokia was going to be their only customer.

"[The] growth of component manufacturers could be impeded if they are too slow in broadening their customer base and internationalizing. It's in the interest of every subcontractor and customer for the subcontractor's customer base to be sufficiently broad. This creates opportunities for expansion and helps maintain competitive edge."

While the Finnish members of Nokia's production network were highly dependent on Nokia in the late 1990s, as shown in Table 12.1, it did not seem to be a problem. A 30 July 1998 Nokia Inc. press release highlighted the company's growth in DFW from a "handful" of employees in 1992 to more than 3500 in 1998, with Olli Kallasvuo, President of Nokia Inc., saying that Nokia's growth [in DFW] *"exceeded even the company's most optimistic projections."* Nokia's local employment would further grow to 4500 by the summer of 1999 and to 5500 by early 2001.[48]

The first exposure of being too heavily dependent Nokia came in 1999, when Nokia Network's announced that it was closing its Diplomacy Road plant in Fort Worth and shifting production to its factories in Finland and the United Kingdom. As a result, WeCan closed their DFW operations, and Efore and Mecanova faced the loss of a major local customer.

Table 12.1 Nokia's Production Network Dependencies

Company	Revenue (FIM million)	Growth (%) 1997 – 1998	Dependence on Nokia
Efore	262	13	More than half
Elcoteq	2346	45	Noteworthy
Electrobit	130	30	Noteworthy
Eimo	345	167	85%
JOT Automation	600	50	Noteworthy
Perlos	1207	50	80%
PMJ Automec	128	9	60%

Source: *Helsingin Sanomat*, 'Nokia jakaa kasvun ja kivun,' 1 August 1999

Nokia Mobile Phones' business, however, was still booming in 1999. Earlier, in 1998, Nokia converted a factory in Reynosa, Mexico, to mobile phone production. Following Nokia Networks departure, Nokia decided to convert the Diplomacy Road factory to mobile phone production in order to meet growing demand.

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[48] *The Dallas Morning News*, 3 February 2001.

Business appeared to be booming for all of the U.S. telecommunications industry in early 2000, especially in DFW. *The Dallas Morning News* reported in its 8 February 2001 issue that the local unemployment rate fell from 3 percent in November 2000 to 2.5 percent the following month. With DFW's local economy virtually operating at full employment, labor costs were becoming a problem.

The *Fort Worth Star-Telegram* reported in its 6 February 2001 issue that Nokia was cutting its Fort Worth work force by 1500 employees and shifting some mobile phone production to South Korea and Mexico. While Nokia had already been issuing warnings about the projected level of mobile phone sales, beginning in July 2000, company officials told the Fort Worth newspaper that labor costs were one of the factors leading to the decision to shift production out of Fort Worth and not slower demand for its phones.

Indeed, there were moves already under way in the mobile phone business that strongly indicated that production was changing. Both Motorola and Ericsson announced that they would outsource their mobile production and close their U.S. manufacturing operations. In addition, production for handheld electronics in general was moving out of the USA. Finland Trade Center, Houston, found in research conducted in 2001 that there were only two remaining mobile phone manufacturers in the USA, Nokia and Kyocera, and that the two largest Palm®-based handhelds had outsourced production from the beginning. Additional concern came from the fact that the outsourced production was even moving out of nearby Mexico to locations in Asia.

The narrowing U.S. market was a problem for the local Finnish companies in DFW, which was made all the more evident by what *The Economist* called "The great telecoms crash," in its 20th-26th July 2002 issue. *Business Week*'s 3 June 2002 issue made the crash akin to almost being the catalyst for an economic depression.[49] The effects of the crash can be seen in Nokia's net sales in the Americas as shown in Figure 12.1.

When business was booming, the local Finnish companies in DFW tried to put in place capabilities to broaden their customer base. JOT early on hired a local marketing manager and pursued new business so successfully that Anssi Räty told Finland Trade Center, Houston, in 1998 that JOT was the kind of Finnish company that Nokia liked to see in America. Perlos also had a person in place in late 1996 to develop new business, but

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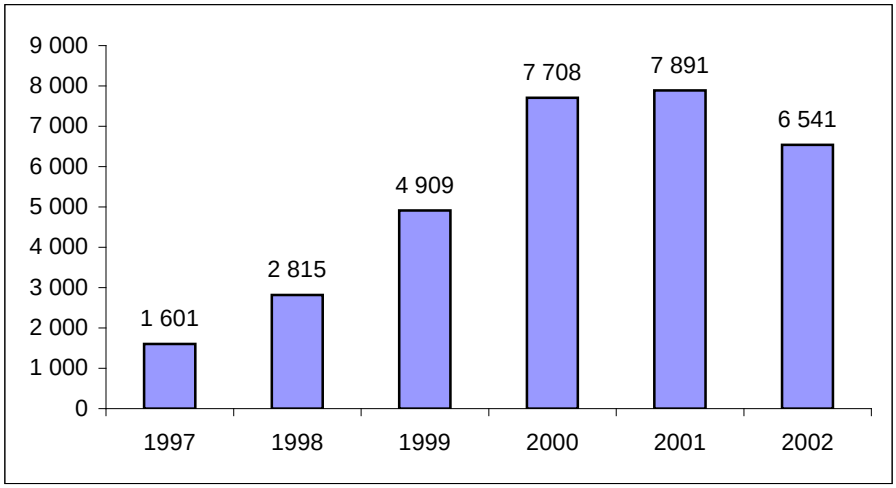
[49] Article was titled: "Tale of a bubble, how the 3G fiasco came close to wrecking Europe."

Nokia's surging production in the late 1990s pressed Perlos' capacity, prompting Matti Jääsalo, when queried about developing new business on various occasions, to say we are working hard to service our major customer.

Figure 12.1 Nokia's net sales in the Americas, 1997 - 2002 (Million EUR)



Source: Nokia

Other companies were constrained in finding locally competent marketing and sales personnel by such things as their identity, the tight local job market and their resources. Ismo Linden at Efore remembers that Efore was unknown and the local job market made it difficult to hire and hold the right kind of people. Heikki Rekonen at Aplac Solutions said that the tight local job market made it impossible for a small company like Aplac to find a local sales manager, and when the job market became softer they did not want to take the risk of hiring someone. Tommi Rainola at Orbis said that they tried to find a local sales person, and they actually had several candidates, but nothing worked and they were not able to find someone until 2002.

The employment climate in DFW's telecommunications community is an indication of the downturn's severity. In its 2 November 2003 issue, the *Dallas Morning News* reported that DFW has lost at least 21,600 telecommunications jobs since the end of 2000. The *Dallas Market Report* wrote in its 16 February 2003 issue that Nortel had reduced its headcount in DFW from a high of 9000 to 4730 by the end of 2002. *Knight Ridder Tribune Business News* reported on 5 November 2003 that Alcatel had reduced its labor force from 7000 in early 2001 to 2100 in the fall of

2003. Earlier, the *Fort Worth Star Telegram* reported on 23 July 2003 that only 8.8 percent of the high tech workers in the DFW area who had been laid off had been able to find employment in their fields of expertise.

The above papers also reported at the same time about the collapse of the real estate market in Telecom Corridor®. *Knight Ridder Tribune Business News* said that many of the buildings that had opened in Richardson and Plano have never had a tenant. The *Dallas Morning News* stated: "About 34.1 percent of the office space in Richardson and Plano is vacant, up from 29.3 percent in 2002 and 18.4 percent in 2001."

The impact of the downturn in the telecommunications industry and the U.S. economy was swift and devastating for even the most successful Finnish companies. Pat O'Brien says that JOT first started in DFW with a service office to support Nokia, then they hired a local marketing and sales person to expand the business, next they hired project engineers to service their new customers and then they started local manufacturing. With the recession, JOT followed a reverse path, except more swiftly.

JOT was merged with Elektrobit Group, and its local staff in DFW was sharply reduced. Recently, it has moved to the new facilities occupied by Elektrobit and Nemo Technologies in Coppell, Texas.

Elektronet, which was solely dependent on JOT, faced grimmer prospects. Esko Kiviniemi says that Elektronet did not get enough early references. They should have been more aggressive at the beginning in trying to find new clients, but they thought JOT was going to be a big company. And also Elektronet was a small company and did not have the money to invest in marketing. Elektronet's office was closed in June 2001.

13 Adapting to changing times

Aplac closed its sales office in DFW in 2003, but Heikki Rekonen is high on the U.S. electronics market, and he said that Aplac will probably return to DFW once the electronics and telecommunications industries get over their "hangover." He did caution, however, that it is crucial for small companies coming into the U.S. market to find a local partner that has a strong customer base. He said that it is a question of credibility, because a company coming from Finland is always small unless you're a Nokia. He does, however, see the benefits of Finnish companies joining together to provide a solution.

From a marketing standpoint, Jouni Saastamoinen at Nemo Technologies and Hannu Impola at NetHawk are joining together in their sales efforts. The two recently traveled to Brazil to jointly call on clients. Jouni Saastamoinen does not see this type of relationship working with other companies. He says Nemo and NetHawk's products complement rather than compete against one another, and they are sold to the same customers – i.e., wireless carriers. Nemo would find it difficult to join with some of the other Finnish companies in DFW since their customers are different.

Perhaps one of the most successful Finnish relationships in recent times in DFW as well as one of the best examples of companies adapting to the changing production environment is found in the activities of Efore and Mecanova. Both companies were able to overcome diminished business from their traditional Finnish customers by forging a relationship that pursued business in areas outside of telecommunications equipment.

Mecanova and Elektronet worked with the TE Centre in Oulu and with Finpro in Helsinki to establish a subsidized joint export marketing effort in DFW that would involve the hiring of a shared local marketing and sales director. This effort did not result in anything and Elektronet returned to Finland just before Mecanova established its local sheet metal fabrication facility in Garland, Texas, near Richardson. Fortunately, Vesa Vihavainen, the President of Efore in the USA, decided to join Mecanova in a joint marketing program, and they shared a local sales representative. Together, they pursued small-scale contract-manufacturing work with Kone Elevators, which is located in the DFW area. When Mecanova decided to pull out of DFW, because it did not want to risk further capital investment, Timo Vilmunen joined Efore as a sales manager for contract manufacturing, and the work with Kone and other non-telecom companies was transferred fully to Efore.

Kone Elevator continues to outsource more and more of its production, and Efore has been able to create a contract manufacturing business out of its relationship with Kone Elevators that is separate from its traditional power supply production. By targeting small-scale contract manufacturing, Efore has been able to develop an emerging niche in Texas, serving those companies with small production runs that would still like to have the opportunity to outsource. Larger contract manufacturers have traditionally not been interested and/or cost competitive in this niche. As a result, Efore's business during recessionary times has grown dramatically. Efore increased its customers from 6 to 15 in 2003, and in a twelve-month period ending in fall 2003, Efore's sales in the USA increased 266 percent. The expanded business made it necessary

for Efore to lease another building in DFW, approximately equal in size to its existing power supply manufacturing facility, when all of the other companies were cutting back on space.

Vesa Vihavainen suggested to Aplac Solutions, NetHawk and Orbis that they consider subletting space in Efore's new facility. This could save on costs, and it would provide a better opportunity for them to share information. NetHawk agreed to move into this new facility, and they have saved substantially on rent. Orbis is still in its present lease and will most probably move to a different part of Irving when its lease expires. Aplac closed its Irving office and decided to maintain a postal address at its old location in Irving.

In 2002, Vesa Vihavainen and Hannu Impola were instrumental in establishing the Finnish Business Guild (FBG) in DFW. The Irving Sister Cities Program at the Irving Chamber of Commerce hosts monthly meetings for FBG. The original idea was to meet every other month and have a forum where local Finnish business leaders could meet informally and discuss in Finnish, if they wished, various business topics. Interest spread so quickly that meetings began to be held almost every month. The forum is currently used to introduce newly arrived Finnish businesses to the local DFW Finnish commercial community, including firms that are not in electronics, and it is also used to introduce local service providers to the Finnish companies. K-P Wilska is the honorary chairman of FBG, but he does not take an active role in the organization.

Vesa Vihavainen estimates that there are approximately 3000 Finns living in DFW and there are more than 30 Finnish-owned companies. With such a base, there are plans to change the FBG from its present low-profile status into something more formal. In 2004, the Finnish-American Business Guild will be established, and in 2005, the goal is to establish the Finnish-American Chamber of Commerce. A more formal organization is expected to get government support as well as more active participation by Nokia.

Some of the Finnish electronics companies have said that there is a need for a different type of organization. Juha Jussila-Song at Elcoteq has attended FBG meetings, but does not find them to be a good format to discuss business development issues. Markku Lento, now the president of JOT in the USA, says that FBG has been a step in the right direction, but he would like to see discussions involving business leads. He also believes that the companies in the Finnish ICT community could undertake joint marketing efforts.

Attempts have been made recently to formally associate the local Finnish ICT companies in a joint program that would promote the group as a virtual production network, offering what Elcoteq calls end-to-end solutions, but it has been difficult to get everyone to agree to join together for various reasons. For example, Nemo Technology, NetHawk and Salcomp saw themselves falling outside the production network, because their offerings were not directly tied to the manufacture of wireless terminals and base stations. Nevertheless, the opportunity still remains to offer end-to-end solutions.

The impetus behind organizing such an effort is the continuing development of innovative ideas in electronics in the USA. Elcoteq and Elektrobit have both stated their interest in pursuing these small emerging niche markets.

There is evidence to suggest that start-up companies are rising from the downturn in DFW's local telecommunications community.[50] There is also evidence to suggest that new wireless business areas, such as enterprise solutions, may offer interesting opportunities in DFW, especially in logistics and automated handling applications. TI is optimistic, at least on DFW, because it will begin construction of a $3 billion chip plant near Telecom Corridor® in 2005 that will employ 1,000 people.

14 Conclusion

There is no doubt that there would not be the kind of Finnish ICT electronics community in DFW today had Nokia not located in the area. But it is clear that the Finnish companies that did decide to come to DFW have clustered together just as Ambassador Valtasaari predicted in 1995.

It is true that Perlos, Eimo and Savcor had little choice but to locate to the Alliance Development because of the need to be near the Nokia Mobile Phones plant. However, most of the other Finnish ICT electronics companies initially moved to Irving, and not all of them were directly part of Nokia's production network.

In this clustering, after an initial failed effort, the first active cooperation among the Finnish companies seems to have most strongly occurred between the firms from the Oulu region. However, the practicalities

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[50] See: http://www.wirelessweek.com/article/CA246674

and efficiencies of business in DFW have since caused companies such as Efore to join with companies such as Mecanova and later NetHawk in mutually beneficial relationships.[51]

These relationships are in part an effort to deal with the changing production landscape in DFW, which has seen the collapse of the global telecommunications bubble and the movement of production to low cost countries in Latin America and Asia. It remains to be seen how wide and deep the cooperation will become in DFW among the local Finnish companies, but it will be in everyone's interest to achieve the economies of scale that lead to a more competitive offering.

This offering appears to have its greatest opportunity in the area of new product design and introduction services, an area in which the local Finnish ICT electronics companies collectively offer end-to-end solutions to both manufacturers and wireless carriers. Fortunately, the base for the Finnish U.S. offering is in DFW, which has the largest concentration of telecommunications firms in the USA.

Appendix 1.

Established major ICT companies in DFW

Headquartered in Dallas, Texas Instruments (TI) was founded in 1930 as Geophysical Service Inc. (GSI) to provide reflection seismographic services to the oil and gas industry. However, following the purchase of GSI by its chairman, president and one other person in 1941, the company diversified into "electronics work" in the 1940s, supplying the U.S. military with submarine detection devices and airborne radar systems. In 1951, the company's name was changed to Texas Instruments Incorporated. From that point in time TI developed into one of the major innovators in the electronics industry.

Major milestones in TI's history include the production of the first commercial silicon transistor (1954), the design of the first transistor

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[51] The companies from the Oulu region brought a desire to cooperate with them to DFW. Some have called these companies' founders the "Oulu Mafia." Regardless of the name used to describe this relationship, it has worked well in establishing communication and cooperation among the companies.

radio (1954), the demonstration of the first integrated circuit (1958), the invention of the first hand-held calculator ((1967), the invention of the first single chip microcomputer ((1971), the introduction of the first single chip speech synthesizer (1978), and the introduction of the first multiport video random-access memory chip (1984).

In 2002, TI was the world's fourth largest semiconductor and chip manufacturer ranked behind the number one, two and three companies, Intel, Toshiba and NEC, respectively. TI also regained the rank in 2002 as the world's number one wireless IC manufacturer, ahead of the number two and three companies, Qualcomm and Motorola, respectively. With regard to the latter, TI's success can be traced to its relationship with Nokia.

The beginning of the 'clustering' of telecommunications companies in Telecom Corridor® can be traced to TI's establishment of its Dallas corporate campus on the border with Richardson, Texas, in 1956. In 1957, Collins Radio, an electronics company in Cedar Rapids, Iowa, established a facility in Richardson to the north of TI's campus. A popular suggestion for the reasons why these companies decided to locate in the cotton fields north of Dallas is that "it was wide open country that allowed them to set up their antennas and get good reception.[52]

The second major boost for establishing the environment that would ultimately attract the more than 600 telecommunications-related firms in Telecom Corridor® today can be traced to the gradual deregulation of the U.S. telecommunications industry. In 1969, the U.S. courts ruled that electronics companies could sell telecommunications equipment directly to business users, thus bypassing the AT&T monopoly.[53] In 1978, MCI received permission to use its microwave technology to compete against AT&T for business-related telecommunications services.[54] On 1 January 1984, the AT&T telephone monopoly was broken up, creating multiple telephone carriers in the USA with equipment needs.

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[52] Simnacher, B., "In Texas, telecom is King of the Cowboys," America's NETWORK, 15 March 1994, p. 52.

[53] A local Dallas businessman named Tom Carter had invented an improved telephone and sued the telephone monopoly AT&T in order to connect his phone to its telephone lines.

[54] In 1963, Microwave Communications Inc. (MCI) was established to provide businesses with long-distance private line telephone services between Chicago and St. Louis. Microwave technology had not been patented in the USA, because it had been used for national defense. AT&T refused to allow MCI to connect to the AT&T lines, and MCI sued.

MCI Network Services established an engineering office in Richardson in 1972 in order to be near its major supplier Collins Radio. In 1982, MCI located its network construction, purchasing and engineering group to Richardson to position these units more closely to its suppliers, Rockwell International, which had acquired Collins Radio in 1973, and Northern Telecom (Nortel Networks), which had acquired the local voice switch manufacturer DanRay in 1978.

While operating in the neighboring country of Canada since 1895 and sharing common roots with AT&T, Nortel Networks didn't establish its first U.S. manufacturing operation until 1972. However, from the company's acquisition of DanRay in 1978, Nortel Network's grew substantially in DFW. Richardson would serve as its U.S. headquarters, as well as the global headquarters for its Wireless Solutions and Enterprise Solutions divisions. While Nortel Networks has sharply readjusted its operations worldwide, including its headcount in DFW, the company still employed more people at year-end 2002 in the USA (13,780) than it did in its home country of Canada (10,140).

Fujitsu Network Communications (Fujitsu) began operations in the USA in 1980 in order to sell its microwave radio transmission systems to MCI. In 1984, Fujitsu established manufacturing and customer support functions in Richardson. Today, Richardson serves as Fujitsu's U.S. corporate headquarters as well as the location for its U.S. engineering, manufacturing, systems customization, installation, customer support and technical assistance units.

Ericsson established its first sales office in the USA in 1902. It joined Fujitsu in Richardson in 1984, when it established the company's first AXE development center in Richardson. Since then, Ericsson has established its North American headquarters in Plano, Texas, to the north of Richardson.

In 1987, Alcatel acquired the large international U.S. telecommunications company ITT. This was followed by the acquisition of Rockwell International's (Collins Radio) Network Transmission Systems Division in DFW in 1991. The USA became Alcatel's largest market. Today, Alcatel maintains its headquarters for all of the Americas in Plano, Texas.

In 1996, Samsung Electronics Company, Ltd., established Samsung Telecommunications Americas (STA) in Telecom Corridor®. STA maintains its R&D lab and North American marketing in Richardson, and it installed an assembly line in DFW for retrofitting "returned" mobile phones from the carriers, which are shipped to lucrative markets in Latin America.

Jeong Han Kim, President of STA, said: "Before coming here in 1996, we reviewed New Jersey, Denver, San Diego and the Netherlands. The central time zone is a logistical advantage in serving our U.S. and Canadian customers coast-to-coast." Peter Skarcynskis, Vice President of Marketing for wireless terminals, added: "Dallas and Texas are among our strongest U.S. markets."[55]

Radio Shack Corporation, which was formerly Tandy Corporation, has it beginnings in Fort Worth, Texas, when it was founded in 1919 as the Hinckley-Tandy Leather Company in order to provide leather shoe parts to shoe repair shops in the Fort Worth area. Following the Second World War, one of the founder's sons, Charles D. Tandy, convinced his father to expand the business into providing leather craft supplies to the home hobbyist. The prospects in the post-war hobby market appeared so good to Charles Tandy that the original business was split in 1950, with the Tandys taking the leather craft mail order and retail supply business as their own and founding Tandy Leather Company, which was later renamed Tandy Corporation in 1960.

Following perhaps on the theme of 'do-it-yourself' hobbies, Charles Tandy became interested in consumer electronics. In 1963, Tandy Corporation purchased the virtually bankrupt, Boston-based RadioShack® electronics retail chain and mail order business, which had been founded in 1921 to supply the needs of both professional shipboard and amateur short wave radio operators in the Northeastern USA.[56] This acquisition ultimately led Tandy Corporation to focus entirely upon consumer electronics in 1975.

From its short wave radio beginnings, RadioShack had entered the rapidly expanding high-fidelity ("hi-fi") market in the late 1940s, opening the USA's first audio showroom in 1947 to provide consumers with direct comparisons of speakers, amplifiers, turntables and phonograph cartridges.[57] In 1954, RadioShack established its own private label line of hi-fi equipment under the Realistic® brand name. By the time of the Tandy acquisition in the early 1960s, RadioShack had nine retail outlets and a worldwide mail-order business that supplied the do-it-yourself market.

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[55] See: http://www.businessweek.com/adsections/telecom/telegiants.htm

[56] The RadioShack Corporation website states that the original founders chose the name "RadioShack," because it was the term used to describe the structure that housed short wave-radio equipment.

[57] For a full history of RadioShack and Tandy Corporation, see: www.radioshack.com

Tandy began to deepen RadioShack's international business in the late 1960s. Stores were opened in Canada in 1968 and in Australia, the UK, Belgium, France, Germany and the Netherlands in 1969.[58]

In the 1970s and 1980s, Tandy Corporation was able to ride the wave of consumer electronics trends in the USA, serving as a consumer electronics market innovator in certain niches and establishing its own electronics production for specific product lines. In 1977, "the first mass-marketed" personal computer (TRS-80) was manufactured and introduced by Tandy.[59] And in the same year, RadioShack began selling the first 40-channel CB radio.[60] In 1985, RadioShack stores introduced to the U.S. consumer market the first high-performance satellite television systems that the do-it-yourselfer could install as well as the first mobile/portable cellular telephone, which was a product of the company's relationship with Nokia-Mobira.

Taking advantage of the growth in mobile telecommunications in the 1990s, Tandy, which renamed itself to RadioShack Corporation in 2000, is today the largest retailer of wireless [mobile] telephones in the USA, and the company has strategic alliances with the large mobile carriers Sprint and Verizon.[61] Here it is important to recognize that the successful stories of both Tandy and Nokia, in at least their respective portions of the wireless value chain in the USA, can be associated with the production alliance that they established in the 1980s.[62]

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58 "Tandy Stores" was used as the retail brand name in these markets.

59 This was the first assembled unit in the USA. The competing option was in kit form.

60 Tandy Corporation benefited from the rapid popularization of Citizen's Band (CB) radio in the USA during the 1970s, which moved the technology from the domains of the long-haul trucker and serious radio hobbyist to the everyday automobile driver and home user.

61 Mobile phones in the USA are by and large sold to consumers through the wireless carriers, which offer a discounted price for specified brands and models via their various service plans.

62 RadioShack does not identify on its website history Tandy Corporation's relationship with Nokia (Mobira). Interestingly, Nokia-Mobira did not recognize the relationship with Tandy in its late-1980s handout of key milestones in Mobira's history.

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CHAPTER V

Multinational Corporations in a Local Perspective – The Case of Varkaus in Finland

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ABSTRACT: *The effects of foreign acquisitions have been mainly studied at the corporate level. The article attempts to complement this picture by studying the consequences of foreign acquisitions from the perspective of local business units. The analysis is based on fieldwork conducted in 2002 – 2004 in Varkaus, an industrial town in Finland. Until the 1980s, the town was dominated by one large Finnish company. Since then, the company has sold all its businesses in the town, and almost all have been acquired by foreign companies. The article reveals that foreign ownership has primarily had a positive impact on the development of the business units acquired, as the units still have almost the same number of employees as they did in the 1980s, in spite of overall growth in productivity. There have been problems and even conflicts between local business units and their new foreign owners due to differences in management styles and business goals. However, the findings support the view that in favorable circumstances local business units may have surprising power vis-à-vis multinational companies. It is also argued that multinational companies lose a significant amount of knowledge and innovation potential if they fail to use the knowledge available in their local units.*

Keywords: *Multinational corporations, foreign acquisitions & mergers, local developments.*

TIIVISTELMÄ: *Ulkomaisten yritysostojen vaikutuksia on tutkittu pääasiassa yritystasolla. Artikkeli pyrkii täydentämään tätä kuvaa analysoimalla ulkomaiseen omistukseen siirtymisen vaikutuksia paikallisten liiketoimintayksiköiden näkökulmasta. Analyysi perustuu Varkaudessa vuosina 2002 – 2004 tehtyyn kenttätutkimukseen. Varkaus oli 1980-luvulle saakka yhden suomalaisen yrityksen hallitsema kaupunki. Sen jälkeen yritys kuitenkin myi paikalliset liiketoimintayksiköt ja niiden ostajiksi tulivat etupäässä ulkomaiset yritykset. Artikkelissa tutkitaan ulkomaiseen omistukseen siirtymisen vaikutuksia liiketoimintayksiköiden menestykseen, johtamiseen ja autonomiaan. Tulokset osoittavat, että ulkomaisella omistuksella on ollut pääasiassa positiivinen vaikutus yksiköiden menestykseen ja työllisyyteen. Johtamisen tasolla on ollut ongelmia ja jopa konflikteja, jotka ovat johtuneet erilaisista johtamistyyleistä sekä erilaisista näkemyksistä yksiköiden kehittämisen suhteen. Suotuisissa olosuhteissa yksiköt ovat kuitenkin pystyneet hyvin vaikuttamaan omaan kehitykseensä. Lisäksi tutkimus osoittaa, että monikansallisten yritysten kannalta on tärkeää hyödyntää paikallisten yksiköiden osaamista ja innovaatiopotentiaalia, koska muuten ne voivat menettää merkittäviä uudistumismahdollisuuksia.*

Avainsanat: *Monikansalliset yritykset, ulkomaiset yritysostot ja -fuusiot, paikallinen kehitys.*

1 Introduction

A central issue in the contemporary debate on globalization revolves around the character and societal impact of multinational corporations. These multinational corporations are often discussed in a highly critical tone, especially with respect to their activities in Third World countries (e.g., Klein 2000, Fung, O'Rourke & Sabel 2001). In the context of developed countries, multinational corporations are not subjected to quite as much criticism. Yet concerns are often voiced when nationally owned companies are acquired by multinationals.

One concern is the fear that foreign owners are less committed than their national counterparts when it comes to developing units that are located far away from corporate headquarters. This fear could be called the "capital with a face" argument. The most recent developments in economic globalization, however, may have weakened the force of this argument: in fact, multinational companies have been moving their operations away from their home countries to countries with lower costs, such as China.

In addition, others argue that there are no good or bad owners as such, but that the crucial point is how compatible the new owner company is with the acquired unit. Thus, the theory does not assume that there are good and bad owners, but that there are good and bad matches (Lichtenberg 1992; Ali-Yrkkö and Ylä-Anttila 2001). The above-mentioned arguments can be combined into a hypothesis assuming that a company's success may improve under foreign ownership due to better compatibility, but at the same time its risks increase, because in bad times it may be the first target for streamlining or divestment due to its distance from company headquarters.

Multinational corporations have also attracted attention in academic management and organization research. Central topics in this research include the differences between multinational corporations originating in different countries ("the country of origin effect"; see, e.g., Harzing and Sorge 2003, Whitley 2001), as well as the relations between multinational corporations and local companies and business units. Some studies have presented cases in which the acquired, local companies actually have had quite a lot of power in relation to the companies that own them. "This suggests that rather than being propelled by sharks, which eat the small fishes, globalization is also propelled by small birds seeking protection under the eagle's wings," Kristensen and Zeitlin (2001, 183) argue based on their case studies in Denmark. Furthermore, Doz, Santos, and Williamson (2001) have presented a thesis of *metanationalism,* according to

which local units can be central to the success of global companies. Local and (from the perspective of corporate headquarters) marginal markets may provide fertile ground for the birth of interesting combinations of technologies, products, and services which may eventually change the shape of global markets.

In Finland, the impact of acquisitions by multinationals has been studied from two perspectives. One has been to study the acquired companies' success in terms of growth and profitability. These studies have found that foreign ownership has primarily had a positive influence on the acquired companies' development (Pajarinen & Ylä-Anttila 1999, Ali-Yrkkö and Ylä-Anttila 1999, Pajarinen and Ylä-Anttila 2001). The other perspective has been to study the impact of foreign ownership on management, in terms of business strategy, corporate governance, and the diversity of business areas (e.g., Tainio *et al.* 2001).

In the Finnish studies, the effects of foreign acquisitions have been mainly studied at the corporate level. This article attempts to complement this picture by studying the consequences of foreign acquisitions from the perspective of local business units. The article is based on fieldwork conducted in 2002 - 2004 in Varkaus, a small industrial town in eastern Finland. Until the 1980s, the town was an industrial community dominated by one large Finnish company, Ahlström Ltd. Since then, Ahlström has sold all its businesses in the town, and almost all have been acquired by foreign companies.

The main body of the fieldwork consisted of interviews with about 50 people in the town. The interviewees included directors of the business units, labor union representatives, local authorities, and other people familiar with developments in the community. These data were complemented with intensive company and press monitoring, and by maintaining continual contact with the most relevant parties from the perspective of the study. For the present, the study process has been grounded in the data: the conceptual framework, research problem, or hypotheses were not strictly defined in advance. Rather, the aim has been to find interesting phenomena, and use them as a basis for developing new hypotheses on the nature of the relationship between multinational corporations and their local business units.

Thus far, one report in Finnish has been published on the study (Jääskeläinen and Lovio 2003). This article attempts to take the study further by focusing on the following questions:

- How is the nature of the link between the local business units and the global economy altered when the units are acquired by foreign owners?

- How has foreign ownership influenced the management of local business units?
- How have the local units been able to influence their own development and the decision-making within their multinational owner companies?

The article is organized as follows. First, a basic description is given of the Varkaus case. Then, an attempt is made to answer the above-mentioned questions in Sections 3, 4 and 5. Finally, the analysis is summarized in terms of the general nature of the local-global connection, as reflected in the findings of the present study. Due to readability considerations, the sources of the empirical data are not presented in detail in this article. They can, however, be found in the full report (Jääskeläinen and Lovio 2003).

2 The Varkaus case

Varkaus is a small industrial community of 23,000 inhabitants in eastern Finland. This part of Finland was very rural up until 200 years ago. The town of Varkaus started to evolve gradually during the 19th century by the local river rapids, around which small industries grew up. At that time, entrepreneurs from southern Finland established a company utilizing the abundant waterpower, bog iron ore and raw wood material. In the early 20th century, there were two notable companies in the area. Paul Wahl & Co had three production works in the area: a sawmill, a machine shop, and a shipyard. The machine shop produced, for example, machinery and equipment for the growing Finnish forest industry. It also produced steam boilers used by the shipyard and other industries. Paul Wahl & Co also had a competitor in Varkaus: the Lehtoniemi shipyard and machine shop. Together, these companies employed about 1,000 out of a total population of 5,000.

In 1909, Ahlström Ltd purchased Paul Wahl & Co, and later also its competitor Lehtoniemi. The family-owned Ahlström (established 1851) was then one of the largest companies in Finland, operating in both the metal and forest industries. It had a number of business operations all over southern Finland. The owners of Ahlström saw Varkaus as a new, promising northern industrial site for developing the paper industry. In the following decades, the company invested heavily in Varkaus by building a new power plant, a sawmill, a pulp mill, two paper machines, a

plywood mill, and new facilities for the machine shop and the shipyard. By the 1930s, the Ahlström factories employed more than 2,000 workers. Varkaus had turned into the largest industrial site of Ahlström, which by that time had grown into the largest company in Finland.

In 1929, Varkaus became a market town, and in 1962, a city. The town literally grew up around the factories, as the company dominated the development of the local community in every respect. The streets, housing, schools, church, hospital, etc. were all built by the company. The company-town nature of Varkaus is symbolized by the fact that the main street, which runs between the factories, is called Ahlström Street.

Ahlström continued to invest in its factories in Varkaus up until the 1980s. As a result, there were, for example, four paper machines in Varkaus. The machine industry consisted of three units producing steam boilers, pulping equipment, and screen plates. Furthermore, the computer department of the paper mill had evolved into a new company manufacturing automation equipment and systems for the process industries. All in all, the Ahlström production units employed 3,000, and the population of the local community had grown to more than 25,000.

In the mid-1980s, however, the relationship between Ahlström and its production units in Varkaus started to change rapidly. The new CEO Krister Ahlström, appointed in 1982, started to internationalize the company. In 1985, Ahlström had 12,000 employees, only 17% of whom worked abroad. The company was very diversified: in addition to the forest and machine industries, the company had business units in the glass, electrical, and automation industries. The company management decided that during the internationalization process, it was important to focus on the lines of business in which its chances for success were the best – the remaining businesses were to be sold off. This strategy was eventually completed in 2002. Now the company was focused on fine paper products and other fiber-based products. The company is smaller than it was in the 1980s, but on the other hand, it is very international. More than 80% of the company employees now work abroad (see more details in Laurila & Lilja 2003).

As a result of the focusing strategy, Ahlström sold all of its business units in Varkaus to other companies. What was unusual about these divestments was that in most cases, the new owners were foreign companies. The new owners include Stora Enso (Finnish-Swedish), Hartmann (Danish), Andritz (Austrian), AFT (Canadian), as well as Foster Wheeler and Honeywell from the US. Thus, the town built by one Finn-

ish company turned into a business locality for many different multinational companies.

Table 2.1 Foreign owners of central businesses in Varkaus in 2002

Company (the year of acquisition)	Country of origin	Turnover and number of employees, 2001	Employees in Finland	Employees in Varkaus, end of 2002	Business in Varkaus
Stora Enso (1987)	Finland and Sweden	13,509 mill EUR 44,275	15,054	1,345	pulp, paper, board, and sawmill
Hartmann (1999)	Denmark	1,422 mill DKK 2,093	50	50	egg cartons
Foster Wheeler (1994)	USA	3,397 mill USD 10,394	600	550 [1]	energy technology
Andritz (2000)	Austria	1,319 mill EUR 4,545	1,100	300 [1]	pulp technology
1. CAE (1992) 2. AFT (2001)	Canada Canada	- -	150	150	screen plates
Honeywell (1992)	USA	23,652 mill USD 115,000	534	400	industrial automation
Tellabs [2] (2001)	USA	2,290 mill USD 7,334	1,000	15	communications infrastructure
Total				2,810	

[1] These figures include a machine shop Warkaus Works owned jointly by Foster Wheeler and Andritz, as well as another machine shop owned by Andritz. Today, however, most of the personnel in these companies consist of product developers and salespeople.

[2] The Tellabs unit is different from the other units in the table: it was not acquired from Ahlström but is a totally new unit.

Table 2.1 presents some basic information on the current owners and the business units they own in Varkaus. The largest owner was the origi-

nally Finnish state-owned Enso-Gutzeit, which acquired the Ahlström sawmill, pulp mill, and paper machines in Varkaus in 1987. In the early 1990s, Enso-Gutzeit grew rapidly, and it was merged in 1999 with the Swedish company Stora. The current Stora Enso can be considered a Finnish-Swedish company, and is run by top management in London. The division heads of the Stora Enso units in Varkaus are also mostly located outside Finland. Stora Enso is the largest European company in the forest industry.

The Danish company Hartmann is an international packaging company founded in 1917. In Varkaus, the company owns a small unit producing egg cartons. Hartmann is the world's largest manufacturer of these specialty packaging materials, and it has similar production facilities in many other countries. On a global scale, however, Hartmann is a small company. Most of the Varkaus unit's production is sold in Finland.

The third European owner is the Austrian company Andritz. The Andritz personnel in Varkaus consist of three groups. These include, firstly, personnel responsible for designing and marketing soda recovery boilers. Secondly, they include manufacturing workers at the Päivärinne machine shop, which most probably will soon be sold to local entrepreneurs. In addition, Andritz owns another machine shop together with Foster Wheeler. Andritz also owns other acquired business units in Finland. From a global perspective, Andritz is a mid-sized machine industry company, which is among the world's leading companies in pulp equipment. It owns factories in many European countries.

There are four business units in Varkaus owned by North American companies. US-based Foster Wheeler acquired Ahlström's energy technology company, which mainly produces fluidized bed boilers and power plants. Most of the Foster Wheeler personnel in Varkaus consist of design and project staff, whereas the actual production of boilers in Varkaus has decreased. Foster Wheeler is a mid-sized stock-listed American company focusing on energy technology, which owns production facilities in the United States, Europe and China. Due to financial difficulties, Foster Wheeler was delisted from the New York Stock Exchange in autumn 2003.

The Canadian company CAE acquired a small business unit of Ahlström that produces screen plates. Later on, CAE sold off its screen plate business to the Canadian equity investment company AFT. AFT currently owns three screen plate factories: the one in Varkaus, and two others in Canada and South Korea.

US-based Honeywell acquired Ahlström's process automation business. Honeywell is a large, diversified company with more than 100,000

employees. It is the world's leading company in, for example, automation equipment. The company produces and develops automation products in very many countries.

The American communications infrastructure company Tellabs established a new small unit in Varkaus in 2001. Tellabs wanted to employ designers from outside the large cities, where it was difficult to find new recruits at that time. The people employed by Tellabs in Varkaus were mainly recruited from the Honeywell Varkaus unit, where they had worked for many years designing embedded information systems.

Overall, the business units owned by the different multinational companies today employ about 2,800, which is almost the same number as Ahlström employed in the 1980s.

3 The local economy in Varkaus: its special character and the change in its link with the global economy

Varkaus is an idiosyncratic local economy, which has had a special kind of link with the global economy. This relation changed when Ahlström sold its business units to multinational companies.

Firstly, Varkaus can be characterized as an industrial island in eastern Finland, which is isolated and lacks alternatives, but is firmly rooted in the area. The term "isolated" refers to the fact that the local people have hardly any alternative job opportunities within a radius of 50 km of Varkaus. There are few alternatives within Varkaus, either, as each kind of product is produced by only one company in the town. The lack of alternatives is emphasized by the fact that the number of jobs has not grown in Varkaus during the past 15 years, the unemployment level was extremely high in the 1990s, and the population is somewhat declining. The population has decreased by 10% from the peak year, 1986, to 22,700 in 2003. The lack of alternatives has engendered a strong commitment to the existing business units and workplaces. The desire to defend and increase the employment opportunities is a concern shared by business unit directors, trade union representatives, and local authorities alike. People with employment rarely move out of town, because most have roots in the community, and it is difficult to sell one's house at a reasonable price. Entrenchment in the locality is increased by the long history of the local business units in the town: sawmill products, steam

boilers, and pulp equipment have been produced in Varkaus for as long as 150 years.

Another feature characterizing Varkaus is its dependence on outside resources and markets. The industry in Varkaus was engendered by capital, technology, and management from southern Finland, aiming at the export market. There has been little local entrepreneurship directed at the local or national markets in Varkaus. In fact, the arrival of Ahlström can be viewed as a case of internal colonialism: Ahlström invested in Varkaus in order to exploit the local natural resources and make them into products for the export market. The town was built to serve the needs of the factory. Managers from outside were sent in to govern the factories and the town itself; on top of everything, they were mostly Swedish-speaking up until the 1970s, and they had their own residential areas and schools built.

Varkaus, however, gradually increased its relative independence of external decision-makers. Firstly, during the 1960s and 70s, the town administration disassociated itself from the control of Ahlström's local management. The local services, formerly provided by the factories, were turned into public services. In addition, the technological independence of the factories in Varkaus increased. The machine shops in Varkaus developed and manufactured products in which the local units had a clear leading edge within the Ahlström group. The clearest sign of this increased independence was the establishment of Altim Control, a process automation business unit, in 1979. The unit emerged entirely on the initiative of computer specialists in Varkaus, and Ahlström had nothing to do with the automation business anywhere else.

The business units in Varkaus, which had gradually built up their independence, were put to a tough test, however, when Ahlström divested them. What would be their fate under new ownership? The change was not that the units were suddenly linked to the global economy; it was that the nature of their link to the global economy changed. Paper from Varkaus had been sold all over the world. In fact, one of the symbols of the globalization debate, *Financial Times*, has been printed on paper from Varkaus since the 1980s. In the fields of engineering and automation technology, Ahlström established or acquired foreign units in Sweden, France, and the US, especially in the 1980s. The people working in Varkaus were thus quite used to operating in an international business environment. What was new, however, was that after the divestments, the units themselves were also owned by foreigners.

Following the change in ownership, the links of the business units in Varkaus with the global economy were altered in at least the following ways:

- The historical emotional ties disappeared: For a long period of time, Ahlström was highly committed to Varkaus. Varkaus was the creation and the pride of the company, and especially of one generation of its directors (Walter Ahlström, whose name is still carried by a restaurant in the main street). The strength of the historical tie is illustrated in the still continuing conflict that broke out in 1987 within the owning family, when the CEO Krister Ahlström decided to sell the paper mills in Varkaus.
- The companies turned from builders of the town into tenants: In Ahlström's times, the local management had literally designed and produced the town infrastructure from the drainage system to the educational system. At the end of the Ahlström era, this role decreased significantly. The current owners, in contrast, want no part in building the town infrastructure. They do not even want to own their own facilities. Today, the city builds the new facilities for the companies, which rent them for a longer or shorter period of time. Furthermore, a process is currently ongoing in which Andritz, and perhaps also Foster Wheeler later on, will sell their machine shop ownership in Varkaus to local entrepreneurs.
- From domestic family ownership to foreign stock markets: Ahlström was and still is a family-owned company, which up until the 1980s had few business units abroad. In contrast, the current owners of the business units in Varkaus are stock market companies, with no special bond to Finland. Stora Enso is an exception here, as its ownership interests in Finland remains strong even though it is very international.
- The significance of the units in Varkaus in the business of the new owners is very small, when compared to Ahlström's time: Even though Ahlström did not originate in Varkaus (the company was established on the west coast near Pori), Varkaus was the main locality of the company from the 1930s onward. Even in the early 1980s, 26% of the company employees worked in Varkaus, and production in the town generated as much as 45% of the company turnover. These figures are much smaller for the current owner companies. Slightly more than 3 per cent of the workforce of Stora Enso work in Varkaus. The respective figure for Hartmann is 2%, for Foster Wheeler, 5%, for Andritz, 6%, and for Honeywell about 0.5%.

- From owners of a diversified company to owners of companies with a clear focus: In the 1980s, Ahlström was a relatively large diversified company, yet internationally, it was a relatively small player in all its industries. Now, the business units in Varkaus are owned by companies that are globally significant players in the industries represented in Varkaus. Honeywell is the world's largest producer of industrial automation, and Stora Enso is the world's second largest forest industry company. The engineering companies Foster Wheeler, Andritz, and AFT are also leading players in their own product lines. Thus, the business units in Varkaus hold a stronger position in the market as part of the new owner companies than they had in Ahlström's time.

On the one hand, the factors discussed above indicate that today, the Varkaus business units have a stronger link with the global economy than they did before, because now they are parts of the global leading companies in their own lines of business. On the other, these factors also reveal the potential weakness in this link: the new owners have no historical or national commitment to Varkaus. They do not invest in the town or its buildings, the role of Varkaus is mostly small in the context of their business as a whole, and they also have similar business units elsewhere in the world. This means that the units in Varkaus need to compete for their position within the parent company much more fiercely than they had to in Ahlström's time. Thus, while the status of the Varkaus business units has improved in terms of external market position, they have landed in much tougher competitive settings within their parent companies. This state of affairs reflects the hypothesis stated in the beginning of this article concerning the simultaneous emergence of a better match (resources and marketing channels) and higher risks (decreased commitment by the owners).

Describing the nature of the new relationship of the business units in Varkaus with the global economy would require a relatively detailed description of the competitive position of these business units within their new international owner corporations. Presenting such an analysis would require plenty of space, so only a synopsis is presented here. After the acquisitions, the position of the business units was one of three basic types:

- Situation type 1: The foreign company acquired the unit in Varkaus in order to buy out a competing product and gain a new local producer for its own products (case Honeywell).
- Situation type 2: The foreign company acquired the unit in Varkaus in order to gain a new, good product that complements its previous

product range; concurrently, the acquiring company improved its position in the European market (cases Foster Wheeler, AFT, to some extent also Andritz).

- Situation type 3: The foreign company acquired a business unit in Varkaus in order to expand its production and markets in products that it already produced in other localities and countries (cases Stora Enso, Hartmann).

From the perspective of the business units in Varkaus, situation type 1 is difficult, and its consequences are analyzed in more detail in Section 5. In contrast, the type 2 and 3 situations offer, in principle, good prospects for business development.

In all cases, the acquisition by new owners also meant that the business units were merged into companies with different management cultures and styles than had been the case under Ahlström. This was a source of risk shared by all units: can the management styles be merged in a way that is satisfactory to both the owning companies and the business units?

4 The new multinational parent companies' impact on management style in the business units

All the business unit managers and labor union representatives interviewed agreed that foreign ownership had had an impact on management styles in the business units. The most prevalent opinions included the following:

- the management time scale has contracted: it is difficult to find "patient capital" for investments and product development, and quarterly performance becomes focal;
- the demands for business performance have grown;
- stock market quotations have become the key factor determining acquisitions, divestments, and management;
- reporting requirements have grown;
- investments and personnel plans need to be very well justified, and decisions regarding them may be very slow.

This is most probably the case, as well, yet it is worth noting that these changes are not purely a consequence of the foreign acquisitions of business units in Varkaus. These same changes have been experienced in Finnish publicly listed companies, partly as a consequence of the growth in foreign ownership of their stock (see, e.g., Tainio *et al.*, 2001). It is thus justified to claim that such changes would have occurred in any case, even if the business units in Varkaus had remained in the ownership of Ahlström or other Finnish companies. In Varkaus, however, the change was more rapid and dramatic due to the direct transfer to foreign ownership.

Such changes in management style are quite common today, and they have most probably led to improvements in business efficiency, to some extent. Yet it is worth pointing out that this change was not appreciated even by the business unit managers, to say nothing of the trade union representatives. The tough and short-term performance requirements were viewed as oppressive, and it was believed that they sometimes lead to poor decisions in the long term. The local management appreciated long-term and risk-taking product development and co-operation with customers. The local managers seemed to be much more critical toward the new shareholder value-based management than the top management of large Finnish companies or the business press have been.

The business managers and employee representatives interviewed also referred to other aspects in the management of the parent companies that had felt foreign and out of place. These aspects included:

- the hierarchic structure and formal relations, when compared with the local management style;
- the separation between functions (product development, production, marketing) and
- the distant relationship between management and employees, and especially trade union activities.

Both managers and employees considered the Finnish management style better in these respects. Moreover, they were especially critical toward the North American management style. The Swedish, Danish, and Austrian style of management was viewed as being less aggressive and closer to the Finnish style, whereas it was said that North Americans tend to impose their own style of management on the units, irrespective of local conditions. North Americans were also criticized for a lack of knowledge of the European way of managing customer relations and marketing. This indicates that the local managers were clearly able to identify differences in the management style of multinational companies

with different national origins. This is in line with the importance of the country of origin effect as presented by Harzing and Sorge (2003).

Table 4.1 gives a somewhat pointed depiction of how the local unit heads in Varkaus experienced the difference between the Anglo-Saxon style of corporate management, and their own Finnish (or more broadly speaking, Nordic) style of managing their business units. There appear to be two kinds of differences. There are the general national differences between the Anglo-Saxon and Nordic business management models (cf. Whitley 2001). Another difference derives from the fact that multinational companies represent mobile capital, which is continually in search of new products, industries, and locations, whereas the local business units represent embedded (settled) capital, which aims to secure its position by developing its existing business.

Table 4.1 Differences between the Anglo-Saxon style of corporate management and the Nordic style of business unit management in the light of the Varkaus case

	The Anglo-Saxon style of *corporate management*	**The Nordic style of *business unit management***
basic perspective	business units are investment objects, detachment is maintained locally by - operating in leased facilities - outsourcing support functions and even physical production	business units are development objects, commitment to the local is engendered by the attachment of competent personnel and the entire business to the community
timescale	quarterly and annual performance important	the cycle of investments and development projects
measures of economic performance	stock quotations = rapid growth, high profitability	more patient profitable growth
management and problem solving	- management by frequently reported numbers - successful individual leaders - replacing managers, buying and selling	- project management - team management, employee participation, trade union involvement - finding new solutions, finding new owners
co-operation, managers' use of time	investor relations	sub-contractors, public research and educational institutions
core issues	product concepts, brands	technology, customer needs
overall character	mobile	embedded

These differences in management style did not however, lead to heightened conflicts in any of the business units studied. This was mainly because, in the end, the Finnish managers had mostly been able to do things their way. According to the Finnish managers themselves, they had managed to defend their autonomy by maintaining the profitability of the units, and the other figures that headquarters are interested in, at a good or at least tolerable level.

The interviews with the business unit managers gave the impression that the units in Varkaus live, to some extent, in two different realities. One is the official reality that is presented to headquarters. The other is the unofficial reality as it appears to the employees and the broader local community. In Finland, one factor that helps in keeping these realities separate is the language. Communication between the units and their headquarters is conducted in English, but most of the practical work and everyday activities are conducted in Finnish, that is, on the other side of the language barrier from the perspective of the foreign owners.

5 What influence do the local units have on decision-making in multinational companies? – case Honeywell

The overall picture from the analysis is that the business units in Varkaus have done fairly well after having been acquired by foreign owners. The following account focuses on the course of events in the case with the most problems, because it reveals interesting mechanisms in the link between the local and the global. The case is that of the Honeywell unit in Varkaus. The following is an account of its developments in Varkaus in 1992-2003:

Stage 1. Honeywell acquired Ahlström's automation company, Altim Control, in summer 1992 in order to buy a competing product off the market and replace it with its own product. Honeywell was interested in the customer accounts and competent designers of the Varkaus unit, but it was not interested in developing the old products of Altim Control or in the production of electronic and mechanical components for automation products. Following this strategy, a large number of R&D personnel were discharged in autumn 1992, and the production of electronic and mechanical components was outsourced. Instead of the product by Altim Control, the business unit in Varkaus was forced to sell its clients the Honeywell automation system. The situation was considered extremely

difficult and offensive in Varkaus. This was underlined by historical events: the entire idea of establishing Altim Control had originated in the 1970s, when the paper mill in Varkaus had adopted the Honeywell automation system. The computer personnel in Varkaus were convinced they could design a better system, and this had been one of the reasons for establishing Altim Control.

Stage 2. To the surprise of Honeywell, it turned out that neither the old nor the new customers of the Varkaus unit were interested in Honeywell's products, after all. During the first year after the acquisition, the unit in Varkaus managed to sell only one Honeywell system. Thus, Honeywell was swiftly losing its market to its other competitor in Finland (currently Metso Automation). In order to rescue the situation after almost a year of stagnation in the business, Honeywell management gave the Varkaus unit permission to start selling their old system. The Finnish unit management was eager to grasp this opportunity, and started to develop their system further in customer projects. At the same time, some of the designers who had been discharged set up their own engineering companies, which were available as sub-contractors for Honeywell. The companies that had been established for producing electronic and mechanical components also managed to start up their production. Thus, the shutdown of the local automation industry was reversed.

Stage 3. The problem, however, was that Honeywell's decision to allow the sales of the Varkaus unit's product was not final, and it did not include permission to carry out extensive product development. In fact, Honeywell launched the development of a new automation product in the US, with the aim of replacing both Honeywell's own product and the products of the Varkaus unit. This product development project was partly a failure, however, leading to a situation in which three products competed for the same markets within the corporation for many years. The Honeywell units in different parts of the world were competing for the same clients. Honeywell also kept a close eye on the costs in Varkaus, and unlike in the other business units in Varkaus, Honeywell sent in a business unit director from the States for more than a year.

Stage 4. In 1997, the parent company Honeywell acquired another large American automation industry company, Measurex. Surprisingly, this contract improved the position of the unit in Varkaus. Unlike Honeywell, which was focused on products, Measurex had a customer-oriented global organization specialized in pulp and paper industry equipment, which continued its operations relatively independently within Honeywell. This provided a global channel for the sales of products from Varkaus. In connection with the Measurex acquisition, Honeywell also

gained Roibox Ltd in Kuopio (60 km from Varkaus), which originated in Finland and which produced automation equipment for the paper industry. Roibox's product turned out to be a good complement to the products from Varkaus, and the turnover of both units took an upward turn.

Stage 5. 1999-2001 brought new uncertainties to Varkaus. In 1999, the Honeywell group was acquired by the American Allied Signal corporation, and the new merged company was given the name Honeywell International. In the following year, negotiations were launched for a merger with GE. Furthermore, the profitability of the corporation took a downward turn, leading to overall insecurity. Honeywell sent in a new foreign unit head with the task of improving the profitability of the unit. The importance of improving profitability was highlighted by the need to boost Honeywell's stock quotation with an eye on the potential merger with GE.

People worked hard in those years to increase profits, and the subcontractors felt they had been under heavy pressure. The quest for profitability also led to some bad decisions. The unit in Kuopio was closed down, and its production was transferred to Varkaus despite employee opposition. Then the entire product of the Kuopio unit was sold, even though it also reduced the sales of the Varkaus unit. Occupied with the merger negotiations, Honeywell failed to solve the problem of three competing products, and the competition within the company remained intense. This, in turn, placed a heavy strain on the product developers in Varkaus. Ten experienced designers, who had worked for the company for years, switched over to a new unit established by Tellabs in Varkaus in the hope of gaining a more stable product development environment in Tellabs and the communications infrastructure business.

Honeywell's aim, at that time, to improve profitability at any cost is well reflected in the company's annual report for 2001, with a special focus on improving profitability. In the report, Honeywell's retired CEO Bossidy expounds: "Performance culture isn't a slogan for us - it's reality. Performance is coded in our collective DNA and defines what it means to work for, do business with, and invest in Honeywell". In the section on human resources, the report continues this line: "Our culture is demanding. Performance really matters here; all employees have tough goals and we hold them accountable. Not everyone wants to work at Honeywell - and that's fine with us." (Honeywell 2002, 2, 15)

Stage 6. From the perspective of the Varkaus unit, the situation suddenly took an upward turn in autumn 2001. The EU put a stop to the merger between GE and Honeywell. During the merger negotiations, however, GE had managed to convince Honeywell management that the company should reorganize from a product-based structure to a custom-

er-based one. As a consequence, a division focusing on the pulp, paper and graphical industries was established in Honeywell, and the Canadian director who had been running the unit in Varkaus for a few years was appointed its head. During his stay in Varkaus, he had become convinced that the unit's products are best among the competing Honeywell products in these areas of application. This led to the decision that some core solutions in the products from Varkaus became the standard for all Honeywell products in these applications. At the same time, the geographical market of the Varkaus products was expanded at the expense of other Honeywell units. Furthermore, the new Finnish director of the Varkaus unit was given permission to re-acquire the product of the Kuopio unit, which had previously been sold.

Stage 7. During the past year, the position of the Varkaus unit has continued to improve. The largest product development units in Honeywell are located in the States. However, the costs of R&D are relatively high there. Furthermore, the research environment in the US is not very productive from the perspective of developing products for the pulp and paper industry. There are no longer any large producers of paper machines in the country, and the universities are not interested in the field. For this reason, Honeywell decided to relocate the unit developing new products for the paper industry. After studying the feasibility of many countries, the company decided to establish the new R&D unit in Finland, because Finland is one of the leading countries in paper technology, and because the Finnish forest industry companies had grown, over the years, into important global clients. In addition, the salary of a Finnish R&D engineer is about one-third of the salary paid in the States. In Finland, Honeywell organized a call for tenders in three cities, and on the basis of the offers received, decided to establish the new unit partly in Kuopio and partly in Varkaus. As a consequence of this decision, Honeywell employed 50 new R&D experts in Kuopio and Varkaus. In Varkaus and Kuopio, this event has been celebrated as a glorious example of how one can defend and develop local capabilities. Honeywell's reputation has recovered quickly, as well: the former adversary has even been called "King Midas" in the local press.

Honeywell has established new foreign research units in other countries besides Finland. Their location indicates that costs have played a central role in the locating decisions. Honeywell Technology Laboratories units are today located, besides in the United States, in Bangalore, India, in Beijing and Shanghai, China, and in Brno, Czech Republic (Honeywell 2003).

Table 5.1 Summary of factors influencing the development of the business unit after foreign acquisition in the case of Honeywell

1. Overlaps in the business of the acquiring company and the unit acquired at the time of the acquisition	-	Important negative factor in the early stages
2. The relative technological and business competence of the acquired unit and its overall competitiveness in the new owning company (competitive position)	-	Strong positive factor later on: technological competence in the paper and graphic industry, adequate cost competitiveness
3. The evolving business position of the acquired unit, the product and market solutions adopted, the relative size of the unit (market position)	-	In the past few years, increased global responsibility and clarification of the market focus
4. The organizational position of the acquired unit, its independence and relations with headquarters in the new corporation (power position)	-	Tight control, foreign unit leaders, who however turned into protagonists of the Varkaus unit
5. Compatibility of the management and corporate culture of the acquiring corporation and the acquired unit	-	During the first years, significant cultural differences and communication gaps
6. First experiences and events after the acquisition	-	The initial shock gave rise to a need for the Varkaus unit to prove itself
	-	Honeywell held on to the unit even though its role evolved differently than originally planned
7. The strategic commitment of the acquiring corporation in the acquired unit's field of business	-	Commitment at least relatively strong
8. The relative strength of the acquiring corporation in the unit's field of business	-	Honeywell is the largest company in its field of business
9. General performance of the acquiring corporation	-	Honeywell has had some troubles, 2003 was positive

It is interesting that the story has, at least for now, a happy ending. The account also has many points in common with the Danish case analyzed by Kristensen and Zeitlin (2001). Yet from a broader perspective, the most interesting thing is to consider why the events took this course. What mechanisms and interactions in this account are central, and perhaps more generalizable? Table 5.1 attempts to summarize potential explanatory factors at different levels, and their potential impact in the present context. The nine factors presented in the table may also be useful in research on other cases.

In addition to the factors presented in the table, two other aspects are worth noting. The local perspective highlights the importance of the employees' life histories, capabilities and local embeddedness. The global perspective draws our attention to the influential role of arbitrary long-distance effects.

The unit in Varkaus turned out to be successful in defending its own products and its continuity. An important reason for this is that during its 15 years of existence, Altim Control had managed to become so embedded in Varkaus and its people that they were willing and able to defend it. During this time, capabilities had also accumulated and customer relations had been established with the European paper industry. Altim Control's personnel in Varkaus were members of the new young generation of highly educated professionals. Most of the employees were from eastern and northern Finland, and had studied at the local universities or polytechnics. In the height of the company's growth in the 1980s, entire graduating classes were hired to Varkaus from these schools. The young employees worked hard, started families and bought their own houses in the area. The company was not merely a source of earnings for these people, it was a central part of the story of their lives, and their own creation right from the first product. In Varkaus, Altim Control was the kind of company Nokia grew into on a Finnish national scale in the 1990s. The capabilities of the company were inside the heads of its employees, who did not want to move out of Varkaus.

It is quite understandable that the Honeywell representatives who made the decision to acquire the company in 1992 had no idea of the historical role and specific aims of this local player. It is made even more understandable by the fact that even Ahlström's head office in Helsinki never quite believed in Altim Control, which had been initiated by the people in Varkaus themselves. This is aptly illustrated in the following quotation from the dissertation of Paavo Kosonen, a trusted advisor of CEO Krister Ahlström. In this sequence, Kosonen (1994, 125-126) explains why Ahlström sold Altim Control to Honeywell:

> "During the 80's, an innovative team in Central Finland had built up from scratch a business of Industrial Process Controls that rapidly became very well accepted in a number of Finnish process industries, from P&P to chemistry, from the steel industry to printing houses. Soon the team was able to expand its markets to Scandinavia and Western Europe as well (also the Robin Corp, in the US). As a case of product innovation this business was an incredible success. As a component of Ahltrom's redefined global business portfolio, it was an open question mark. Can a small team in eastern Finland really build up from scratch a global, self-supporting automation business that is viable in the long run? - The austere economic environment of 1992 echoed a definite answer, loud and clear: NO!"

What appeared possible, necessary, and realistic in Varkaus, was perceived in the head offices of Ahström and Honeywell as a case of voluntarism, which would not survive the harsh realities of the global market.

It has been claimed that one of the central features of globalization consists of a mechanism of long-distance effects, which are caused by the increased strength and complexity of international links. A change occurring somewhere can be rapidly and dramatically reflected in the life of a local community on the opposite side of the globe. A number of such long-distance effects can be identified in the story of Honeywell and Altim Control. The first type of effects includes the mergers and merger negotiations concerning Honeywell, Measurex, Allied Signal, and GE. Surprisingly, these events contributed to a development within Honeywell, which in the end resulted in the Varkaus unit being given global responsibility in the field of its core competence.

Another type of long-distance effect is the overall growth of the prominence of Finland in forest industry production and equipment manufacturing. In 1992, Finland was still only one of the central countries in forest technology, but by 2002, three of the world's ten largest forest industry companies were Finnish, and Finns also had a strong position in the production of pulp and paper machines and paper chemicals. At the same time, the Nokia effect has boosted Finland's overall technological reputation. From Honeywell's perspective, Finland's forest industry know-how, technological prowess, and affordable cost structure managed to change the first impression of a strange local company that wanted to develop its own products.

In addition to Honeywell, a number of other foreign companies have established production and technology units in Finland in the field of

paper technology. IBM has established a specialized IT service center for the forest industry in the Helsinki metropolitan area. The Swiss global leader in its field, Ciba Specialty Chemicals, is building a new research center for paper chemistry in Helsinki. This new Technical Center Europe will cover all aspects of technical support required for paper and board production. The US-based Albany International, which is the world's leading company in the paper machine clothing industry, is increasing its production and research in Helsinki. In 2001 J. M. Huber Corporation, also from the US, acquired the international Noviant Group, which develops and produces what is known as CMC pulp (sodium carboxymethyl cellulose) in the Netherlands, Sweden, and Finland. After this acquisition, the R&D operations of the Finnish unit, which is located in the small town of Äänekoski, have been expanded. All in all, as a result of the developments in the past few years, 25 per cent of the paper engineers in the world are educated in Finland (*Tekniikka & Talous*, 5 Feb., 2004). The decisions concerning Honeywell Varkaus are thus related to a broader trend than the specific events in Varkaus.

One might find other similar long-distance effects that were independent and beyond the control of Varkaus and Altim Control. The central issue here is the observation that in multinational companies, decisions on business locations are not made, and cannot be made, on the basis of detailed calculations of the optimal location for each unit.

6 The dialogue between locally embedded and mobile capital

In the light of the previous account, the encounter between a local business unit and a global corporation can, in essence, be conceptualized as a dialogue between locally embedded and mobile capital. The present analysis is based on interviews with local players, and on the monitoring of events in Finland. This picture may be somewhat biased. When interviewing the business unit heads in Varkaus, one sometimes got the feeling that they tended to attribute their lack of success to the problems and poor management of the parent company. In contrast, the successes of the business units were attributed to Finnish know-how. During the study, for example, the way Honeywell was discussed became much more positive as the situation improved. Thus, it would be important to also interview representatives of the parent companies in later stages of the study.

In the data, the dialogue between management styles can be viewed, at its core, as a dialogue between the Anglo-Saxon corporate management style and the Finnish or Nordic style of managing business units. It is interesting to note that the local heads of the business units were emphatically in favor of the Finnish management style. In fact, it seems that the Anglo-Saxon, finance-driven model of management is not as popular on the local level as it is in the head offices of Finnish companies, and that the management styles on the local level have not changed as much as the corporate level management has (cf. Tainio *et al.* 2001)

The local managers and trade union representatives also made a clear distinction between the European and the North American style of management, which confirms the idea that the country of origin of multinational corporations continues to influence the way they operate (the country of origin effect).

The local unit heads appeared to resolve the problems created by the differences in management style in the following way: in their relations with the parent company, they adhered to its priorities and customs, but on the other hand, they focused on securing autonomy on the local level, thereby creating scope for local customs. Maintaining the local customs is facilitated by, for example, being far away from corporate headquarters, performing well as a business unit, and being protected by the language barrier.

Foreign ownership has primarily had a positive impact on the development of the acquired business units, which is evidenced by the fact that the units still employ almost the same number of people as they did in Ahlström's times, in spite of the overall growth in productivity. It is difficult to imagine that the units could have been much more successful under Ahlström's ownership. This may be viewed as an observation that confirms the idea that the central issue in the success of an acquired unit is its compatibility with the parent company, not the nationality of its owner.

On the other hand, one must keep in mind that the current success of Varkaus is still based on the innovations developed in Ahlström's times. At least until now, there have been no major innovations under current ownership. It is worth pointing out, however, that foreign ownership has increased the focus on core competencies, thus creating space for new subcontracting businesses in the town. New small and medium-sized sub-contractors have sprung up in Varkaus, and they have also managed to gain customers elsewhere. There has been a marked increase in local entrepreneurship. This has led to lower risks from the perspective of the town: everything does not depend on one large company anymore, as it did in Ahlström's times.

Some of the foreign-owned companies have increased their personnel in the past few years: these include Foster Wheeler (especially engineering staff), Aft, and Honeywell (a new R&D unit). The growth of Hartmann Varkaus has been limited by Hartmann's decision to transfer the Russian market to the corporation's unit in Hungary because of the lower costs there. The production personnel of Stora Enso and Andritz have decreased slightly. Thus, the number of high-skilled jobs in product development have increased in Varkaus. This is an area in which Finland has a favorable price-quality ratio when compared with the multinationals' home countries such as the US and Germany. On the other hand, Finland is losing machine shop jobs to countries with lower costs, such as Poland, Spain, and China. In fact, the present study gives rise to the hypothesis that increasing globalization has decreased the role of the location of corporate headquarters in decisions pertaining to local units. Today, multinational corporations may well decrease their operations even in their home countries, if costs are clearly lower elsewhere, as evidenced by the decisions by Honeywell.

The present study, however, also confirms the idea that success under foreign ownership has its risks. Unexpected long-distance effects may change the unit's situation in ways that are beyond its influence. In the Honeywell case reported here, the long-distance effects were mainly positive, but they can also be negative. As an example of this, one can look at some last-minute news:

- In June 2003, Tellabs announced that it would close down its R&D unit in Varkaus as part of the company's international cost-cutting program. Thus, the product developers who transferred from Honeywell to Tellabs are once again in search of new jobs. According to the local newspapers, this team seeks employment as a group, and aims to remain in Varkaus, which is a good reflection of the local embeddedness of these people.

- The economic performance of the Foster Wheeler corporation has been extremely poor in the past few years. Therefore, the successful Finnish unit was put up for sale in order to boost corporate finances. However, in February 2004 the Foster Wheeler corporation announced that a number of institutional investors had committed to provide $ 120 million in new financing to the company to replace its current term loan and revolving credit facility. In addition, the FW corporation announced that this improvement "enables us to officially discontinue previously announced plans to divest one of our European operating units. Even though we received several attractive offers, we believe that the future Foster Wheeler portfolio

is much stronger if we retain all of our existing businesses" (Foster Wheeler News Release 5.2.2004). Nothing will change but the unclear situation may have weakened the possibilities of Finnish managers to plan their unit's future.

- Engineering companies are increasingly divesting their machine shops. They are focusing on product development, engineering and project operations. Products are purchased flexibly from subcontractors. Following this model, one machine shop in Varkaus is already being transferred to local owners and its facilities are being sold to the town of Varkaus, although the new ownership structure has been somewhat difficult to create. As a consequence, the risks in maintaining a steady load on the production capacity in the machine shops in Varkaus will grow, as the client companies gain more freedom to make machine shops in different countries bid competitively for their business.

The findings also support the viewpoint presented by Kristensen and Zeitlin (2001), according to which local business units may have surprising power *vis-à-vis* multinational companies, as the development of Altim Control as part of Honeywell indicates. More generally, one can point out the extremely strong continuity of the industry in Varkaus. The roots of many of the business units go back 150 years. In fact, these business units are equally old as, or older than, their current owner companies! Furthermore, there are continual mergers and acquisitions at the corporate level, but in the end, these do not necessarily have dramatic impacts on the local business units' development. The names on the rooftops of the business units change more frequently than the activities inside them (see also Lovio 1993). A summary of the factors explaining the continuity in the business units is presented in Table 6.1.

According to the present study, the fate of the local business units depends considerably on the position they gain within the new parent company, and on the parent corporation's competitive position and location policy. The internal competition within corporations has, in fact, gained increased interest in business research. Within this field of research, it would be also worth investigating the local character of business units. In the present study, perhaps the most enlightening experience has been to learn how different the world looks from the perspective of a small town in eastern Finland, compared with how it appears from the perspective of Helsinki, Brussels, or New York. In the head offices, capital cities, and mainstream studies, the local is often viewed as a remnant of insular customs and interests, which merely obstructs the movement of capital toward the most efficient solutions (centralization

Table 6.1 The factors explaining the strong continuity in the business units in Varkaus

The business unit's perspective	-	continuity of competitive advantage based on natural resources or location
	-	capital base accumulated within the business unit
	-	capabilities accumulated among the personnel (technology use and development, customer relations, special characteristics of the business)
	-	resources supporting the business that have evolved in the environment (infrastructure, education, subcontractors, workforce, and industrial culture)
The divestor's perspective	-	it is more profitable to sell units than to close them down
	-	it is usually more profitable to sell to a buyer interested in developing the business than to others
The acquirer's perspective	-	growth by acquiring existing units is faster and cheaper than by establishing new ones
The employees' perspective	-	the employees' have a strong interest in the continuity of the unit; especially in small communities, there are few alternative jobs, and the material and psychological costs of relocating are high
The perspective of the local area	-	due to taxation and employment reasons, it is central to maintain existing business units, and easier than to establish new ones
Cumulative embeddedness	-	the longer the business unit has been in operation, the more it is embedded in its environment, if adequate care has been taken that the unit remains competitive

of production and relocations toward lower costs). This viewpoint, however, fails to recognize that local business units, their surrounding local economy, and the local people have often accumulated – over an extended period of time – a huge amount of visible and invisible (tacit) knowledge. Thus, the local is also a business resource – in fact, a very important one.

In this respect, our data lend support to the metanationality thesis introduced by Yves Doz (Doz, Santos & Williamson 2001). This thesis claims that if a company produces products and information in all its operating areas solely on the basis of experience from the home market or its largest markets and fails to use knowledge available in its branch offices, it loses a significant amount of the knowledge base and innovation potential. Doz reverses the traditional idea of "think local, act global". According to Doz, in a global context multinational corporations need to transform from teachers into learners: they must act globally, but think locally.

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CHAPTER VI

Foreign Acquisitions of Finnish Medical Technology Companies: Their Reasons and Growth Effects

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ABSTRACT: *The article investigates the foreign acquisitions of Finnish medical technology companies from two perspectives. Why have so many companies in this industry been acquired by foreign owners? How have the companies developed under foreign ownership in terms of company growth and domestic employment? The group of companies studied includes all the largest companies in the industry that have been acquired by foreign owners. As a control group, comparable companies that have remained under Finnish ownership were also investigated. The history of the transfer of companies in the industry to foreign ownership is largely similar in the different product groups. The central explanatory factor consists of the difficulties that small companies encounter when attempting to grow. One potential solution for the new small and medium-sized enterprises might have been to ally with a larger Finnish company. In the 1960s, 1970s, and 1980s, large Finnish companies were interested in diversifying into new high tech industries. All, however, gave up the diversification strategy by the 1990s at the latest, when they started their own intensive internationalization. Thus, foreign acquisition of the companies has been a perfectly natural development, for which it is difficult to envisage any alternatives. However, the transfer to foreign ownership has not resulted in any significant growth spurts in the companies. The foreign-owned companies have increased their employees in Finland about as much as the companies that remained in Finnish ownership. On the basis of the present study, the country of origin of the owners has not influenced the growth patterns or R&D investments one way or another. Both in the case of Finnish-owned and foreign-owned companies, the companies' main markets are international, and most of their personnel are located outside Finland. Thus, telling "foreign" and "domestic" companies apart becomes increasingly difficult and unnecessary.*

Keywords: *cross-border acquisitions and mergers, medical technology*

TIIVISTELMÄ*: Artikkelissa analysoidaan suomalaisten terveydenhoidon teknologian yritysten siirtymistä ulkomaiseen omistukseen kahdesta näkökulmasta. Miksi niin monet alan yritykset ovat siirtyneet ulkomaiseen omistukseen? Miten ulkomainen omistus on vaikuttanut yritysten kasvuun ja työllisyyteen Suomessa? Tutkittuun yritysjoukkoon kuuluvat kaikki merkittävät ulkomaiseen omistukseen siirtyneet alan yritykset sekä vertailujoukkona näitä yrityksiä vastaavat kotimaiseen omistukseen jääneet yritykset. Yritysten ulkomaiseen omistuksen siirtymisen keskeiseksi syyksi osoittautuu uusien yritysten ja liiketoimintojen kasvuvaikeudet kansainvälisillä markkinoilla. Vielä 1970- ja 1980-luvuilla suomalaiset suuret yritykset olivat kiinnostuneet diversifioitumisesta uusille kasvualoille, ja näin ne tukivat kasvavia liiketoimintoja, mutta 1990-luvulla ne keskittyivät kasvamaan omilla perinteisillä vahvoilla aloillaan. Kotimaisen konsolidoitumisen vähäisyyden vuoksi, yritykset luontevalla tavalla myytiin tai ostettiin osaksi suuria kansainvälisiä yrityksiä. Ulkomaiseen omistukseen siirtyminen ei ole aiheuttanut yrityksissä voimakasta kasvua eikä supistumista. Kehitys on ollut hyvin samanlainen myös suomalaiseen omistukseen jääneissä yrityksissä. Tämän perusteella voidaan väittää, että tutkittu ala on jo niin*

läpikansainvälistynyt, että ero ulkomaisen ja kotimaisen omistuksen välillä ei aiheuta sinänsä merkittävää eroa yritysten kasvussa tai T&K-panostuksessa.

Avainsanat: *ulkomaiset yrityskaupat, terveydenhoidon teknologia*

1 Introduction

Foreign acquisitions of Finnish companies have increased since the end of the 1980s. In the 1990s, foreign companies made more business acquisitions in Finland than in any other EU country except Luxembourg. The sizes of these acquisitions, however, were not large: mainly small companies were acquired in Finland (Ali-Yrkkö 2002 & 2003). In the years since 2000, about 100 Finnish companies have been annually transferred to foreign ownership. Most Finnish companies have been acquired by companies from Sweden and the United States (Ali-Yrkkö & Pajarinen Chapter IX in this volume).

In the past few years, a major share of the business acquisitions have been made in innovative high tech companies. This can be seen, for example, in the statistical analysis by Ali-Yrkkö, Hyytinen, and Pajarinen (2004), which indicates that Finnish companies holding EPO (European Patent Office) patents were more likely to be acquired specifically by foreign companies (see also Lehto 2004). Understanding why this is the case, and what it entails, has become a central research topic. If a significant number of Finnish high tech companies are turning into subsidiaries of foreign companies, what does this mean for the development of the Finnish economy?

The medical technology industry is a good example of a Finnish high tech industry, in which a significant share of the companies has recently been acquired by foreign companies. Well-known companies holding many patents, such as Wallac, Labsystems, and Leiras, were acquired by foreign companies before the turn of the millennium. In the past few years, the most significant acquisitions in the industry have been the transfer of Instrumentarium and Tamro to foreign ownership. All in all, there are currently about twenty foreign-owned companies in the industry.

This article investigates the foreign acquisitions of medical technology companies from two perspectives:

- Why have so many companies in this industry been acquired by foreign owners?
- How have the companies developed under foreign ownership in terms of company growth and domestic employment?

The group of companies studied includes all the largest companies in the industry that have been acquired by foreign owners. As a "control group", we also investigate comparable companies that have remained under Finnish ownership. The analysis is mainly based on publicly available information and interviews with experts in the field who are familiar with the companies. The experts interviewed for this article are presented in References. Previous research by the authors (Lovio 1988; Kivisaari & Lovio 1993; Kivisaari 1994, 1995, 1996; Kivisaari *et al.* 2001; Saranummi 2001) has also been used as a central source of data. Data on the numbers of company employees are mainly based on information acquired from the companies by telephone.

The article is organized in the following manner. First, we analyze the reasons for the foreign acquisition of companies in the industry. Then we turn to the second question by analyzing the growth and changes in personnel numbers in the companies before and after the acquisitions. In the analysis, the sample of companies is divided into five more detailed fields of business. These include in vitro diagnostics, imaging, anesthetics and patient monitoring, development and trade of pharmaceuticals, and other companies. It is difficult to define clear boundaries for the medical technology industry. The scope of this article has been defined so as to exclude new biotechnology companies in fields related to medical technology. In terms of employment, the companies studied comprise most of the Finnish medical technology industry.

2 Why have the companies been transferred to foreign ownership?

In the following, the development of the industry structure is presented in two different ways. A brief account of the development of each of the companies studied is presented in Appendix 1. In the text itself, the development is considered on a more general level. The aim is to identify the factors that have promoted the increase in foreign ownership in the industry, and to find a more general model that explains the phenomenon. In order to follow the analysis, it is best to read the company descriptions and the general commentary in parallel.

2.1 In vitro diagnostics

In vitro diagnostics refers to the analysis of medical samples in a laboratory. Diagnostics requires measurement instruments, the chemicals used

in them, various supplies, and programs. The products in this field are often based on a combination of skills in chemistry, electronics, mechanics, and programming. The products are often very specialized for a specific diagnostic application. Typically, 90 per cent of the products are exported, and their marketing requires good distribution channels. The products are often based on a new invention. Companies in the field invest heavily in research and development, and co-operate actively with hospitals and medical research institutes. These special features of the business also apply to most of the other product groups in the medical technology industry.

The analysis of the diagnostics product group focuses on four companies established in different decades (Wallac 1950, Ollituote/Kone Instruments 1966, Labsystems 1971, and Clids 1995). Three of the companies were set up by innovator-entrepreneurs (Wallac, Labsystems, and Clids), and one is a corporate venturing enterprise of a long-standing elevator manufacturer, which was later established as a separate division. Many innovations have been made during Wallac's history; the most significant ones were introduced in the market in the 1960s and 1980s. The other companies have also generated a number of innovations, but the original innovations made in the 1970s (Labsystems and Kone Instruments) or the 1990s (Clids) have remained the companies' main products.

At first, the companies attempted to grow organically by improving their products and their marketing channels. Labsystems and Kone also made some small, temporary business acquisitions in the United States. The companies also tried to speed up their growth by developing new products. In this way, Wallac, Kone Instruments and Labsystems all grew into companies each with more than 300 employees. After this stage, however, the companies' attempts to expand their business ran into difficulties. There were two main factors frustrating their profitable growth: the costs of both international marketing and product development.

In the case of Wallac, the solution that emerged was to sell the company to a Swedish corporation. There were no interested Finnish buyers because in the late 1960s, there were not many medical technology companies in Finland, the business was unfamiliar to the large Finnish companies, and there were no venture capital resources as there are today. In the 1980s, the growth pains of Labsystems drove it into a crisis, as a result of which the company was temporarily taken over by the SKOP bank. The growth of Labsystems was slowed down by its original founder's new competing company, Biohit, which grew rapidly in the 1990s.

Furthermore, the financial sector in Finland drifted into a general crisis in the early 1990s. In this context, Labsystems was sold to a foreign company.

The course of affairs leading to Kone Instruments being acquired by foreign ownership was also eventful. Many different measures were taken to speed up the company's growth in the 1980s, but at the same time, parts of the company were sold to a competitor to improve profitability, and parts of the company broke off in management buy-out deals. In the 1990s, large Finnish companies were rapidly going international. As they became more international, the companies almost invariably also decided to focus on their largest product groups. In the case of Kone, this strategy was adopted in the early 1990s, and led to the divestment of the now-diminished Kone Instruments. The entry of the public venture investor Sitra provided a temporary solution. At that time, Sitra was also investing in two smaller companies (Bio-Orbit and Clids). Venture capital investors, however, are usually interested in relatively short-term investments. The solution then was to sell all three companies to Labsystems, which was already foreign-owned. By acquiring the companies, Labsystems, in turn, gained a new opportunity for growth, which had been slow all through the 1990s.

The in vitro diagnostics product group thus includes four different kinds of companies: new enterprises set up by innovators, one large domestic diversified corporation, a public-sector venture capital investor, and currently also two US-based companies specializing in medical technology, which are large companies by Finnish standards. The companies ended up in the hands of foreign owners firstly because the US companies were able to provide the Finnish companies with international marketing channels in their important home markets, and also with the resources needed for research and development. Secondly, the large Finnish companies were no longer, in the 1990s, interested in diversifying beyond their core businesses, and thirdly, the banks and venture capital companies turned out to be short-term owners.

Alongside the gradual nature of the growth in foreign ownership, another important factor in the development described above is the role of innovator-entrepreneurs. A key innovator in vitro diagnostics was Osmo Suovaniemi, who first founded Labsystems and then developed a new company, Biohit, until it was as big as Labsystems. In the early 2000s, Biohit had about 300 employees, at which stage innovator-entrepreneurs' companies typically start to suffer from growth pains and financial problems. Biohit has attempted to solve these problems, for example, by entering the NM list of the Helsinki Stock Exchange. The majority of the

company's shares are, however, firmly in the hands of the founder and his family.

Strong innovator-entrepreneurs want to keep their companies under their own control, which makes it difficult for such companies to form larger ones through mergers. Under foreign ownership, Labsystems has to some extent been able to integrate with other Finnish companies in the field. Integration is, however, hindered by the variety of the product groups in the medical technology industry. In addition to the companies examined here, there are other companies in Finland operating in the field of in vitro diagnostics, but only one of these might have had the potential to integrate the innovations in the field into one business. The largest healthcare company in Finland, Orion, has had its own in vitro diagnostics unit since 1972. It has not, however, expanded through acquisitions, perhaps because Orion has found it more important to develop its core businesses, the production and distribution of pharmaceuticals. Thus, it has not taken a leading role and tried to consolidate the diagnostics business.

2.2 Imaging and dental products

The strongest field in the Finnish medical imaging business has been dental X-ray equipment. Mammography equipment has been another important field of applications. Furthermore, Finnish companies have developed new imaging techniques (MRI and MEG devices). In the following, we will also discuss some other dental equipment companies, as some of the companies manufacturing dental X-ray devices have also been involved in the development and sales of other dental equipment.

Dental X-ray devices were developed in the 1940s and 1950s by a professor at the University of Helsinki. In the 1960s, his basic discoveries led these devices being produced in the new Palomex unit of Lääkintäsähkö Oy, a company closely connected to Instrumentarium. In the 1970s, the unit was merged with Instrumentarium, which at that time was strongly focused on manufacturing new medical care devices through its other new unit, Datex. Instrumentarium was a diversified company in the medical care business, and had originally been an import company. Now it was also looking to develop its export markets on the basis of the company's own innovative products. Remaining an import company would have restricted the company's growth, and also entailed the risk of intensified competition by foreign brand-owners, potentially setting up their own distribution channels in Finland.

Instrumentarium Imaging worked systematically to expand its imaging business in the late 1970s, at first through organic growth. The growth remained slow, however, because of two main factors. Firstly, Instrumentarium Imaging was joined by new domestic competitors. Secondly, a number of new businesses based on the ambitious technologies that Instrumentarium Imaging had developed did not grow rapidly enough.

There were actually three competitors in the production of dental X-ray devices – and for a time, also in mammography devices – in Finland in the 1980s and 1990s: Instrumentarium Imaging, Soredex, which had split off from Instrumentarium, and Planmeca. Since the early 1980s, Soredex was owned by Orion. Planmeca was part of a growing new family-owned company, which operated in the manufacturing and wholesale distribution of a variety of dental products. Orion sold Soredex back to Instrumentarium in 2001, but the competition with Planmeca still continues today.

Another problem in the growth strategy of Instrumentarium Imaging was that the MRI imaging technology that it had developed since the late 1970s turned out to be a slow-growth business. Instrumentarium Imaging also made a small investment in another new imaging method commercialized by Neuromag Oy. In the 1990s, however, Instrumentarium divested both of these business areas. Eventually, Instrumentarium MRI ended up owned by Philips Medical Systems, and Neuromag Oy is today owned by the Swedish company Elekta. Instead of developing its own new products, Instrumentarium Imaging decided to expand its operations by acquiring a manufacturing license and one company abroad, as well as Soredex from Orion. Thus, by 2000, the company finally reached a turnover of more than 100 million euros, and more than 500 employees.

In the dental equipment business (especially dentists' patient chairs), the domestic competition was quite similar to that in the dental X-ray and mammography equipment businesses. Originally, patient chairs were manufactured only by Planmeca, but the innovator Timo Janhunen later started a new company, Finndent, and after selling this to Orion, started yet another called Fimet. All three companies still produce patient chairs. Finndent is a very small company, which Orion divested in 2001. Fimet is a company currently with 55 employees in Finland and with a joint venture company in China. The recurrent moves of the innovator-entrepreneur Timo Janhunen from one company to another provide an apt example of this typical feature of the medical technology business. Founders and key employees want to start their own companies, which is not helpful for integrating competencies on a national level.

The largest producer in dental equipment today is clearly Planmeca, as part of the Planmeca Group. In fact, Planmeca Group, which was established in 1971, is the fastest growing and most successful of the new Finnish medical technology companies. The company is still owned and managed by its founders. Today, it employs 1 700, although only 650 work in Finland. The Group currently includes five companies: Planmeca (equipment manufacturing), Plandent (distribution), Planmed (mammography devices), LM-Instruments (acquired from Instrumentarium in 1999), the Swedish company Amdent, and the Norwegian company Opus Systemer. In the past few years, Planmeca's growth has been speeded up by foreign acquisitions, made especially to expand Plandent. This company is the only one in the present analysis that has been able to grow into a large company as a family-owned one. In 2002, Planmeca Group ranked 135 among all Finnish companies in terms of the size of its turnover, and it was swiftly climbing into the top 100 companies. The secret of its success may include, for example, its clear focus on the dental equipment field and the development of a strong brand in its field. Another explanatory factor is that, in comparison with many other products in the industry, Planmeca Group's products do not require such large product development investments, and they are not such expensive novelty products.

The situation is quite the opposite in the case of Neuromag Oy and Instrumentarium MRI. These companies develop expensive speciality equipment for an international, but quite narrow, market. Both Instrumentarium and Sitra ran out of the capital needed to patiently develop such companies, and there was no other solution left but to sell them to foreign owners.

All in all, the development of the industry structure has been quite similar in imaging and in dental equipment as in vitro diagnostics. The large diversified corporations gave up these product groups quite early in the game (Valmet in the 1980s). Later on, Orion followed suit, and even Instrumentarium opted for a more focused strategy. Among the new companies, one has been successful (similar to Biohit), whereas the others have ended up in foreign hands or remained small companies.

2.3 Anesthesia and patient monitoring

In contrast to the products discussed above, the growth in foreign ownership in the anesthesia and patient monitoring product group has followed a different logic. Four companies have participated in the development of the business in this product group: Kone, Valmet, Instrumentarium Datex,

and Clinisoft. Instrumentarium Datex has been the most successful company in the new Finnish medical technology industry. This unit, which was set up in the 1960s, started producing anesthesia and patient monitoring equipment in the 1970s in close co-operation with the technology users. In the 1980s, internationalization was introduced as a new dimension alongside product development. In the late 1980s, the company acquired a competing unit from Kone, which had earlier acquired the products made by Valmet. Furthermore, in the 1990s, Instrumentarium Datex acquired another company, Clinisoft, to enhance its information systems competencies. Thus, in this product group, the field ended up with only one Finnish company, which certainly improved its position in the business.

In the 1990s, Datex continued to grow through large business acquisitions, first in Sweden and then in the United States. The acquisition of the British-American company Ohmeda is the largest acquisition made by any Finnish company in this industry. Following this and other acquisitions, Instrumentarium became the largest employer in the Finnish medical technology industry by the early 2000s, and Datex-Ohmeda became the largest single business in the industry.

In order to finance the growth of Datex, Instrumentarium focused its own business by divesting all other business areas except for Datex and Instrumentarium Imaging, which was discussed above. Some of the divested companies were acquired by foreign owners. For example, Instrumentarium's most traditional and familiar business to the public, the optical retail business, was sold to a Dutch company. As a result of these developments, a decreasing share of Instrumentarium's growing personnel worked in Finland. In 2003, only one-fifth of the entire personnel were located in Finland.

The acquisition of Instrumentarium by General Electric Medical Systems in 2003 differs both in scale and character from the other acquisitions discussed in this article. Generally speaking, one could say that in the other companies, the foreign acquisitions were due to growth pains and the lack of suitable new domestic owners. In the case of Instrumentarium, the acquisition was a result of the company's success and intensive internationalization. In 2002, Instrumentarium's net sales and profits were at a record level in the company's 100-year history. Paradoxically, this was the very reason why the institutional owners of the company decided to sell its shares to GE. GE was prepared to pay a reasonable price, and the owners were inclined to sell their shares in the company, considering the risk of running a medical technology company in the changing global markets. The global medical technology markets have

become extremely competitive and the industry is consolidating. GE, Philips, and Siemens are all approaching the 10, 000 million euros mark. Regulatory and quality system requirements both in Europe and the US favor large companies, and distribution channels are increasingly owned by the major manufacturers. GE was interested in Instrumentarium because its Medical Systems and Instrumentarium complement each other well. Instrumentarium is strong in many markets (Europe), product areas (anesthesia and critical care, dental X-ray imaging, mammography), and special features (information systems, ergonomics, and design), in which GE was not so strong.

The sale of Instrumentarium was decided by the company's institutional owners. Their decision may also have been influenced by the sharp decline in company stock values in 2000-2003. Selling Instrumentarium was one of the few ways to make a significant profit in the stock market at that time.

2.4 Pharmaceuticals development and distribution

The pharmaceutical development and trade is the oldest type of business discussed in this article. In the late 19th and early 20th century, many companies were established in different cities in Finland for the trade in, and later manufacturing of, pharmaceuticals. The drugs that these companies produced were mostly so-called generic drugs. The companies did no drug development of their own, and they had few entirely new products in the market. Tamro and its subsidiary Star, Orion, Farmos, and Huhtamäki Leiras developed into the most important companies in the field. Tamro, Orion, and Farmos were companies specializing in pharmaceuticals, whereas Huhtamäki was a diversified company, which established the pharmaceuticals company Leiras in the 1940s.

In the 1980s, the domestic concentration of the industry proceeded so that Tamro discontinued its pharmaceuticals production and focused on distribution. Huhtamäki acquired Tamro's production companies. In the late 1980s, Orion in turn acquired Farmos.

In the 1990s, Huhtamäki started to internationalize and focus its operations, and as a result, decided to divest its pharmaceuticals business. This development occurred at the same time as the focusing strategy in Kone. If Orion had then had the resources to acquire the pharmaceuticals business of Huhtamäki, there would only have been one domestic pharmaceuticals producer left in Finland. But Orion did not have sufficient interest or resources to make the acquisition. Huhtamäki first start-

ed to sell Leiras to Pharmacia, but then a new buyer appeared, Schering, which was an old business partner of Leiras. Star, which specialized in ophthalmic drugs, was sold to another ophthalmic company, Santen of Japan. In 2002, Schering also acquired a new small pharmaceuticals development and production company Map Medical Technologies. It is yet another example of how small companies' research and marketing resources easily run out at some point in this industry.

The foreign acquisition of Tamro in the early 2000s has some of the same characteristics as the acquisition of Instrumentarium by General Electric. Tamro internationalized rapidly in the 1990s, just like Instrumentarium. It gained a prominent position in the Nordic and Baltic pharmaceuticals wholesale distribution. As it grew, it attracted the attention of the largest German pharmaceuticals wholesale distributor, which saw the acquisition of Tamro as a good way to enter the North European market. Phoenix Pharmahandel, which today is the second-largest pharmaceuticals distributor in Europe, first acquired Tamro's Danish-owned shares, and later became the majority shareholder in the Tamro Group.

Among the old pharmaceuticals companies, only Orion has remained in Finnish ownership. Orion is currently the largest domestic employer in the medical technology industry, employing 3,500 in Finland. The majority of Orion's personnel, 2,750, work in Orion Pharma. In drug development, the focus in the past few years has been on developing proprietary drugs, but this has not always been smooth going. Furthermore, the growing share of cheap generic drugs has cut a slice out of the domestic market share of Orion's traditional drugs. A few years ago, Orion was on track to focus purely on drug development and production, but the risks entailed by this strategy have made Orion abandon it. In 2002, Orion acquired Sweden's largest pharmaceuticals wholesaler KD, after which Orion passed Tamro Group and became the largest pharmaceuticals wholesaler in Finland and Sweden. Thus, Orion is still involved in three fields of business, in each of which it is internationally a relatively small player.

In general, one might say that the restructuring of the pharmaceuticals production and distribution industry has not proceeded in an optimal manner from the perspective of Finnish-owned businesses. The development of the industry might easily have also led to a solution in which Finland would have hosted one large company in pharmaceuticals production and one in distribution.

2.5 Other medical technology businesses acquired by foreign owners

The analysis includes four companies in other product groups. In the evolution of these companies and their transfer to foreign ownership, we can identify three patterns that have been described earlier in the other product groups.

The transfer to foreign ownership of a company called Kolmi-Set is a typical outcome of the company's former Finnish owner companies' – in this case Tamro and UPM – increased focus on their own core businesses. UPM focused on producing the most common paper grades, and lost interest in the small unit producing specialty products. Tamro, in turn, wanted to get rid of all production operations and focus on wholesale distribution. The solution was that Kolmi-Set was merged with the health care supply units of the Swedish pulp and paper company SCA, making a new company called Mölnlycke Health Care.

The transfer of Dosetek and Bionx to foreign ownership, on the other hand, aptly reflects the difficulties that new, innovative, and specialized companies experience in financing long-term research and development and in creating marketing channels for the international market. For its entire 20-year history, Dosetek has co-operated with the same US-based company. In contrast, Bionx, founded by Professor Pertti Törmälä, experienced a more eventful history of foreign ownership. It was first financed by US venture capital companies and listed on NASDAQ, before being acquired in 2003 by a larger company, ConMed corporation.

In 1999, a number of key personnel left Bionx and founded a new company, Inion, which at least in part is in competition with Bionx. This is one more example of the typical difficulties in the medical technology industry to keep the innovators and competent personnel in larger companies.

2.6 Summary of the reasons underlying the transfer to foreign ownership

The previous description of the transfer of companies in the industry to foreign ownership is largely similar in the different product groups, although some differences could also be identified.

The first central explanatory factor consists of the difficulties that small companies encounter when attempting to grow. Most of the new, innovative small companies in the field are very specialized, research-intensive, and export-oriented. In order to grow into medium-sized or

large companies, they need a steady input of capital for their research and development, access to good sales channels in the US and other developed OECD countries, and as they grow, also an increased level of managerial competence. In most cases, the solution to these problems has been to gain allies by joining a larger company. Planmeca and Biohit are exceptions to this pattern.

One potential solution for the new small and medium-sized enterprises might have been to ally with a larger Finnish company. In the 1960s, 1970s, and 1980s, large Finnish companies were interested in diversifying into new high tech industries, and especially electronics. Companies diversified in this field included the engineering companies Valmet and Kone, the food company Huhtamäki and, to a limited extent, also the pulp and paper company UPM. All, however, gave up the diversification strategy by the 1990s at the latest, when they started their own intensive internationalization.

Another potential solution might have been if the old large companies specialized in the medical care sector – Tamro, Instrumentarium, and Orion – had been able to gather under their wings a wide range of Finnish competencies and small companies. This, however, did not occur, because the companies wanted to focus on their own core product groups and become international. Tamro focused on pharmaceuticals distribution and Orion on pharmaceuticals production and distribution. The internationally successful businesses of Datex and Imaging were quite enough for Instrumentarium.

Industry restructuring and joining forces has proved to be exceptionally difficult in this industry. The products and markets in the industry are fragmented, making it difficult to gain economies of scale by combining different product groups. The innovator-entrepreneurs, who are important for the business, have not been inclined to give up their companies, either. Thus, another central reason for the increase in foreign ownership in this industry is that no Finnish leading companies have evolved that could have assembled the forces of the industry, with enough resources to internationalize and develop new fields of business. The more natural solution has been for each innovative business to separately search for suitable partners and owners. In many cases, this has been preceded by an intermediate stage in which resources have been acquired from a domestic venture capital company, which in turn has sold its shares to foreign owners as an acceptable means of capitalizing by liquidating its investment.

By the 2000s, Instrumentarium, Tamro and Orion had developed into the largest Finnish companies in the industry. Two of them have also transferred to foreign ownership. In the case of Instrumentarium and

Tamro, the reason can be found in the new owners' eagerness to acquire. They were acquired, rather than sold. In the case of Instrumentarium, General Electric Medical Systems wanted to acquire Instrumentarium, which had grown into a prominent international player in the business. In the case of Tamro, Germany's largest pharmaceuticals distributor gained a strong foothold in the Nordic and Baltic pharmaceuticals trade through Tamro.

In fact, the third relevant explanation for the transfer of Finnish companies to foreign ownership is that both small and large Finnish companies have been able to create so many innovative products that they have attracted the interest of large and medium-sized foreign players in the field. Table 1 presents the current owners of the companies studied and the share of the acquired businesses of the owner companies' personnel in 2003. The table indicates that in addition to Tamro and Instrumentarium, also Star, acquired by the Japanese company Santen, was a significant development for its new owners. Star was Santen's first acquisition and its first foreign production unit. Star also became Santen's distribution center in Europe. Wallac, Labsystems, Kolmi-Set, or Leiras are not totally insignificant in the context of the businesses of their new owners, either.

Table 2.1 Current owners of the companies studied and the shares of the acquired Finnish businesses in the new owner companies, 2003

Company	Country of origin	Personnel 2003	Share of personnel in acquired Finnish business, %
General Electric Medical Systems	USA	32,000	16 (Instrumentarium)
Schering	Germany	26,500	3 (Leiras)
Philips Medical Systems	Nether-lands	22,000	1 (Instrumentarium MRI)
PHOENIX Pharmahandel	Germany	17,000	22 (Tamro)
Thermo Electron	USA	11,000	5 (Labsystems, Kone-Instruments, Bio-Orbit, Clids)
PerkinElmer	USA	10,000	6 (Wallac)
Mölnlycke Health Care	Sweden	4,000	7 (Kolmi-Set)
Varian Medical Systems	USA	3,000	1 (Dosetek)
Santen Pharmaceuticals	Japan	2,500	17 (Star)
ConMed	USA	2,500	3 (Bionx)
Elekta	Sweden	1,170	2 (Neuromag)

Sources: Company annual reports and personal communications.

From a broader perspective, the development, that is, the birth of new innovative businesses in Finland in the 1960s and 1970s and their subsequent transfer to foreign ownership, can also be interpreted from the perspective of technological lifecycles. The development of electronics and biochemistry in the 1960s and 1970s provided opportunities for new innovations in all industrialized countries. In many countries, companies just like Wallac, Labsystems, Datex, Palomex, and Ollituote emerged, and they had the opportunity to gain market shares as new technologies replaced old ones. Gradually the technologies matured, however, and the most successful companies started acquiring companies in other countries. For example, Datex made acquisitions in the Netherlands, Sweden, Germany, and the United States, and acquired a manufacturing license in Switzerland. At this point, however, the old player GE woke up (see Lovio 1993 and 2003 for more details on this cyclical model).

There are thus perfectly good reasons for the fact that such a significant share of the Finnish business in this industry is currently owned by foreign companies. The aim has not, however, been to claim that this development was inevitable. It is quite possible to think that in some parts of the industry, a different domestic development process might have led to a situation in which there would have been a larger number of successful and Finnish-owned companies than is the case today.

3 The impact of foreign ownership on growth and employment in Finland

Wallac was acquired by foreign owners in 1969 and the last companies studied here were acquired in 2003. Thus, it is difficult to present an all-encompassing picture of all the impacts of foreign ownership. The following analysis focuses on two issues. How has foreign ownership influenced the viability of the acquired units in general: has the change in ownership given rise to strong tensions in the companies? Another interesting issue is how foreign ownership has influenced growth and employment in Finland. Have the companies that were acquired by foreign owners grown more rapidly than those remaining in Finnish ownership?

3.1 Tensions and crises with the new owners

There are always tensions involved in business restructuring and acquisitions. The aims of the acquiring company and the one being acquired are

not necessarily in alignment. There may be significant differences in the corporate cultures. People are appointed to new positions and tasks. There may also have been lengthy debates and disagreements on the benefits and alternatives of the deal. Most of the previously described events most likely involved such tensions. Yet, the question here is whether there have been conflicts or problems that were intensive enough to become public, or ones that could threaten the entire existence of the company under its new owners.

To the authors' knowledge, such cases have been rare in the present data. Perhaps the most dramatic period was experienced by Wallac in the late 1980s under the ownership of Pharmacia (for more details, see Hyvönen & Miettinen 1999, 138-141). Before Pharmacia, Wallac was owned by LKB, which provided useful marketing channels for Wallac's instrument business. In the mid-1980s, Pharmacia acquired LKB, and thus became the new owner of Wallac. Wallac expected this to be a useful turn, as its strategically important new product Delfia required competence in marketing chemical reagents, and Pharmacia had a higher level of such competencies than LKB. Yet, it soon turned out that Pharmacia was prepared to be quite hard-headed in order to force Wallac's business onto the track that it had planned. In the early 1990s, Pharmacia transferred the product development, production, and marketing of Delfia to Uppsala, Sweden. At the same time, the entire Wallac top management were fired, as well as many of the other personnel. The Finns did not resign themselves to the new solution, however, but set up a new company, Otsoni Oy. The precarious situation changed, however, when Procordia acquired Pharmacia and started negotiations with Otsoni to return Delfia to Finland. The negotiations were successful, and Otsoni Oy was merged with Wallac.

Wallac also had some difficulties with the distribution chains of LKB and Pharmacia. The move from LKB's to Pharmacia's distribution chain slowed down Delfia's marketing, as a new distribution chain had to be trained. Pharmacia also controlled Wallac's operations through its distribution chain, and Wallac was subverted to the role of a production plant, rather than an independent operator. Wallac also had an interest in licensing the new technology to some other large diagnostics company in order to speed up the diffusion of the new technology. LKB and Pharmacia were not, however, interested in making such deals.

In Wallac, the conclusion drawn from these experiences has been that it is important to develop the company's own distribution chains. Procordia and the current owners have allowed this. The idea about licensing the technology is also interesting. From the perspective of the current

article, this implies that Wallac's options did not include a more Finnish alternative, but rather a more international one.

Another example of a tense situation concerns the sale of Neuromag to foreign owners. At that time, Neuromag was owned by a domestic equity investment company. The investor considered it necessary to liquidate its investment, and decided to sell the company, through an intermediary, to Neuromag's competitor in the US. If this deal had continued, one of the companies would most likely have been merged with the other. In this situation, however, the problem was solved by re-acquiring the company through intermediaries, and selling it to an alternative company, which was better for the Finns.

Venture capital is obviously necessary for the development of startup companies. Yet relying on professional equity investors also appears to entail risks. In order to capitalize on their investments, venture capital investors are often prepared to opt for deals that are not viewed favorably by company management.

3.2 Growth and domestic employment

All the foreign-owned companies studied here still exist. In some cases, the company strategy has changed, and in others, products have been divested, but none of the companies have been entirely discontinued. But how have the companies grown in the new owners' times? Have they grown more rapidly than companies that remained in domestic ownership? In order to answer these questions, Table 3.1 contains information on the size of the companies in 1995 and 2003, indicated by personnel numbers. The companies have been divided into three groups: large stock-listed companies, companies transferred to foreign ownership, and companies remaining in domestic ownership.

In the case of large stock-listed companies, Instrumentarium and Tamro have been acquired so recently that the effect on employment of the acquisition cannot yet be discerned. It may be noted, however, that these companies have grown by making acquisitions more rapidly than Orion, which remained in domestic ownership. The growth has taken place abroad. In all three companies, the number of domestic employees has decreased sharply due to business divestments. The divested companies, however, also still exist and employ almost the same number of people as they did before.

Table 3.1 Change in number of employees in the companies studied, 1995 – 2003, by company type.

Company	Personnel, 1995	Personnel, 2003	Change 1995 - 2003
Instrumentarium (GE)			
- total	2,559	5,016	+ 2,457
- in Finland	1,990	1,285	- 705
Orion (FIN)			
- total	5,197	4,690	- 507
- in Finland	4,717	3,418	- 1,299
Tamro (Phoenix Pharmahandel)			
- total	2,041	3,820	+ 1,779
- in Finland	1,020	460	- 560
Major stock-listed companies together			
- **total**	**-9,797**	**-13,526**	**+ 3,729**
- **in Finland**	**-7,727**	**-5,163**	**- 2,564**
Finnish business units divested by major stock-listed companies		2,380	**+ 2,380**
Leiras (Schering)	1,000	880	- 120
Wallac (PerkinElmer)	500	550	+ 50
Labsystems (Thermo Electron)	330	517	+ 17
Kone Instruments (Thermo Electron)	150		
Bio-Orbit (Thermo Electron)	10		
Clids (Thermo Electron)	10		
Star (Santen)	300	430	+ 130
Kolmi-Set (Mölnlycke Health Care)	(342 part of Tamro)	280	- 62
Instrumentarium MRI (Philips)	80	160	+ 80
Bionx (ConMed)	50	70	+ 20
Dosetek (Varian)	10	41	+ 31
Neuromag (Elekta)	11	28	+ 17
Foreign-owned together	**2,793**	**2,956**	**+163**
Planmeca Group (FIN)	750	1,700 (1,050 abroad)	+ 950
Biohit (FIN)	120	298	+ 178
(Orion Diagnostica, part of Orion)	(384)	(285)	(-99)
KSH Products (FIN)	50	182	+ 132
Inion (FIN)	-	75	+ 75
Fimet (FIN)	60	55	- 5
Ani Labsystems (FIN)	(part of Labsystems)	27	+ 27
Finndent (FIN)	(47 part of Orion)	11	- 36
Finnish-owned together	**1,027**	**2,348**	**+ 1,321 (+271 in Fin)**
TOTAL IN FINLAND	**11,158**	**11,797**	**+ 639**
TOTAL	**13,228**	**21,210**	**+ 7,982**

Sources: Company annual reports and personal communications.

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The companies that were acquired by foreign owners, mainly in the late 1990s, have slightly increased their personnel in the period between 1995 and 2003. In two cases, the number of personnel has decreased. Leiras has quite recently downsized its research and development in Finland, which has decreased its number of employees. Before this, however, it invested quite heavily in setting up new R&D laboratories in Finland. In the case of Kolmi-Set, the decrease in personnel numbers is due to the company's factory in Ilomantsi, Finland, closing down and the transfer of its production to other plants within the company. In contrast, ample investments have been made in modernizing the company's factory in Mikkeli, Finland.

The most positive impact on employment of foreign ownership has been experienced in Star and Instrumentarium MRI. None of the companies, however, have gained any radical growth impetus. This indicates that the growth pains the companies experienced under Finnish ownership are connected to the companies' products and their demand, so that the better marketing channels acquired through foreign ownership have not essentially improved the situation.

The companies that remained in Finnish ownership have increased their personnel more than those that were acquired by foreign owners. A significant share of the total growth, however, is due to the foreign acquisitions of the Planmeca Group. In terms of increasing domestic employment, this group of companies is comparable to the foreign-owned group. Biohit has grown more than Labsystems, but the overall growth picture is fairly even, because part of the growth is artificial, in a sense, and is based on the transfer of competence. KSH Products, for example, has grown by starting to manufacture the products of Neuromag, Wallac, and Labsystems as a sub-contractor. Ani Labsystems is a product group divested from Labsystems to Finnish ownership. The actual production of Inion is still small compared with the size of its personnel.

In the pharmaceuticals industry, we can compare the development of the number of employees in Orion, Leiras, and Star. The number of employees in Orion Pharma in 2003 is the same as it was in 1995, and this is the case for the combined number of employees in Star and Leiras. In contrast, Orion Diagnostica has been less successful than the diagnostics companies Wallac and Labsystems, which in turn have grown more slowly than Biohit.

The conclusion of this comparison is that there are no significant differences between foreign-owned and domestically owned companies in Finland in terms of changes in the number of their employees. Both groups of companies have somewhat increased their employee numbers,

resulting in a net increase of 600 jobs in Finland, according to the figures in Table 3.1. Although this figure is small, it can be considered an achievement, as generally speaking the number of jobs in industry has declined in Finland in the early 2000s.

The growth of companies in the industry, which has been significant at times during the period studied, appears to occur mainly through foreign acquisitions, that is, through the international restructuring of the industry. Foreign acquisitions do not, of course, increase the number of jobs in the countries in which the acquired companies are located.

The effects of the transfer of Tamro and Instrumentarium to foreign ownership cannot be studied yet. As for the Finnish operations of Tamro, it is clear that there is not much room for their growth. In the case of Instrumentarium, the turn of 2004 was followed by some temporary layoffs and employee cutbacks in the information systems company Deio, Instrumentarium Imaging, and the Instrumentarium head office (*Helsingin Sanomat* 3.3.2004). The real outcomes of the acquisition, however, remain to be seen.

4 Summary

The data presented here allows for a number of conclusions. Firstly, it seems that in most of the cases, the foreign acquisition of the companies has been a perfectly natural development, for which it is difficult to envisage any alternatives. Of course, one may speculate that the domestic restructuring of the industry might have proceeded slightly differently, which might have led to the emergence of stronger Finnish-owned company groups, which could be successful as independent companies even under current conditions. Moreover, the foreign acquisitions of Instrumentarium and Tamro were not "necessary", but rather solutions based on the judgment of the companies' institutional owners. In the 1970s and 1980s, medical technology markets were very fragmented and, therefore, it was difficult to consolidate the industry on the Finnish scale. However, the current international situation is very different. The industry customers – major hospitals and other medical service networks – are increasingly interested in buying everything from a few companies and, therefore, international companies have to be able to sell "everything to everybody". Regulatory and quality system requirements also favor large companies, which, in addition, increasingly own distribution channels.

Secondly, it seems that the transfer to foreign ownership has not resulted in any significant growth spurts in the companies. The foreign-owned companies have increased their employees in Finland about as much as the companies that remained in Finnish ownership. The transfer to foreign ownership can in some cases, however, be viewed as the only possibility for the companies to continue in operation. In none of the cases has the transfer to foreign ownership resulted in the total discontinuation of a company in Finland. In some cases, some of the changes have been negative from a Finnish perspective, but these changes have been successfully reversed. Mergers and acquisitions always entail risks.

Thirdly, Finnish companies in the industry appear to have weathered the internationalization of the industry fairly well. The companies studied today employ significantly more people than they did in the mid-1990s. The growth, however, has occurred abroad, and has been part of the international restructuring of the industry.

Employment in the industry has grown slightly in Finland, which is a remarkable achievement at a time in which industrial employment is generally on the decline. Thinking of the future, it would be important to have new Finnish seminal companies continually entering the industry, and to maintain the flow of investment by the foreign owners of the existing companies in Finland in new product development.

Taken together, the data give rise to a clear impression that business in the industry is highly internationalized. In the case of both Finnish-owned and foreign-owned companies, the companies' main markets are international, and most of their personnel are located outside Finland. Thus, telling "foreign" and "domestic" companies apart becomes even more difficult and unnecessary. The countries of origin of the companies do make a difference in terms of management styles and corporate cultures. Yet, on the basis of the present study, the owners' country of origin does not influence the growth patterns or R&D investments one way or the other.

Appendix 1.

In vitro diagnostics

Wallac. Wallac Ltd was founded by Jorma Wallasvaara in 1950 in Turku. The company specialized in the production of laboratory instruments. The early product lines included radiometers, which were the company's main product until the 1980s. In the 1970s, Erkki Soini started to study tracer compounds that could replace radioisotopes. In 1974, the company began to study time-resolved fluorescence. In 1984, the company

introduced a new product based on this technology, the immunological assay method, Delfia. In the 1990s, this became the company's main product line.

Wallac came under foreign ownership in 1969, as no new Finnish owner could be found. From 1970-1986, Wallac operated under the ownership of LKB, owned by the Swedish development company, Incentive. In 1979, Wallac's old Radiation Monitoring Business was sold to the Swedish company Studsvik. In 1992, Wallac's local management in Turku reacquired the company and founded Rados Technology Ltd. In 2002, the Rados Technology Group joined the international synOdys Group.

In 1986, the Swedish company Pharmacia acquired LKB, and thus also Wallac. Pharmacia transferred the Delfia business to Sweden despite protests by the Finnish management. Soon after, Pharmacia was acquired by the Swedish company Procordia. Procordia transferred the Delfia business back to Turku, and because Wallac did not operate in the core business of Procordia, Wallac was sold to the US company EG&G in 1993. EG&G is currently called PerkinElmer Inc. and has focused its operations, currently employing 10,000. In 2002, Wallac, with 550 employees, is part of the company's main business area, the Life and Analytical Sciences division, and it is called PerkinElmer Life Sciences Wallac Oy.

Ollituote/Kone Instruments. The original name of the company was Hissi Huolto Oy. It operated in Helsinki and was owned by the Kone Group. In the mid-1960s, the company produced live wires called Olli (on the basis of which the company name Ollituote Oy was adopted), hazard flasher lights, traffic signs, and traffic safety systems. In 1966, Kone employed Harri Timonen to develop the company into an electronics industry unit for Kone. As a result of business analyses, the main focus was on medical equipment. As its first products, the company launched a line of patient monitoring equipment in 1969. In this product group, Ollituote first co-operated with the new biotechnology department of the Valmet instrument factory, which, for example, produced the control center for the patient monitoring equipment. Later, Ollituote acquired the manufacturing rights for the patient monitoring equipment from Valmet. The department at Valmet then started to focus on manufacturing X-ray equipment. In the late 1980, Valmet decided to focus on industrial automation, and ceased to manufacture X-ray equipment.

The second product group that Ollituote launched, in 1972, included analyzers for clinical chemistry and laboratory IT systems, developed together with medical specialists. In the mid-1970s, Ollituote, operating in Espoo, employed 200 people, and in 1980, as many as 300. In 1977, the company was merged with Kone and organized as its instruments product line. In 1979, this unit was involved in founding Fluilogic Oy.

In the 1980s, Kone Instruments expanded its operations by starting to operate as a sales agent for other companies' products in the Scandinavian market. In addition, the unit also owned the patient monitoring equipment business of Burdick from the US for a few years. The unit was not very profitable, but Kone patiently financed it, and was rewarded by also gaining electronics experts for developing control electronics for elevators. In order to improve profitability, the patient monitoring business was sold to Instrumentarium Datex in 1987. At the same time, the production of digital color monitors was sold to the employees, who established this business as Unigraf Oy, which still operates today. In 1989, the instrument group acquired the US-based Reagents Applications Inc. in order to reinforce its clinical chemistry analyzer systems business. In 1992, the unit was incorporated as Kone Instruments Oy.

The company ran into trouble, however, as the markets in the former Soviet Union and in the US crashed simultaneously, leaving the company with a significant overcapacity

in production. The production unit was sold in an MBO deal to its management in 1992. The new company, still in operation, was called KSH-Productor Oy. In 1993, Kone Instruments Oy employed 250 people. At that time, the Kone Group streamlined its business intensively, and in line with this strategy, the decision was made to sell Kone Instruments Oy. In 1995, this was solved so that the new owners included management (20%), Sitra, The Finnish National Fund for Research and Development (50%), and Kone (30%). The subsidiary in the US was divested. At that time, the company employed 150 people and it adopted the name Konelab Oy in 1998. In 1999, Sitra decided to sell Konelab Oy, Clids Oy, and Bio-Orbit Oy to the US company Thermo Electron Corporation, which had earlier also gained ownership of Labsystem in connection with a business acquisition. Thus, the clinical chemistry analyzer product Konelab, developed in the early 1970s as System Olli 3000, is today part of the US-owned Thermo Electron Oy.

Labsystems. In 1971, Osmo Suovaniemi established Finpipette Ky, which started to manufacture the pipettes developed by Suovaniemi. In 1974, the company was renamed Labsystems Oy. The company grew rapidly and started to manufacture a variety of products. In 1986, the company ran into a crisis resulting from the failure of a large development project and the growth in international marketing costs. The company, which employed 350 people in Finland, was taken over by the development company Interpolator of the SKOP banking company, and later directly by SKOP. As SKOP ran into a crisis in the early 1990s, Labsystems was sold to the UK company Life Science International in 1993. Today, it is owned by the US-based Thermo Electron Corporation. In 1999, Thermo Labsystems, in a single deal, acquired Bio-Orbit, Clids, and Konelab (for USD 19 million), in all of which the main owner was SITRA. The current name of Labsystems and the other Finnish companies acquired by Thermo Electron is Thermo Electron Oy and it employs 500 people in Finland (in Vantaa and Joensuu).

Comment [RD1]: Abbreviations of university degrees go after the name. If you give them for one person then you must give them for everyone. This is not done in Britain and America – unless you've a doctorate – and no-one has any idea what a licentiate is any way ☺

Bio-Orbit. In 1978, research in bioluminiscence was started in Wallac. The background to the research was a dissertation on bioluminiscence technology in Sweden in the company that owned Wallac. The idea, thus, came from Sweden and the first luminometer reagent was made in 1979. In 1988, Bio Orbit Oy was established to continue this business. In the beginning, the company was financed by the venture capital companies Euroventures and Suomen Yrityskehitys Oy. Later on, SITRA became the main owner of the company. At this stage, the company had a staff of 10. Biotool, a company from Turku, was merged with the company in the mid-1990s. Thermo Labsystems acquired Bio-Orbit in 1999, and it thus came under foreign ownership. The business today is small-scale.

Clids. The company was founded in 1995 in Kuopio. It developed a modular automation system for laboratories, which can be used to improve the cost efficiency of laboratories. The identification system for laboratory samples developed by the company is based on a microchip, which is used to store personal identification data and other information on laboratory results. The first product developed by the company was sold to the Kuopio University Hospital. In the early years, Ilkka Vartiainen was the research director of the company. Savon Teknia and Sitra joined the enterprise as capital investors. In 1999, Thermo Labsystems acquired Clids, which is how it came under foreign ownership.

Biohit. The founder of Labsystems, Osmo Suovaniemi, set up this company in 1988 after having been ousted from the top management in Labsystems. In addition to Suovaniemi, a number of other key personnel left Labsystems and joined Biobit. The company has grown steadily since it was established. In 1994, the company employed

120, and in 2003, 300. In 1999, the company was listed on the NM list of the Helsinki Stock Exchange. In 2000, a new production plant was opened in Kajaani, and the next year, new facilities in Helsinki. More than 95% of the turnover still derives from liquid dispensers, that is, pipettes. In the past few years, the company has developed new diagnostic tests, and instruments and analysis systems related to them. The company has a number of partnership contracts with foreign companies, enabling the sales of the company's products especially in the United States market. In the past few years, the company has been showing slight losses.

Imaging and other dental products

Instrumentarium Imaging/X-ray equipment. Professor of Dental X-ray Technology, Yrjö Paatero, was the inventor and developer of the imaging system based on dental panorama X-ray equipment. He developed the first operational equipment already in the 1940s. The first piece of equipment suitable for clinical imaging was completed in 1959 by Paatero together with Timo Nieminen. It was first produced industrially in Lääkintäsähkö Oy, which was a company split off from Instrumentarium and specializing in importing X-ray equipment. Palomex Oy was founded in 1964 to produce dental X-ray equipment. In 1977, both Palomex Oy and Lääkintäsähkö Oy were merged into Instrumentarium.

In addition to dental X-ray equipment, Instrumentarium Imaging started to produce mammography equipment for the diagnosis of breast cancer in the 1980s. Furthermore, in order to speed up its growth, in 1994 Imaging acquired the technology and product rights for the Omega C surgical C-arm of the Swiss company Comet AG. Imaging was further strengthened with the acquisition of Germany's leading manufacturer of C-arms, Ziehm GmbH, and its US sister company in 2000. In addition, in 2001, Imaging reacquired Soredex in Finland, a spin-off from Palomex. In 2002, Instrumentrium Imaging and Soredex together had a turnover of 130 million euros with 500 employees in three countries.

Instrumentarium was acquired by General Electric Medical Systems in 2003. As a condition of the deal, the competition authorities required Instrumentarium to give up its ownership of the German company Ziehm.

Soredex. CEO Timo Nieminen of Palomex left the company together with a few other people and founded Soredex Oy in early 1977. The reasons for starting a new company included the founders' aspiration to develop a new X-ray device based on the use of a direct-current generator. The company introduced its first panorama X-ray device in the market in 1978. After having run into financial problems in 1981, Soredex was acquired by Orion. In the 1980s, Soredex developed a mammography device, which was, however, sold to the US Gendex Corporation in 1993. In the 1990s, Soredex developed a number of other imaging devices and techniques. In 1995, Soredex and Finndent, which had also been acquired by Orion in the 1980s were merged into a new company, Orion Oy Soredex Finndent. Finndent produced dentists' patient chairs and dental drills. In 2001, Soredex was acquired by Instrumentarium, and was thus reunited with its unit of origin, Instrumentarium Imaging. Soredex continued to operate as an independent unit, however. Instrumentarium did not want the Finndent unit of Soredex, which was bought out by management. When General Electric Medical Systems acquired Instrumentarium, Soredex too came under foreign ownership.

Planmeca. Heikki Kyöstilä, a dental equipment salesman, established Planmeca in 1971. The company started its business by producing, for example, dentists' chairs and in-

strument cabinets. The product variety expanded, and in 1980 the company had 50 employees. In 1983, Planmeca introduced the first microprocessor controlled dentists' chair in the world. In 1986, the company also started to produce dental X-ray equipment, and mammography equipment in a new company Planmed Oy, established in 1989. The Planmeca Group also includes Plandent Oy, which sells the group's and other companies' dentistry equipment and accessories. The group of companies has grown and internationalized rapidly in the 1980s and 1990s through business acquisitions. Today, the company employs 1,600 and is still owned by the founding family.

Finndent. Timo Janhunen established Finndent Oy in 1975. Earlier, he worked for a few years in Planmeca, but had a conflict over his share of the profits from a dentist's chair he had developed. Janhunen's father was a dentist, so he had a good understanding of the clients' needs. Finndent started out producing dentist's chairs. In the 1980s, the product range was expanded to include dental drill units. Due to economic problems, Janhunen sold Finndent to Orion in 1980. The products were developed under Orion until 2001, when the company was bought by management. Today, the company operates in Mäntsälä and still continues to produce dental units and dental drills.

Fimet. After Timo Janhunen sold Finndent he founded Fimet Oy in 1981. At first, the company did sub-contracting work for Finndent. In 1985, Janhunen disassociated himself entirely from Finndent and started to develop a competing dental patient chair in Fimet. It went into production in 1989. In 1990, Sitra made a venture investment in the company, and later on also provided it with a new CEO, while Janhunen continued with the company as director of product development. Today, the company employs about 60 in Askola and about 60 in Shanghai, China, in a joint venture company.

Instrumentarium Imaging/MRI. In 1978, Instrumentarium Imaging started to develop a new diagnostic method on the basis of magnetic imaging technology, partly based on ideas generated in the Low Temperature Laboratory of Helsinki University of Technology and VTT, Technical Research Centre of Finland. Most of the product development investments of Imaging were directed at developing MRI-devices related to this technology. The first device was delivered in 1981 to a domestic customer, and the first exports were made in 1984. Due to the heavy development investments of this equipment, and to the slow growth in sales, Instrumentarium decided to discontinue further investments in the development of these devices in the early 1990s. In 1993, Instrumentarium and Picker International from the US, owned by the British General Electric Company (GEC) founded a joint company Picker Nordstar Oy. In 1996, Instrumentarium divested all its shares in the company, and in 2001, Picker International was acquired by Philips Medical Systems. Today, the company is called Philips Medical Systems MR Technologies Finland Oy, and it employs 140 people, one-third of whom work in product development.

Neuromag. The development of brain scan equipment began in the Low Temperature Laboratory of Helsinki University of Technology in the early 1970s. Neuromag Oy was established in 1989 on the initiative of the president of Sitra and Professor Olli Lounasmaa, in order to commercialize this new technology. Sitra became the main shareholder of the company, and Instrumentarium Oy a minority owner. In 1991, a 122-channel prototype developed by Neuromag was completed, which was the first MEG device that covered the entire head. In 1994, the company had 11 employees and in 1999, 28. In 2000, the US company BTU, a competitor of Neuromag, acquired the company in order to create synergies between the companies. The companies, however, ran into a competition situation, in which one or other of the companies would have had to be

closed down. However, the Neuromag shares were sold in 2002 to a Dutch investment company, Vaandramolen Holding BV. In 2003, the Swedish company Elekta acquired Neuromag, and it currently operates under the name Elekta Neuromag Oy. Thirty Neuromag MEG devices have been sold around the world.

Anaesthesia and patient monitoring systems

Instrumentarium Datex. Instrumentarium is an import company established in 1900 by Finnish doctors. In addition to importing, Instrumentarium gradually started to develop its own production. In the 1960s, following the enthusiasm about electronics, a new company called Datex was set up in 1969 to develop a variety of applications under the leadership of Tapio Tirkkonen. Later on Tapio Tirkkonen resigned from Datex, because Instrumentarium management wanted to focus on medical applications. Among these applications, the most successful was an anesthesia monitoring system, developed in co-operation with experts at the Helsinki University Central Hospital (Tapani Tammisto and Jorma Auvinen). During the 1980s and early 1990s, Datex developed three new generations for anesthesia monitoring. In addition, it purchased a similar business operated by Kone. The product line was very successful. In the early 1990s, Datex employed more than 500.

In the 1990s, Instrumentarium strengthened the business of Datex by making two large foreign acquisitions. In 1993, the anesthesia and critical care unit Engström was acquired from the Swedish company Gambron. In 1998, the patient monitoring system business of the British company American Ohmeda Group was acquired. In addition, a small company from Kuopio called Clinisoft was acquired. In 1998, the Datex-Ohmeda division already employed almost 3,000 and it became clearly the largest line of business in Instrumentarium. The successfulness of Datex-Ohmeda encouraged Instrumentarium to give up many of its other businesses and focus on developing Datex-Ohmeda and Instrumentarium Imaging. In 2002, moreover, Datex-Ohmeda acquired the US company Spacelabs Medical. Datex-Ohmeda, employing more than 4,000, had become the world leader in its field, and its turnover was 840,000 million euros out of the entire Instrumentarium turnover of 1,000 million euros. It had also become the largest product group in the Finnish medical technology business.

The success of Datex-Ohmeda and Instrumentarium as a whole attracted the attention of General Electric Medical Systems. Instrumentarium had grown into a large and successful company, which was well suited to complement the business and competencies of GE Medical Systems. Hence, at the end of 2002, GE made a very good bid for Instrumentarium's shares. The institutional Finnish owners of Instrumentarium decided to accept this offer, although the company management were not enthusiastic about the acquisition. The acquisition was finalized in early 2004. Due to the competition authorities' requirements, GE was forced to sell Spacelabs Medical.

Kone Instruments patient monitoring business. As was described above in connection with Ollituote, the Instruments unit of Kone, together with Valmet, was a pioneer company in patient monitoring. In the 1980s, the success of Datex clearly left Kone a runner-up, and it sold its patient monitoring business to Instrumentarium in 1987.

Clinisoft/Deio. Clinisoft, established in 1993 in Kuopio, is a company producing intensive care information systems. Soon after it started business, it was acquired by Instrumentarium Datex to enhance the company's information systems competencies. For the first

few years, however, Clinisoft was able to operate very independently. In 1997, Datex management decided to start to develop information systems into an independent line of business, and it was made into a specialized unit consisting of Clinisoft Oy and the anesthesia information systems in Datex. In 2000, the unit was renamed Clinisoft Business Unit and it employed about 70. It produced information systems for both anesthesia and intensive care. In early 2001, the unit was incorporated as Deio Oy, by that time already employing 130. Deio's business has not quite found its focus, and it has not been able to show a profit. Along with Instrumentarium, Deio was taken over by GE Medical Systems.

Pharmaceuticals development and trade

Star. Tamro established Star in 1922 to produce pharmaceuticals. For years, the main product of the company was the painkiller powder Hota. In the 1940s and 1950s, the company employed about 100. In the 1960s, it started to produce ophthalmic drugs (eye-drops). By the 1980s, Star was the only company in Finland focusing on ophthalmic drugs. It employed about 200. In 1987, Huhtamäki acquired Star from Tamro. In 1992, the entire ophthalmic drug business of Huhtamäki was concentrated in Star. When Huhtamäki divested its pharmaceuticals business, Star was sold to the Japanese company Santen Pharmaceutical in 1997. At that time, the company employed 300. As part of Santen, Star – today known as Santen Oy – is the leading Nordic manufacturer of ophthalmic drugs, and the producer of the Santen products marketed in Europe and the US. It currently has 420 employees.

Leiras. The food and stimulant business (RaNa) in Huhtamäki was originally a project, which produced wartime vitamins for the army in Turku. RaNa became a subsidiary in 1946, and grew into a separate pharmaceutical plant, which was named Leiras in 1949. The company's first products were health products and vitamins. The company expanded its own production in the 1950s by making cooperation agreements with international pharmaceuticals companies. In the late 1960s, Leiras was the second-largest pharmaceutical company in Finland. In the 1970s, the aim of the business was to maintain its position in the domestic market, while developing exports. In the 1980s, Huhtamäki decided to reinforce Leiras by acquiring other domestic drug factories. The company acquired Star and Rohto (est. 1947) from Tamro, as well as Medica Oy (est. 1911). The acquired units were merged into Leiras, which was incorporated in 1992. Soon, however, Huhtamäki decided to give up pharmaceuticals. The German pharmaceutical group Schering AG acquired Leiras (except for Star) in 1996. In 2003, Leiras Oy and Schering Oy, which had marketed the products of Schering AG in Finland, were merged into a new Schering Oy. Under Schering's ownership, the drug development and production of Leiras have been focused, and there have been new investments in research. The current product lines of Schering Oy focus on gynecology and andrology products, multiple sclerosis treatments, skincare products, hematology and oncology. Under Schering's ownership, the company personnel first grew from 1,000 to 1,100. After the business was focused, the number of employees has been slightly declining. In early 2003, the number of employees was 965, and it declined to about 850 in 2004. The company is led by the German Jean-Francois Grenier.

Map Medical Technologies. Map Medical Technologies is a small pharmaceuticals development and production company, established in 1991 by workers at VTT, Technical Research Centre of Finland. The company develops, manufactures and markets radio pharmaceuticals, among other things, for the improved diagnosis of neurodegenerative diseases and for the diagnosis and therapy of oncological diseases in the Nordic

region. In 2002, Leiras, by then a subsidiary of Schering, acquired the company, which thus came under foreign ownership.

Tamro. In 1895, pharmacists from Tampere established a wholesale company called Drogeri-Handelsbolaget I Tammerfors. The company is the oldest healthcare company in Finland. The company became a nation-wide wholesaler in 1940, and was listed on the stock market in 1955. In the 1980s, Tamro controlled 70% of the Finnish pharmaceuticals wholesale trade. Tamro was acquired by the development company Spontel Oy in 1994. The company participated in the Nordic restructuring of the industry by acquiring pharmaceuticals wholesale companies in Sweden and Denmark. Its business also expanded to Norway and the Baltic countries. In 2002, Germany's largest pharmaceuticals wholesale company Phoenix Pharmahandel AG & Co became the largest owner of Tamro, and later gained ownership of the entire company. The acquisition has also been termed a hostile takeover in the media. Under new ownership, the company strategy has changed to some extent. The new owners appointed as Group CEO Jo Lanmoen from Norway, who had resuscitated the company's poorly performing Norwegian subsidiary. The new management also turned around the company's strategy of creating a common Nordic operating concept. The new management also made some lay-offs, which restored the business to profitability. Distribution was also streamlined. Due to the new ownership and strategy, the role of Tamro Finland in the Tamro Group has declined. Its share of group turnover is 15%. After the lay-offs, the company only employs 310 people in Finland. The entire Tamro Group has 3,820 employees.

Orion. Orion Oy was established by Onni Turpeinen and the chemists Emil Tuurala and Wiikki Walkama in 1917 in Helsinki. The aim was to produce and sell medicines. In the 1940s, the company established the subsidiaries Noiro, focusing on cosmetics, and Oriola, focusing on pharmaceuticals wholesale. The company operations were transferred to Espoo in the 1960s. Orion Diagnostica was established in 1972. Orion acquired the Danish pharmaceuticals factory Ercopharm in 1977. In 1981, Orion merged with the Finnish company Fermion, producing drug ingredients, and in 1991, the pharmaceuticals company Farmos-Yhtymä, employing 1,500. In the 1980s, Orion started to invest in research aiming at discovering drugs of its own. Currently, Orion has introduced 7 proprietary drugs in the international market. Today, Orion Pharma is the largest pharmaceuticals company in Finland, employing 2,750 at the end of 2003. In 2002, Orion acquired Sweden's largest pharmaceuticals wholesale company KD, making Orion, through Oriola and KD, the leading pharmaceuticals dealer in Finland and Sweden. Tamro Group is, however, larger than Orion's wholesale group in terms of total size. It employs 3,820, whereas Orion's wholesale business only employs 1,590. Earlier, Orion also has some equipment manufacturing (e.g., Soredex and Finndent), but it divested these companies in 2001. In 2003, Orion also sold the cosmetics company Noiro to funds operated by the equity investor company CapMan. After this, Orion's business has focused purely on pharmaceuticals and other medical products. In the past few years, Orion has employed more than 5,000, but after downsizing in 2003, the company employed 4,690 at the end of the year. In 2002 and 2003, Instrumentarium was a slightly larger employer than Orion. Orion has been a listed company since 1995. At the end of 2003, foreign owners held 17% of Orion's shares.

Other medical technology companies

Dosetek. The company started operating in 1980, when two researchers at the Radiation and Nuclear Safety Authority decided to establish a company producing measure-

ment instruments for radiation therapy. In 1982, Varian Medical Systems offered Dosetek the dealership of their products in Finland. The deal was made: Dosetek started selling Varian's radiotherapy equipment in Finland, and Varian started selling Dosetek's measurement equipment in Europe. Dosetek grew relatively rapidly, and was acquired in 1993 by Varian. Following the acquisition, the markets expanded, and the company was able to focus more closely on product development. Today, the company produces radiation therapy dosage planning systems. In 2000, the company employed 34. Today, it is named Varian Medical Systems Finland Oy.

Kolmi-Set. Kolmi-Set is a company producing hospital supplies, which was originally owned by Tamro and Yhtyneet Paperitehtaat. In 1981, Kolmi-Set was acquired by Tamro. In the 1990s, Tamro decided to focus entirely on the pharmaceuticals wholesale trade. In 1997, Kolmi-Set was merged with the clinical division of the Swedish SCA/Mölnlycke Group, and these were formed into a new, independent company, Mölnlycke Health Care AB, with Tamro maintaining part ownership in the company. In 2001, Tamro gave up its ownership. At the end of Tamro's ownership period, the company employed about 350. Under Mölnlycke's ownership, the number of personnel has been on the decline. In 2003, the specialty drape factory in Ilomantsi, Finland, was closed down, and its production moved to Belgium and the Czech Republic. The modern factory in Mikkeli, Finland, specializing in the wound care business, continues to operate.

Bionx. The company is a product development company specializing in biomaterials, developing and producing bio-absorbable implants for the surgical care of bone fractures, connective tissue damage, and tissue tracts. The main product of the company is a meniscus arrow for connecting tears of the meniscus. The company's competence is based on work started in the 1970s by the research group of Professor Pertti Törmälä from the Tampere University of Technology. In the 1980s, the first companies were set up to commercialize this know-how. In order to solve problems in finance and marketing, the developers turned to venture capital companies in the US. A company called Bionx Implants Inc. was established, with its financial management in the US and research and production in Finland. The company was listed on NASDAQ in 1997. After this, the company grew rapidly, soon employing about 100. In 1999, a number of the managers left the company and established a competing enterprise. In 2001, the company had 120 employees, of whom 80 worked in Finland. In 2003, the US-based ConMed Corporation acquired the company, and it is currently known as Linvatec Biomaterials Oy.

Inion Ltd. The managers who left Bionx set up a new company in Tampere in 1999. The company specializes in the development, manufacturing, and marketing of innovative biomaterials and their surgical applications. The company launched product lines for applications of craniomaxillo-facial surgery in 2001, applications for dental and sports medicine in 2002, and orthopedic trauma fixation in 2003, all based on Inion's patented Inion OPTIMA material family. Inion employs 75 altogether in its Tampere facilities and its sales companies in the United States and Britain. The company has showed a loss since it started, but expects to become profitable in 2005. The largest owners of Inion Ltd. are the Swedish HealthCap, the Finnish BioFund, the Swiss Bank von Ernst, the Finnish-Swedish CapMan/Swedestart, and the US-Nordic POD Holding. Other owners include the Finnish institutional investors Pohjola, Suomi, and Tapiola.

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Interviewees

Hannu Ahjopalo, Vice President, EMEA Strategic Marketing and Business Development, GE Healthcare Information Technologies.

Niilo Saranummi, Research Professor in Health Technology at the Technical Research Centre of Finland (VTT).

Harri Timonen, Director of Kone Instruments (1966 – 1999).

CHAPTER VII

Internationalization Phase of High-Tech SMEs – The Case of Finnish ICT and Biotechnology Companies

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&

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ABSTRACT: *The study provides evidence that the biotechnology industry in Finland is still in the early stage of development compared to the ICT cluster. The operational focus of biotechnology companies is primarily on research and development (R&D) whereas in the ICT cluster the focus is much more on customer needs. Fast growing ICT companies seem to be driven by international business opportunities. A fast response and the ability to take advantage of the opportunity seem to be critical success factors. The biotechnology companies in general in Finland are still small and mostly financed by outside investors. Earnings models and business plans are still under development. The study shows that internationalization in these two modern industries differ from the traditional export driven industries.*

TIIVISTELMÄ*: Tämän tutkimuksen tulosten mukaan biotekniikka- ja tieto- ja viestintäala ovat toimialoina hyvin erilaisia. Suomessa biotekniikka-toimiala on vielä alkuvaiheessa, ja useimpien yritysten toiminta on edelleen vahvasti tutkimus- ja tuotekehitysvaiheessa. Suurin osa Suomen biotekniikkayrityksistä on edelleen kooltaan pieniä. Pääosa niiden rahoituksesta on saatu yrityksen ulkopuolisilta sijoittajilta. Kansainvälinen toiminta painottuu voimakkaasti t&k-yhteistyöhön ulkomaisten organisaatioiden kanssa. Sen sijaan tieto- ja viestintäteknologian (ICT) ala on Suomessa jo pitkälle kehittynyt ja toiminnallinen painopiste on asiakkaissa ja heidän tarpeissaan. Moni keskisuuri ja melko pienikin ICT-alan yritys on perustanut ulkomaisia tytäryrityksiä. Tutkimus osittaa, että bioteknologia- ja ICT-alan kansainvälistyminen poikkeavat perinteisestä vientivetoisesta kansainvälistymismallista.*

1 Introduction

1.1 Background

The global marketplace has changed dramatically in recent decades, especially during the 1990s after the positive shift in world politics. The major drivers of change – that is, globalization as it is widely called – are technological development and liberalization of world trade and investments.

Dramatic increases in speed, quality, and efficiency of international communication and transportation have reduced transaction costs in international trade, and the worldwide standardization of technology has reduced R&D and production costs. Furthermore, at least to some extent, globalization also means increasing similarities among consumers, scale advantages, and growing global competition.

Under the umbrella of the World Trade Organization (WTO) governments have been willing and able to reduce national barriers to foreign trade and investment. The expansion of the European Union and the establishment of NAFTA are major steps towards free trade, even though they help in strengthening regional competitiveness in global competition.

The traditional internationalization theories (see e.g. Luostarinen 1970) have assumed certain patterns in becoming international, starting from exporting or importing and eventually moving toward foreign direct investments. Exporting is seen to start with nearby countries and then expands gradually to cover a larger part of the world. These theories have described internationalization as a time-consuming process. This is still true in a majority of the cases, but there are a growing number of companies that do not have time to expand slowly. The market opportunity might be valid for only a short time, or the competition favors fast market penetration.

Today, the internationalization of companies covers far more activities than just the purchasing of materials and equipment and the selling of products. It seems that international cooperation in research and product development, financing, and marketing are increasing among smaller technology companies. [1]

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[1] See e.g. Niinistö (2001) and Saarenketo (2002).

Globalization has offered new possibilities for the enterprise to organize its international operations, utilizing global opportunities. This concerns bigger companies in particular. However, there is no reason why small enterprises cannot utilize the same global advantages as the bigger ones. Partnering with other enterprises in other countries or cooperation with international universities and research centers is not so costly that smaller enterprises cannot afford it. Even locating an R&D unit in Silicon Valley or some other technological advanced location is possible for smaller enterprises if it offers competitive advantages.

One very interesting trend is the increased outsourcing of R&D activities by bigger companies. This is a management answer to the need to enhance competitiveness in global business. The new strategy has led to growing cooperation within the business community and between the business and academic communities.

This phenomenon opens up worldwide opportunities, particularly for companies having special competences or skills. Cooperation in R&D is essentially cooperation between experts. Intensive communication is characteristic of such a relationship, and being close to partners offers clear advantages. From a cost perspective, it is even possible for a small innovative company to establish an R&D unit near its foreign partner if the relationship so requires.

1.2 Goals of the study

The first goal of this study is to describe the internationalization process of high-tech SMEs. We will test the hypothesis that even a small company can benefit from the strengths that can be found in host countries worldwide. For example, according to this assumption a software company can benefit from being present in California, because California is known to be the heart of the global software business. Similarly, a biotechnology company can benefit through participation in research programs carried out in important international research centers.

The second goal is to study the role of a foreign subsidiary in a company's global operations. Traditionally, a foreign subsidiary serves as a local sales and marketing unit for products produced by the parent company or it is a local manufacturing unit. However, the subsidiary might have other roles in the organization, such as in R&D or global business management.

The third goal is to describe the major managerial challenges that have been encountered by managers in a local subsidiary such as experiences managing a multicultural organization and difficulties in technology transfer.

2 The data and methods

2.1 The sample

Two relatively new and high technology intensive industries were selected for the study: ICT and Biotechnology. During the past ten years, the ICT industry has risen to become one of the major industries in Finland.

The biotechnology industry, in turn, is still in the early stage of development in Finland compared to the ICT cluster. For instance, seven out of the 30 biggest biotechnology companies, ranked by number of employees, had no turnover (*Talouselämä* no. 14/2002). The Finnish public organizations such as Tekes (National Technology Agency) and Sitra (The Finnish National Fund for Research and Development) have considerably financed Finnish biotech companies.

To study the internationalization of Finnish small and medium-sized companies operating in the biotechnology and the ICT industries, two countries – the UK as a European representative and the US – were selected.

According to Finpro's statistics from spring 2002 there are some 30 subsidiaries of Finnish ICT companies in the UK and as many in the U.S. Moreover, some of the bigger companies, such as Nokia and JOT Automation (in 2002 JOT Automation merged with Elektrobit), have several sites in both countries, in addition to the above. However, it is difficult to give an exact number of ICT subsidiaries, because the definition of ICT is rather broad. Also, the number of subsidiaries is subject to constant change: new companies enter the markets and old ones depart.

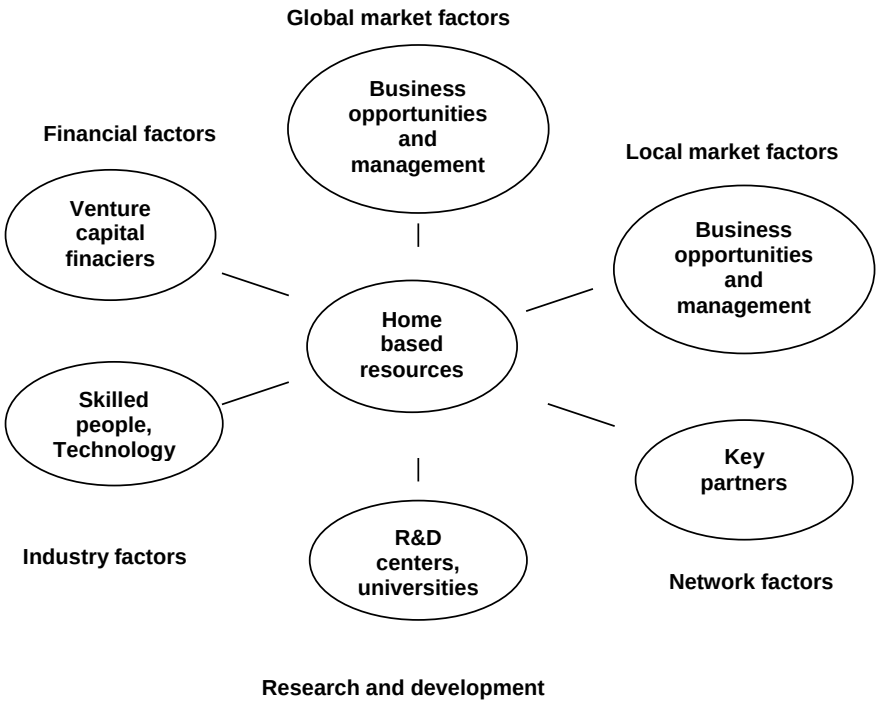
Altogether, 33 companies were interviewed. In the case of ICT, this included 13 companies in the U.S and 10 companies in the UK. All but four of the selected ICT companies belonged to the SME category. The bigger ones were included, because they recently grew out of the SME category, and they were expected to provide good information for the study. Three of the companies had subsidiaries in both the UK and the U.S. In the Biotechnology case, 10 companies were interviewed in Finland, all of them belonging to SME category. The interviews focused on parent companies, because only two SME companies were found to have foreign subsidiaries in either the UK or the U.S. And even in these two instances it was found that the subsidiaries were not fully owned by the Finnish parent company, thus placing them outside the parameters of the focus group.

Semi-structural question patterns were used in company interviews. The questionnaires were slightly different in the ICT and biotechnology cases due to the point of contact, that is, subsidiary versus parent company, respectively. Those interviewed were mainly heads of the unit, with the title of President or Managing Director. Finpro staff in London, Silicon Valley, and Houston conducted the interviews.

2.2 Analytical framefork

To be able to make this determination, the factors and motives that have lead companies to expand their activities outside of Finland must be understood. The following analytical framework, developed from factors and motives identified in the business literature, depicts the various considerations that lead a company to engage in international business activities.

Figure 2.1 Factors and motives for international cooperation



Local market factors

Attractiveness of the local market, that is, size, stage of development, availability of efficient distribution channels, and other favorable issues, has traditionally played a major role when planning a market entry.

Global market factors

The marketplace may also offer favorable factors outside the local commercial environment. For example, companies in a particular local industrial market, such as ICT companies in California, may control worldwide sales channels through their established global operations. In such cases, a local presence has "status value" in the eyes of customers worldwide.

The size of the local market is not always crucial. A market may offer other advantages, such as being more advanced than markets elsewhere. Assuming that the rest of the market is developing in the same direction, learning through early presence in an advanced market offers competitive advantages to companies.

Network factors

The company has strategic partners in the market. Partners can be companies offering supplementary products and services or clients having strategic meaning. The value of a partnership is not necessarily measurable directly in money. The partnership can help in learning new competences, thus allowing the company to reach a better position in the business network than it could otherwise do alone.

Research and development

The market offers unique added value in R&D, and thus cooperation with local universities and research centers is beneficial.

Industry factors

Favorable infrastructure and availability of advanced technology, services, and skilled people are factors of strategic importance for any technology company. Exploitation of these benefits requires a local presence. Knowledge is often in a tacit form, and can be transferred only through informal communication by people.

Financial factors

Availability of financial support is essential for most fast growing companies. In this regard, venture capital financing has played an important role

in financing, especially in the growth of ICT and Biotechnology companies. The venture capital investors typically favor investments in nearby companies to guarantee better control over the investments and to avoid possible cultural problems. Therefore, this study pays special attention to relationships with foreign R&D centers and universities and cooperation with local companies in the vicinity of the company's subsidiary.

3 ICT results

Interviews with 13 subsidiaries in the U.S and 10 in the UK were carried out. All these companies were wholly owned and controlled by their Finnish parent companies.

The companies belong to the following subcategories of the ICT business:

	UK	U.S
Software	7	6
Electronics, mechanics	1	4
Services (consulting, manufacturing etc.)	1	3
Other	1	0

The software and hardware companies focus mainly on the production side of the ICT business, but they also offer their customers a wide variety of services such as training and maintenance. Furthermore, in many cases the companies are also deeply involved with their customers' product development programs.

In general, the border between the product and service business seems to be rather blurred in ICT. Companies primarily offer solutions to their customers' needs. The solutions are typically based on ICT technology, for example, software, but the solutions include customer specific engineering, consulting, and other services. Intensive and long-term customer relationships are characteristic of this business.

3.1 Internationalization process

The following table presents the length of time between the establishment of the parent company and the establishment of the first foreign subsidiary.

Years	Number of companies
0-2	6
3-5	1
6-9	5
>10	6

It is interesting to note that the companies seem to be divided in to two groups, those that established their first subsidiary soon after forming the parent company and those that have done it rather late, with only one company belonging to the 3-5 years category.

It is difficult to find a single reason why some of the companies established their foreign units so late. However, when a company's history is long it normally includes several changes in both the business environment as well as in strategy. A decision to establish a foreign subsidiary might be based upon developing a new business or strategic opportunity. The importance of opportunity and timing was emphasized by some of the managers interviewed. Thus, it is irrelevant to know whether the first foreign subsidiary was established 7 or 17 years after the birth of the company.

Of more importance is the reason why some of the companies established their first foreign subsidiaries very soon after the start of the parent company. The 6 companies that established their first foreign subsidiaries within 2 years of founding the parent company are rather different in all respects. Even though we cannot introduce any single explanation why these 6 companies have selected the strategy of rapid internationalization, it seems that the managements of these companies have realized the business opportunity, selected this strategy, and have been able to finance the costly realization of it.

In almost all of the cases, the foreign subsidiary was initially established around one or at the most very few Finnish expatriates. Then, as the subsidiary grew organically, people were hired locally.

3.2 Internationalization drivers

The primary reasons for establishing a foreign subsidiary vary from company – to company. The following table describes the factors behind the establishment decision (see also Figure 2.1).

	U.S	UK
Global market factors	2	4
Local market factors	9	3
Network factors	8	3
R&D factors	1	-
Industry factors	3	5
Financial factors	-	-

Our results support the view that there is no single motive that explains the companies' internationalization decisions. In many cases, managers could not specify just one reason for establishing their subsidiaries, opting instead to also list secondary and supporting reasons for the decision.

An interesting outcome is that establishment motives differ between US and UK subsidiaries. While in the US case local market and network factors are clearly the most important, in the UK case answers are more equally divided.

The most interesting outcome in the U.S is that 8 out of the 13 companies mentioned close cooperation with a strategically important partner or partners as the primary reason for establishing their subsidiary. In many cases the company had business relationships with partners, but in some cases the partnership was established to strengthen product or service offering to joint customers. However, one very evident reason for establishing operations in the U.S is Nokia and the business cluster that emerged around it in the 1990s. Four companies clearly mentioned that business with Nokia was the major reason for their decision to come to the U.S, and one company followed one of Nokia's key partners. In these cases, the network factor is related to market factors. Thus takeing this into account, the table strongly suggests that the majority of establishment decisions have been market-driven. In the UK, in turn, only three companies considered key partners as a primary reason for establishing their local office. In all of these cases the partnership was with key customers. However, it is important to bear in mind that technology companies offering technology and services, instead of products, typically first establish business with one customer and then expand the cooperation to cover other customers. A "customership" is typically a long lasting relationship, and the number of customers will stay limited. Thus, it is not always easy to distinguish the terms 'key partner', 'customer' or even 'market'.

With only slight variations in their responses, all of the companies interviewed listed the same major advantages in having their own local subsidiary. Proximity helps to better understand customer needs and market requirements, making customer support easier and helping in developing and controlling sales channels in the local market and, in many cases, the entire continent as well.

Global market factors have also driven companies to establish foreign subsidiaries. In the UK, four subsidiary managers used the criterion of developing a Pan European business management capability to arrive at their decision to establish a local presence. According to their responses, the UK is recognized as the leading European country in their respective businesses. Thus, it is natural and even beneficial to be located in the UK in order to take care of management across a broader geographic area. The U.S. subsidiaries of two software companies also underlined the importance of global market factors as a criterion for establishing a local presence. One of the companies interviewed has even moved its headquarters from Finland to the U.S.

For those companies interviewed, industry factors play a considerably higher role in the UK than in the U.S. Half of the subsidiary managers named industry factors as the most important reason to establish a subsidiary in the UK. In three cases the subsidiary was basically established around one key person. The management in the Finnish parent company already knew the person through past cooperation. In only a single case was the subsidiary a result of an acquisition of an existing local company. In the U.S, industry factors were the primary reason for establishing a local subsidiary in three cases. These three subsidiaries operate in the software business, with two located in California and one located in Texas. Each company stated that the industry leaders in their businesses are US-based companies. The status of working close to these leaders provides a competitive advantage, even on a global scale, making recruiting easier and helping to closely follow the latest business trends and technological developments.

Of all the subsidiary managers interviewed, only one mentioned the importance of local universities as a major reason for establishing a subsidiary in the U.S, aside from the attractiveness of the market. The figure is surprisingly low considering the importance of network and industry factors as reasons for establishing a local subsidiary. Furthermore, none of the companies, even in the U.S, mentioned the attractiveness of the venture capital market as the primary reason for establishing a local subsidiary. One reason, perhaps, is that in many cases U.S. venture capitalists require the companies in their investment portfolio to be headquar-

tered in the U.S. However, some managers mentioned that outside risk capital made it possible for them to establish foreign subsidiaries. An absence of risk capital would not have allowed these companies to internationalize so rapidly.

The type of ownership in the companies was not a question in the interviews, but it might offer an interesting topic for further study, because even in the questions asked it became apparent that venture capital investors have an active role in shaping the internationalization strategies of their portfolio companies.

Two of the business managers interviewed underlined the importance of timing as a reason for their decision to establish a foreign subsidiary. Having a local company was considered the most powerful way to seize the emerging business opportunity. According to these managers, acting quickly gave them a strategic advantage.

The interviews show that the location of a subsidiary relates to the reasons why the company establishes a foreign subsidiary. As identified above, the two primary factors for market entry were attractiveness of the market (market factors) and cooperation with partners (network factors). In the case of networking factors, the companies clearly prefer to be close to their partners to facilitate cooperation. All of the companies that listed network factors as the primary reason for establishing a subsidiary in the U.S followed this rule. However, when the companies decided to enter the market because of market factors, the exact location was based upon various secondary factors such as logistical advantages that the location offers, availability of skilled people, and proximity to other Finnish companies.

3.3 Role of a foreign subsidiary

The current roles of the subsidiaries correspond well with the original motives and factors for establishing a subsidiary in the region although the role of the subsidiary in the U.S varies from the headquarters to the U.S. sales office. Regardless, whatever were the initial reasons for establishing a local presence, subsidiaries have typically gained a comprehensive role in the company's entire operation in that territory and, in many cases, outside of the region.

All of the interviewed subsidiaries in the U.S and UK were responsible for business in that specific market. Five subsidiary managers in the U.S said their unit takes care of business development on the North American continent, and four of the UK based subsidiary managers said that their unit was responsible for business development in Europe. Fur-

thermore, one of the units in the U.S was responsible for global business development, and one of the UK subsidiaries had global responsibility for one of the company's product lines. With only a few exceptions, almost all foreign subsidiaries were taking care of customer and partner support. The companies also utilized local subsidiaries to follow market developments and monitor changes in customer needs. This role was regarded as highly important.

3.4 Networking in research and development

From the perspective of the innovation system, it is interesting to consider to what extent foreign subsidiaries participate in technology development.

Altogether, 9 of the 23 subsidiaries carry out their own R&D activities, while the rest primarily support business development targets for goods and services that are designed elsewhere, especially in Finland.

While locally carried R&D work is usually a part of a company's main R&D activity, one subsidiary has a fully independent R&D operation and another company has overall organizational R&D responsibility for one product line. In other companies, the intensity of cooperation between a parent company and subsidiary varies from exchange of information to joint projects.

Our interviews suggest that companies cooperate less frequently with local universities than with other local companies. Eight out of the 23 cooperate with local universities or research institutes. More importantly, some of the subsidiaries have joint R&D projects that are strategic, in nature. One company has a network of academic people in local universities available for exchanging information and developing the company's competences. In addition to these forms, some companies provide free software products to universities for reasons of image building and marketing. We could find no major differences in level or forms of university cooperation between the UK and the U.S.

Turning now to company cooperation. Subsidiaries cooperate to a great extent with other local companies within the same industry, with this definition of cooperation not including the purchase of business goods and services, such as legal services and office supplies. Altogether, 18 of the 23 companies interviewed cooperate locally with other companies. Again, in this respect there seems to be no major difference between the UK and the U.S.

However, the forms and strategic nature of the cooperation vary widely. While the most often mentioned forms of cooperation are purchasing of components, outsourcing of hardware or software projects, OEM agreements, and licensing of know-how, a number of companies also cooperate closely with their key customers. In some cases the subsidiaries are involved in customer specific development projects, and in others they act as the interface between the customer and their company's R&D staff in Finland. Furthermore, many companies have an important role in conveying technical information.

While in most of the cases the cooperation with sales partners supports local sales, in some cases cooperation supports Pan European, Pan American, or even global sales.

In addition to cooperation with local universities and companies, more than half of the subsidiaries interviewed cooperate with other local Finnish companies. However, cooperation between Finnish companies seems to be much more common in the U.S than in the UK. This might be described partly because many of the companies belong to Nokia's local production network and are located in the same region of the U.S. Another explanation might be that the long distance and cultural differences create a more favorable environment for cooperation with other local Finnish companies than can be found in the UK.

3.5 Management and leadership

Our interviews suggest that the views differ in the U.S and the UK on who should lead the local subsidiary. While the managers in the U.S underlined the importance of having a Finn as the president of the subsidiary, managers in the UK pointed out the importance of locally hired managers. One potential explanation for this difference lies in control. The U.S. units seem to have a more independent position in the corporate organization than those in the UK. This is rather understandable, considering the difficulties that distance and time difference create for the control of the operation. In both countries the Finns occupy mostly expert tasks, especially technology experts. Sales and other customer specific tasks are typically given to local employees because they are expected to perform better as experts of the local culture.

On the one hand, by using Finnish expatriates the parent company is able to transfer the corporate culture and values from the parent com-

pany to the new organization. According to this line of reasoning, locally hired US managing directors create the risk of managerial conflicts between the parent company and the local subsidiary. On the other hand, the major advantage of local business leaders concerns their ability to cement contacts within the local business community, and cultural and social issues also support this view.

According to a number of local managers, the management in the parent company does not always understand the local requirements and does not provide full support. Working in the local environment requires at least some adaptation to the local business environment and culture. Clearly communicated corporate goals and values, as well as properly defined working processes and systems, were expected to create a sound base for local adaptation.

The interviewed managers were asked to give recommendations for other foreign companies that are considering establishing their first unit either in the UK or the US. The most common recommendations were:

- Carry out the market investigation and other preparations thoroughly.
- Think carefully about the reasons why it is necessary to establish a foreign subsidiary – does it support the corporate strategy?
- Have a well-thought-out strategy
- Prepare a realistic budget – where do you need local assistance?
- Be ready for higher costs than expected
- Have sufficient resources available at the outset
- Take the key people with you who know the company and the business
- Recruit only the best people
- Use local advisors and consultants, for example, Finpro ry
- Be patient

The interviews clearly indicate that the companies try to reach their sales and other growth goals by networking with other companies rather than increasing their own organization.

4 Biotechnology company results

Now, we turn to the internationalization of the Finnish biotechnology industry. Interviews with 10 managers of biotechnology companies were interviewed. All these companies belong to the SME category, and only one was established earlier than 1990. Most have been operating 2-7 years.

In 2001, two companies had over 5 million euros turnover and 3 companies had less than 1 million euros turnover. Three companies had no turnover because their product is still under development. In terms of employment, 5 companies employed less than 30 and 3 companies employed more than 50.

The companies belong to the following subcategories of the biotechnology industry.

Table 4.1. Biotech companies by subcategory

Subcategory	Number of companies
Pharmaceuticals	3
Diagnostics	4
Functional Food/ Food	2
Other	1

Despite the companies focusing on the above-mentioned categories, many of them also offer some other products and services, and can be seen in other categories such as services, equipment, environment, research reagents production, and health.

4.1 Internationalization process and development

Even though some of the companies interviewed are still in the product development stage, all except one stated they have had established contacts abroad from the very beginning. It seems that the internationalization process is seen as a broader issue than the usual pattern, that is, starting from exporting or importing and gradually moving toward foreign direct investments. For biotechnology companies, internationalization starts in the very early stages of the company's development, and is based on networking as a way of doing business. In this regard, internationalization en-

tails not only the export of goods, but also more importantly it involves R&D activities, which are closely linked to partners and universities abroad.

The companies interviewed have no foreign subsidiaries and only two companies have very small representative offices abroad – one in the UK and one in the U.S. Both offices employ only one person.

However, the majority of the companies had considered the US as a potential location for subsidiary. The willingness to establish a subsidiary in the US is based on their view that the US is the most important potential market for them. Moreover, four companies also see Europe as a desired location for their business units. Two companies had considered the UK as a potential location for a subsidiary and two other companies mentioned Switzerland and Germany.

Several motives lie behind planning to establish a foreign subsidiary. These include:

- Desire to enter into the U.S/ European market
- Central location
- Get closer to local authority
- Product development cooperation
- Competence and expertise
- Closer customer, partner, subcontractor, and agent contacts and service
- Larger research base (people) and global studies
- Market visibility
- Market credibility
- Logistics
- Develop company's operations

The reasons given by the companies for currently not having foreign units are:

- Lack of finance
- Lack of skillful management
- Insufficient sales
- Does not bring enough added value (R&D unit)

The lack of finance was particularly stressed. Companies do not generate enough sales and cash flow to make the foreign unit profitable for their business. Some of those interviewed said that R&D is cheaper and safer in Finland.

Three out of 10 companies do not even have plans to establish a unit abroad. The following quotations describe reasons for this:

"It is as easy to conduct business activities from Finland as from foreign countries."

"Finland is a good place for product development. When doing R&D abroad there is a threat of an information leak. It is not necessary to be near the markets."

"A networking business model with foreign partners and distributors is the best solution at the moment and a unit abroad is not needed."

4.2 Networking with universities and companies

The scale of cooperation

All the companies have active international cooperation with other actors in the field. Cooperation networks include not only foreign companies, but also universities and research institutes.

Cooperation with other companies takes several forms. Most cooperation is related to competence building and many companies consider foreign competence and skills essential for their business. As one manager said: "*Our company has found special skills are needed abroad and the ultimate goal in service buying is to get the best expertise just on time now and in the future*". Moreover, cooperation forms with other companies include purchasing of components, licensing, technology transfer, as well as marketing, selling, and distributing.

Table 4.2. Countries where the companies interviewed have university/research institute cooperation

Country	Mentioned X times
Germany	3
The Netherlands	3
Sweden	2
U.K	2
U.S	2
Australia	1
Canada	1
France	1
Iceland	1
Japan	1
Russia	1
Spain	1

Almost all the companies have some level of cooperation with foreign universities and institutes, and there is a desire to develop and reinforce the cooperation further. Some companies mentioned they are carrying joint R&D projects, which even have a strategic nature. However, the forms of cooperation are numerous varying from basic research to product modifications for a specific market.

The companies interviewed have international university/research institute cooperation with many countries (Table 4.2). It seems that there is no single country with a dominant position in terms of university cooperation.

Benefits of international cooperation

The benefits of the cooperation with companies and universities that the interviewees mentioned can be divided into four categories: expertise, business, market, and product factors.

The interviews suggest that the most stressed factor is ***expertise*** including components such as competence, skills, learning, and quality. Cooperation also often has ***business*** targets including enforcing of sales, distribution and marketing, and growth of productivity and turnover. Finding the right partners in sales and marketing is essential in order to generate income. The third cooperation benefit is related to ***market*** which includes market visibility and reference. Through cooperation companies strengthen their marketing efforts globally, resulting in sales growth. The fourth element concerns the ***product*** – its developing, testing, and technology testing. Some companies mentioned that a short-term aim is to get the business partners involved in product development. Cooperation has to be based upon mutual interests, trust, and explicitness. Moreover, successful cooperation requires synergy and a win-win situation, as well as a good personal relationship between partners.

Future plans

Future plans for the companies interviewed vary but one commonality is the expectation of growth in sales. Related to that a number of companies are going to develop their distribution channels, increase license agreements, and create closer relationships with distributors and agents.

Most of the companies consider the U.S. an interesting market area. The U.S. is seen as a location with a good global market visibility and market potential in the future. Three companies see Europe – Italy, Germany, and the UK – as their most important target market. One company is going to establish distribution channels in Europe, and then

channels can be established elsewhere. The aim of this operation is to outsource the component purchasing and keep the product development, planning, and assembling in Finland.

Due to the lack of opportunities to take care of marketing, one company sees that they will be part of the global/international company within 5 years. The objective of another company is to be a European enterprise in the future but keep manufacturing in Finland because of the raw material and skills.

One company has technology alliances under negotiation in order to take advantage of a partner's expertise. Here a partner should offer interesting technological expertise/solutions and not just good marketing skills. The plan of another company is to conduct clinical studies abroad and also establish their own foreign units for clinical study. This would broaden the base of the study and help to enlarge the cooperation network.

A problem that was mentioned is encountered with participation in studies conducted by universities and research institutes, where outside investors, making purely investment decisions, guide internationalization. Also, there is the fear that investors force the company to become part of a larger company in order to get their investment back. This, however, is offset by the fact that being part of a larger company makes the position in the market quite strong.

5 Discussion

The results of the study show that the biotechnology and ICT industries differ substantially from one another when it comes to SMEs' (small and medium sized enterprises) the development stage, nature of operations, and ways of internationalization. The biotechnology industry is still in the early development stage in Finland compared to the ICT cluster. Big companies are missing, with the exception of the major medical companies. The biotechnology industry emerged in Finland in the 1990s, numbering today approximately 100 companies. In comparison, the roots of the ICT cluster are deep in history, and the cluster today includes several hundred companies, having a turnover ten-fold that of the biotechnology industry.

The operational focus of biotechnology companies is primarily on R&D, whereas in the ICT cluster the focus is much more on the customer. Also, due to tight product safety requirements and technological

complexity, R&D projects in biotechnology are substantially longer lasting than in ICT.

Our results, based on interviews, indicate that the ICT companies are driven by international business opportunities, which are characterized by close customer relationships, a fast response to changes in business environment, and partnerships with other companies. The operational focus seems to be shifting from product development to customer relationships and business from product orientation to customer orientation. In this context, the reasons and motives for international cooperation differ from traditional ones.

The interviewed managers of ICT companies emphasize the importance of developing business opportunities and the timing of international operations. Management realizes a business opportunity, selects a proper strategy, and manages in one or more ways to finance the costly realization of the strategy. In the case of small companies, the venture capital investors most probably play an important role. This was not asked in the study, but it is an interesting topic for further studies.

Among the ICT study group, the major motives for companies to establish foreign subsidiaries in the UK and the U.S are close cooperation with key customers and networking with strategically important partners. Availability of technology, know-how, and skilled people are considered important criteria in deciding the location of a subsidiary. Market attractiveness is still considered important but not in the same context as traditional internationalization theories assume. Cooperation with local universities existed but not as much as expected.

A problem that was mentioned is encountered with participation in studies conducted by universities and research institutes, where outside investors, making purely investment decisions, guide internationalization. Also, there is the fear that investors force the company to become part of a larger company in order to get their investment back. This, however, is offset by the fact that being part of a larger company makes the position in the market quite strong.

Among biotechnology companies the international connections are related to research and product development. Cooperation with international universities in research and development is typical of biotechnology companies. Supplementing the missing competence is important but not the only reason for international cooperation. International cooperation with the right partners is viewed as adding to credibility and helping to build a favorable ground for business activities.

Finland is considered a good environment for the biotechnology business, and the smoothness of international cooperation reduces the need for foreign subsidiaries. The companies do not find international cooperation difficult. The people in business very often have an academic background, and they are used to working in international society. International cooperation in the academic community has long traditions, and the values, rules, and methods are international. In Finland, the biotechnology companies are still rather small and financed mainly by outside investors. Earning models and business plans are still under development.

In sum, the internationalization in these two modern industries differs from the traditional product export driven industries. It also shows that the internationalization of ICT companies and biotechnology companies differ from each other. This subject is not yet studied and understood well enough by the Finnish innovation system and requires further work. The needs of very fast growing high technology companies should have high priority when considering new services in the innovation system.

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CHAPTER VIII

Location of Headquarters, Internationalization of Business and Taxation[1]

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&

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[1] This article is heavily based on Ali-Yrkkö & Ylä-Anttila (2002).

***ABSTRACT**: This article looks at the internationalization of business, factors affecting the location of corporate headquarters, and the role of taxation. Most of the large Finnish companies have rapidly increased their foreign direct investment and globalized their business during the last 10 – 15 years. The main factors explaining the foreign investment are the size of the market and the income level of the host country. Taxation affects too, but is not necessarily among the most important criteria. Firms' locational decisions are an outcome of the interaction and combination of several factors. Both in Finland and Sweden relocations of headquarters have, in most cases, taken place as a consequence of a merger or an acquisition. However, there are a few cases when the relocation decision has been made independently of M&A. Taxation might play an important role as a location factor when two equal companies merge.*

***KEY WORDS:** Headquarters, internationalization of firms, relocation, taxation*

***TIIVISTELMÄ**: Artikkelissa tarkastellaan pääkonttorien sijaintia, yritysten kansainvälistymistä ja verotusta. Viimeisten parinkymmenen vuoden aikana etenkin suuryritykset ovat jatkaneet nopeaa kansainvälistymistään. Markkinoiden koko ja maan kehitystaso ovat tutkimuksen mukaan keskeisimpiä ulkomaisten investointien selittäjiä. Myös verotuksella on rooli ulkomaisten investointien määräytymisessä, mutta se ei ole investointien ensisijainen päätöskriteeri. Sekä Suomessa että Ruotsissa pääkonttorien muutto ulkomaille on tapahtunut lähes kokonaan yrityskauppojen ja -fuusioiden yhteydessä. Verotuksella voi olla keskeinen merkitys erityisesti silloin kuin kaksi tasavahvaa yritystä yhdistyy.*

***AVAINSANAT**: Pääkonttori, yritysten kansainvälistyminen, siirtyminen, verotus*

1 Introduction

While in the 1970s the internationalization of Finnish firms included mainly exports, the 1980s saw the rapid internationalization of production, and, finally, during the latter part of the 1990s also ownership internationalized substantially. The comprehensive internationalization of companies has raised the question of the location of firms' different functions and the factors affecting locational decisions.

The potential relocation of the headquarters has recently given rise to a debate in many smaller European countries, including Finland and Sweden. Both these Nordic economies have fairly large multinational companies (MNCs) with a high foreign ownership share and a multitude of overseas activities. These MNCs are the most probable candidates to relocate their headquarters (HQs).

However, little is known about the factors affecting the location of HQs. The significance of taxation is particularly of interest from a policy point of view. In this article, we look at the internationalization of firms, focusing particularly on the role of taxation and the relocation of headquarters. The research questions include: To what extent have Finnish companies internationalized their headquarters functions? What factors affect the decision regarding the location of headquarters and FDIs? How does taxation affect the location decisions?

2 Role and tasks of headquarters

2.1 Why might the location of the headquarters be important?

Headquarter (HQ) location is a relatively novel aspect of firms' internationalization. Previously it was taken as given that production and HQ are located close to each other.[2] In recent years, however, HQs have become increasingly mobile and the link between production and HQ activities has become less straightforward.

At the same time, HQ activities have become more knowledge-intensive and, hence, more strategic for the surrounding society. Like

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[2] See Braunerhjelm (2004).

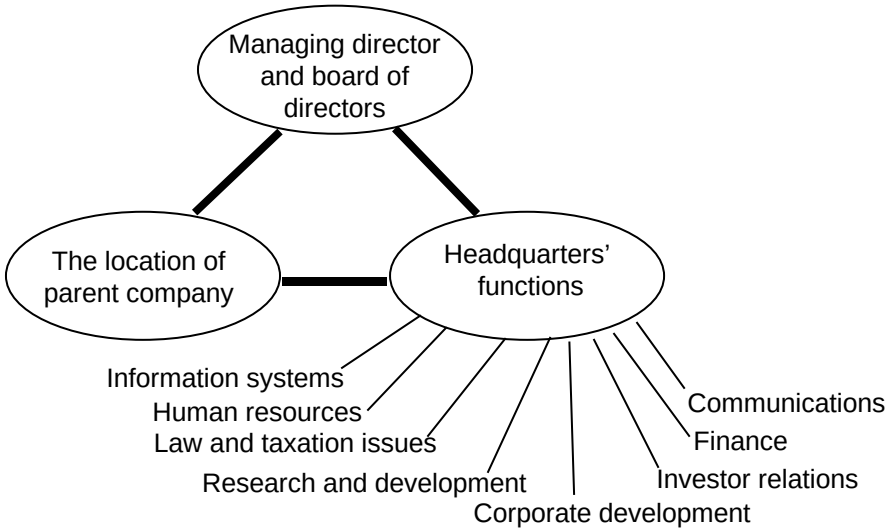
other knowledge-intensive activities, HQs are assumed to have significant positive spillovers to the rest of the economy through interaction with other advanced sectors and activities. As summarized by Braunerhjelm (2004), key competences are developed within, and the most qualified management is attracted by corporate head offices making them important nodes in a knowledge-driven, dynamic economy.

The location of HQs is often interpreted as signaling to other firms that a region or a country has locational advantages which might be enjoyed also by other knowledge-intensive activities, such as R&D. Thus, they have a potentially huge symbolic value, which explains why the issue has gained increasing attention in policy making.

2.2 What are headquarters?

A firm's HQ as such is relatively easy to define, but the location of it is not. Is it the legal domicile of the parent company, the place where the top management is located or the location of the strategic HQ functions of the corporation? Organizational structures of corporations vary across countries and industries. Sometimes HQ activities are centralized at group level, sometimes decentralized to regional HQs located outside the home country.

Figure 2.1. The definition of headquarters



Source: adapted from Braunerhjelm & Lindqvist (1999).

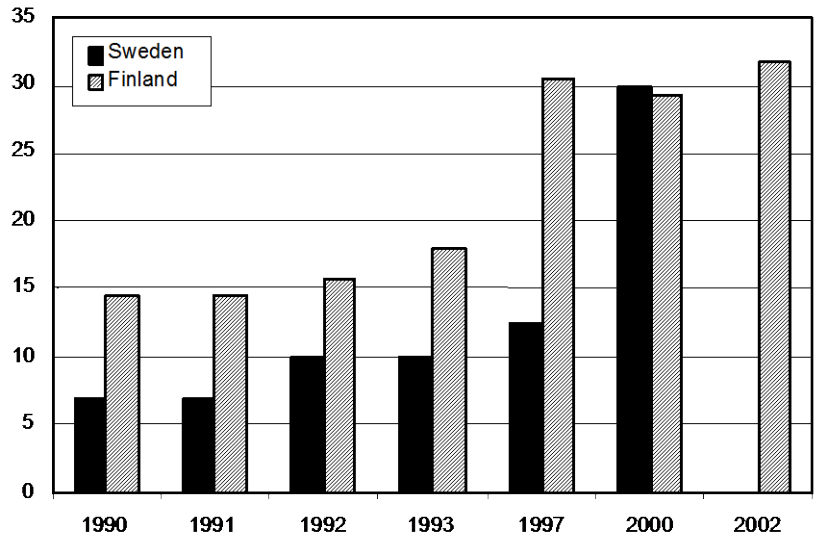
The basic description of HQs is given in Figure 2.1. This type of definition has been used while compiling the survey data we use below. HQ consists of 1) top management and board of directors, 2) domicile of the parent company (legal registration), and 3) various HQ functions that are strategic for the corporation.

3 The internationalization of corporate headquarters

3.1 Location of headquarters

Figure 3.1 gives the basic information of relocations of Finnish corporate headquarters since the early 1990s. As many as one third of the 250 largest firms have their HQ abroad. The biggest increase was seen in the late 1990s when the cross-border mergers and acquisitions (M&As) increased both globally and in Finland.

Figure 3.1 The share of Finland and Sweden's 250 largest firms with their corporate headquarters abroad



Indeed, the relocation of headquarters has, in almost all cases, taken place as a consequence of an M&A. The existing headquarters of a foreign company that acquires a Finnish firm most often determines the location of the newly formed company, that is, the HQ. However, there are some cases in which the relocation decision has been made independently of a merger or an acquisition. In these cases, the firms have been small or medium-sized and have typically operated in the high-tech industry. Small IT companies, in particular, tend to locate their head offices abroad, just to be closer to their markets and sources of international venture funding. For example, software companies Solid and MoreMagic (specialized in mobile paying) have relocated their headquarters to the US. In 2002 Microcell[3] – focusing on contract R&D and production design of mobile phones – moved its headquarters to Switzerland. Also the biotechnology firm Bionx Implants' headquarters are now located in the United States.

Table 3.1 gives a list of the most significant HQ relocations in Finland. In all these cases the relocation has taken place as the result of an M&A.

Table 3.1 The largest originally Finnish firms whose corporate headquarters have been relocated abroad during the 1990s and early 2000

Firm	Mode	Where to	Firm	Mode	Where to
Ahlströmin leijukerroskattilat	Acquisition	US	Servi Systems	Acquisition	Denmark
Nokian Paperi	Acquisition	US	Sinebrychoff	Acquisition	Denmark
Kyrel	Acquisition	US	Cultor	Acquisition	Denmark
Metsä-Serla Chemicals	Acquisition	US	Nokian Kaapeli	Acquisition	Holland
Ojala-yhtiöt	Acquisition	US	Leaf	Acquisition	Holland
Timberjack	Acquisition	US	Ahlström Pumps	Acquisition	Switzerland
Martis	Acquisition	US	Nokia-Maillefer	Acquisition	Switzerland
Sonera	Acquisition	Sweden	Hartwall	Acquisition	UK
Enviset	Acquisition	Sweden, US	Arctia (hotels)	Acquisition	UK
Salcomp	Acquisition	Sweden	LK Products	Acquisition	UK
Tamrock	Acquisition	Sweden	Asko Kodinkone	Acquisition	Italy
Assa-Abloy	Merger	Sweden	Andritz-Ahlström	Acquisition	Austria
STV	Acquisition	Sweden	Aker Finnyards	Acquisition	Norway
Leiras	Acquisition	Germany	Polarkesti	Acquisition	France
Marli	Acquisition	Germany	Transtech	Acquisition	Spain
Huolintakeskus	Acquisition	Germany	Lohja Rudus	Acquisition	Ireland

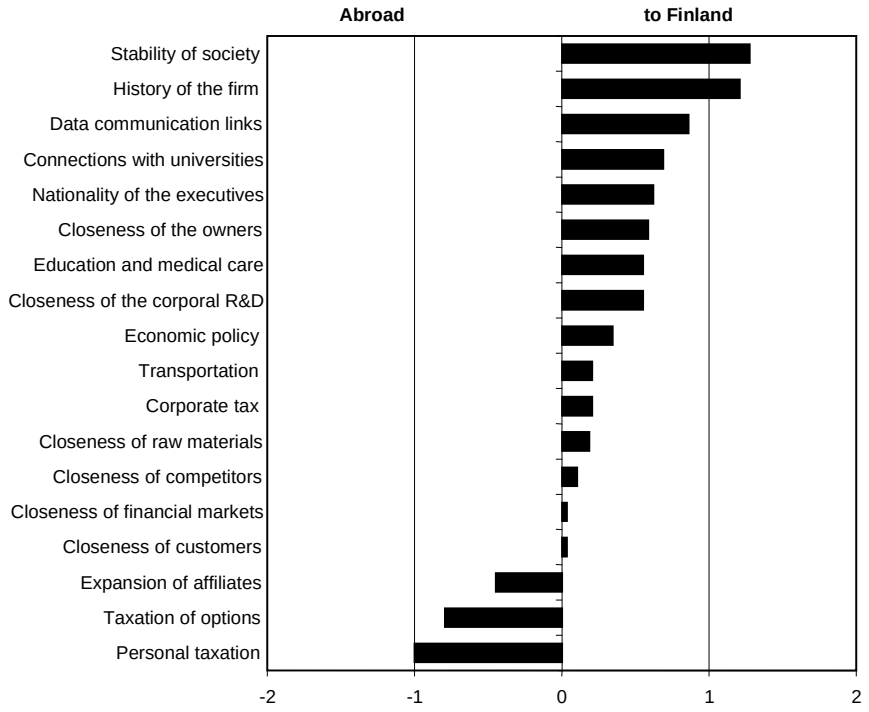
[3] In 2003, Microcell was acquired by Flextronics.

3.2 Factors affecting the location of corporate headquarters

The previous section showed that only a few Finnish companies have relocated their headquarters abroad without an M&A. Although the relocation of entire headquarters independent of an M&A has been a rare event, various headquarters functions have internationalized quite rapidly. Irrespective of the mode of internationalization of the HQ – be it M&A, internationalization of certain HQ functions, or independent relocation of the entire HQ – the factors that affect the location are to some extent similar.

Our next step is to look at what factors have affected the location decision of corporate headquarters. First, we use data from a recent survey. In the survey, HQs were defined broadly to embrace functions described above.

Figure 3.2 Factors favoring the location of headquarters in Finland and abroad



Source of statistics: Confederation of Finnish Industry and Employers. Values scaled between -2 and 2. 2 are strongly in favor of locating in Finland, 1 is somewhat in favor of locating in Finland, 0 is neutral, -1 is somewhat in favor of locating abroad and -2 is strongly in favor of locating abroad.

The survey was made in 2002 by the Confederation of Finnish Industry and Employers (TT) addressing the main factors that affect the location of headquarters. The results, presented in Figure 3.2, show that firm's history, social stability, and data communication links favored locating the headquarters in Finland.

Obviously, the country's high income tax rate and heavy taxation of personal stock options, as well as promoting growth in subsidiaries, favored relocation of HQs abroad. There were clear differences in responses depending on how globalized the firm in question was, with more globalized firms perceiving more advantages in locating their headquarters abroad.

Braunerhjelm (2004), using survey data from Sweden, comes to similar conclusions. The most important factors affecting HQ location include: proximity to efficient communications, attractive regulatory regimes, individual taxes, and proximity to customers. Braunerhjelm's study (2004) shows also that a great majority of Swedish HQ relocations are outcomes of M&As, just as in the Finnish case.

Factors affecting decisions on headquarter location vary across industries. Firms in industries that need new capital, in particular, may want to be located near main financial markets, such as New York and London, where many analysts, investment banks, venture capital firms, and other financial institutions operate.[4] This may help them become better known among investors and therefore increase their possibilities of raising new capital. Also the significance of the HQ proximity to R&D varies across sectors. Technology-intensive and product-oriented firms perceive co-location of R&D and HQ activities more important than other types of firms (Braunerhjelm 2004).

Problems in recruiting personnel may also have an effect on the location of corporate headquarters. Large multinational firms, in particular, operating in a small country may find it difficult to persuade personnel to move to remote peripheral areas. Industrial clusters or agglomerations with a dense labor market of skilled people are obviously more attractive to high-tech firms and their HQs.

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[4] Cf. Braunerhjelm (2004).

4 Factors affecting the location decision of FDI

As indicated above, HQs are relocated mainly as a consequence of mergers and acquisitions, that is the main mode of FDIs. Hence, it is justified to analyze in more detail the determinants of FDI in general, and the significance of taxation in particular. The survey results from both Sweden and Finland indicated that taxes (especially personal taxes) are regarded as one of the most important determinants of HQ location.

We use a standard empirical FDI model to analyze the impact of taxation on investment flows. The model aims at explaining how aggregate FDI flows are distributed across countries. We follow the approach of Gorter and Parkhan (2000) and replicate their study using a new data set (see Ali-Yrkkö & Ylä-Anttila 2001).

4.1 The role of corporate taxation in foreign direct investment

The basic regression model is as follows:

$$\frac{FDI_{ij}}{FDI_j} = \alpha_j + \beta_j s_i (t_i - \bar{t}) + \gamma_j \ln P_i + \delta_j \ln \frac{GDP_i}{P_i} + u_{ij,}$$

i=1,..,14, j=1,…,8. (1)

where FDI_{ij} denotes the outward investment stock in country *i* of country *j*. and FDI_j the total outward FDI stock of country *j* in the EU area. Moreover, α_j is a country specific constant, β_j the tax parameter to be estimated, s_i the population share of country *i* of the population of EU, t_i country's *i* corporate tax rate, $\bar{t}$ the EU average corporate income tax rate, γ_j the population parameter to be estimated, P_i population of country *i* in millions, GDP_i the gross domestic product of country *i* at purchasing power parity of 1990, and u_{ij} an error term

Our special interest is focused on the coefficient β_j which can be interpreted as s semi-elasticity measuring the response of country *j* to a change in the effective corporate tax of an average country that is being

invested in. Thus, it describes the percentage change in the FDI position of country *j* in an average country that is being invested in if the latter changes its corporate income tax rate such that the difference between its rate and the EU mean changes by one percentage point. The main results are reported in Table 4.1.

Table 4.1 The impact of corporate tax rate change on FDI*

Country	Semi-elasticity This study, period 1997-98		Semi-elasticity Gorter & Parikh (2000), Period 1995-96	
	OLS	SURE	OLS	SURE
Portugal	**-8.89** **(-3.29)**	**-10.35** **(-4.4)**	**-11.00** **(4.01)**	**-14.3** **(8.2)**
The Netherlands	**-5.94** **(-2.93)**	**-6.93** **(-11.7)**	**-4.65** **(2.41)**	**-6.6** **(3.8)**
France	**-6.52** **(-3.93)**	**-5.92** **(-12.63)**	**-5.47** **(2.78)**	**-4.6** **(3.7)**
Finland	-1.69 (0.48)	0.75 (0.52)	-2.41 (1.12)	**-4.3** **(3.4)**
Germany	**-4.17** **(-2.61)**	**-3.89** **(-6.6)**	**-3.96** **(2.33)**	**-2.3** **(2.2)**
Austria	1.94 (0.83)	**3.04** **(1.65)**	4.28 (1.57)	**-1.0** **(2.4)**
Denmark			**-5.09** **(1.98)**	-1.5 (1.4)
UK	-6.75 (-1.36)	Zero	-5.51 (1.22)	Zero
Sweden		**1.67** **(2.37)**		
All countries (a separate regression)	**-4.52** **(-4.57)**			

t-statistics in parentheses. For estimation details, see Ali-Yrkkö & Ylä-Anttila 2001. In the SURE estimation, the tax elasticity of the UK is restricted to zero, due to its tax credit status.

According to OLS estimations, our estimates vary from not significantly different from zero for Finland, Austria, and the UK, to -9 for Portugal. Similarly, our SURE estimates range from not significantly different from zero for Finland to -10 for Portugal. The SURE estimates for Sweden and Austria are positive and statistically significant, suggesting that the higher the corporate tax rate in target country *i*, the more FDIs the country *i* receives from Sweden and Austria.

4.2 The impact of personal taxation

In addition to the corporate tax rate, personal tax rate may also affect FDIs. To take that into account, we apply model (1) by replacing the corporate tax rate variable by tax wedge on labor income. The model we estimate is as follows:

$$\frac{FDI_{ij}}{FDI_j} = \alpha_j + \beta_j s_i (tw_i - \overline{tw}) + \gamma_j \ln P_i + \delta_j \ln \frac{GDP_i}{P_i} + u_{ij,}$$

i=1,..,14, j=1,…,8. (2)

The estimation results (OLS) are reported in Table 4.2.

Table 4.2 Tax wedge on labor income and FDI (OLS), estimation results

	Coefficient	t-statistics
Portugal	-5.14	-1.61
The Netherlands	**-3.74***	**-1.70**
France	**-5.87*****	**-2.80**
Finland	1.18	0.34
Germany	**-2.98***	**-1.86**
Austria	0.014	0.01
UK	-8.39	-1.12
Sweden	-2.98	-1.55
All countries (a separate regression)	**-3.24*****	**3.12**

* - Statistically significant at 10% level, *** - significant at 1% level.

Note: see Ali-Yrkkö & Ylä-Anttila (2001) for estimation details. More detailed information on estimation is given in the appendix. The coefficients are semi elasticities , that is, estimates of relative changes in FDI when taxes change by one percentage point. Statistically significant coefficients are in bold.

Again, results are different for different countries. In Germany, France, and the Netherlands (and for the whole group of countries) we receive statistically significant coefficients, but for the rest of the countries not. The impact of the tax wedge remains a bit inconclusive. Personal taxes seem to matter, but not in all cases.

5 Conclusion

5.1 Why does the location of corporate headquarters matter?

The internationalization of headquarters and their possible relocation to another country raises the question of how does this affect the Finnish economy. Because the definition of headquarters is far from unambiguous, the consequences of relocation is considered from the perspective of the parent company's actual physical location, as well as from the perspective of the locations of headquarters operations and top executives.

The location of the parent company of a group (i.e. legal registration) determines where the corporate taxes of the parent company are paid. If the parent company of such a group moves to another country, the country of departure will lose the parent company's future corporate taxes. Relocation of the company headquarters may also have an impact on the firm and country's image. Especially in a case of a small country, a large multinational corporation may help the country to be better known. For example, Nokia's success has increased Finland's reputation as a high-tech country.

Due to knowledge spillovers related to HQs, the parent company moving abroad may generate multiplicative effects in the long run. An extensive move of HQs abroad may serve as a signal of competitiveness of the country to other firms. This may lead to further relocations of HQs and other knowledge-intensive activities. It may also negatively affect the inward FDI.

5.2 FDI and taxation

Taxes have a bearing on FDI, but it is not necessarily among the most important criteria. Corporate taxation of the target country had a statistically significant impact in the case of, for example, Portugal, the Netherlands, France, and Germany. In the case of Finland, corporate taxes were not a statistically significant determinant of FDI. Personal income tax (tax wedge, that is, taxes on wages and salaries, social security contributions, etc.) did not have a statistically significant impact either.

To summarize, firms' location decisions are an outcome of the interaction and combination of several factors and taxation is probably tak-

en into account as a factor that has a bearing if other locational factors are equal.

5.3 Future foresights

Taken that relocation of corporate headquarters abroad has almost exclusively been part of a merger or an acquisition, it is likely that this development continues also in the future. In terms of M&As, the location of the corporate headquarters and parent company is particularly interesting when two equal firms merge. In this case corporation taxation might matter. Tax and competition among countries and regions continues.

It is possible that in the next five years some of the largest Finnish firms will relocate their headquarters abroad without a merger or an acquisition. Already now the globalization of large firms extends to sales, production, R&D, and ownership. As part of this globalization trend and the decreasing importance of Finland as a factor and product market, some HQs and top executives may relocate themselves abroad. Most probable locations are Great Britain and the US. Relocation of corporate headquarters abroad may also be a viable choice for some small or medium-sized high-tech companies, simply because of better access to the international venture capital market and the market for highly skilled and specialized expertise.

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CHAPTER IX

International Transfers of Knowledge, M&As and Ownership

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&

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ABSTRACT: *The goal of this paper is to provide an overview of the relationship between mergers and acquisitions and knowledge transfers. We describe the growth of M&A activity in Finland and consider the role of foreign acquirers in the Finnish M&A market. The results show that the share of cross-border targets increased from 10% to 24% between 1989 and 2001. Due to acquisitions, foreign companies have acquired some 1500 patents from Finland. Most of these patents have been acquired in technology fields related to paper-making, earth/rock drilling, and measuring/ testing.*

KEY WORDS: *Mergers, acquisitions, patents, takeovers, M&A, FDI, technology, transfers*

TIIVISTELMÄ: *Tämän artikkelin tarkoitus on kuvata yrityskauppojen/ yritysfuusioiden ja osaamisen siirtymisen yhteyttä. Artikkelissa tarkastellaan yrityskauppojen määrän muutosta Suomessa ja ulkomaisten ostajien roolia Suomen yrityskauppamarkkinoilla. Tulosten mukaan ulkomaisten ostamien yritysten määrä on Suomessa noussut. Kun vuonna 1989 näiden yrityskauppojen osuus oli vain 10 prosenttia Suomessa tehdyistä yrityskaupoista, niin vuonna 2001 niiden osuus oli noussut jo 24 prosenttiin. Yrityskauppojen seurauksena ulkomaiset yritykset ovat saaneet noin 1500 patenttia. Suurin osa näistä patenteista on ollut teknologia-aloilla, jotka ovat liittyneet paperinvalmistukseen, kallion/kiven murskaukseen ja testaukseen/ mittaukseen.*

AVAINSANAT*: Fuusio, yrityskauppa, patentti, suora sijoitus, ulkomainen investointi, teknologian siirto*

1 Introduction

The empirical evidence indicates that technology-driven FDIs have increased recently (see, e.g., Jungmittag, Meyer-Krahmer and Reger 1999). While the dominant purpose of overseas technology development is to adapt products and production processes to suit local market conditions (Patel and Vega, 1999), it seems that multinational companies increasingly invest in foreign R&D in order to access technology or knowledge held by firms and people in a given country (Neven and Siotis 1996; Florida 1997).

Recent statistics show that mergers and acquisitions (M&As) have accounted for the majority of foreign direct investment (UNCTAD 1998). Companies undertake cross-border M&As not only to gain market share and reduce costs but also as a faster way to acquire complex forms of technology or knowledge than through in-house R&D and their own experience. Moreover, M&As provide companies with a potential route for exploiting synergistic benefits between their own knowledge assets and those of already established firms.

While technology-driven cross-border M&As possibly have positive effects (e.g., knowledge spillovers) on the host country, from the viewpoint of the domestic economy it is not clear that technology sourcing by foreign firms is always desirable. In small open economies with a limited amount of resources, of potential concern is when the most innovative firms with the best growth potential are acquired by foreign companies. This creates fear that the benefits of future growth do not necessarily materialise for the host-country economy.

The aim of this study is to empirically examine knowledge transfers through M&As between companies. Utilising M&A and patent data, we seek to shed light on the following questions:

- What role have foreign acquirers played in the Finnish M&A market?
- What kind of technology or knowledge have foreign companies acquired through M&As?
- Which patent classes have been the most attractive?

It should be emphasised that this study is meant to be first and mainly a descriptive account of the relationship between M&As and international technology transfer.

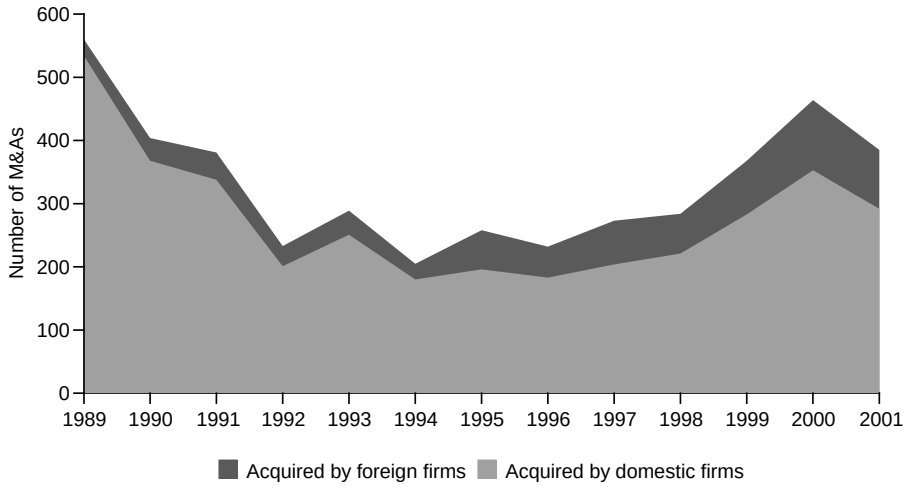
The remainder of the paper is structured as follows. Section 2 describes the pattern of Finnish merger and acquisition activity. Section 3 presents the kinds of technology, as measured by patents, foreign companies have acquired from Finland. Finally, Section 4 summarises the study and provides concluding remarks.

2 Recent patterns in Finnish merger and acquisition activity

In this section, we describe the patterns of Finnish M&A activity since the late 1980s, focusing on Finnish targets. Our M&A data[1] were originally collected from the Finnish business newspaper Talouselämä, with an aim to report all those M&As in Finland where net sales of the target company exceeded EUR 0.5 million. We focus on Finnish target companies by excluding all targets that are located abroad.

Figure 2.1 displays the development of the Finnish M&A market during 1989-2001. The figure shows that the volume of M&As closely follows macroeconomic cycles.

Figure 2.1 The number of M&As by year in 1989-2001



[1] The M&A database is complied by the Labour Institute for Economic Research (see Lehto & Böckerman 2004).

The figure reveals that, on average, 17% of the targets have been acquired by foreign firms. Looking at the data by year shows that the role of cross-border M&As has changed both in absolute and relative terms. The number of cross-border M&As have increased from 30-40 per year in the early 1990s to 90-100 per year in 2000 and 2001. A similar trend can also be observed in relative terms. The share of cross-border M&As increased steadily during the period examined, reaching a level as high as 24% of total M&A activity in 2001.

Table 2.1 depicts the geographical distribution of M&As. Most M&As have taken place in southern and western Finland. This is not surprising since the bulk of firms are located in these regions.

Table 2.1 The regional distribution of M&As in 1989-2001

Region	The number of M&As	The ratio of M&As to the number of business units (per mille)	The share acquired by domestic firms	The share acquired by foreign firms
South	2,253	21	79%	21%
West	1,393	15	87%	13%
East	366	15	92%	8%
North	289	11	86%	14%
Total	4,301	17	83%	17%

Note: The table includes only the M&As whose region of occurrence is known. The regions are based on the provinces (läänit); the Oulu and Lappi provinces have been joined (North) as well as Ahvenanmaa and Länsi-Suomi (West).

The M&As seem to be more evenly distributed when taking into account the number of potential targets in each region (see column 3 in Table 2.1).[2] The proportion of cross-border M&As is the highest in southern Finland and, somewhat surprisingly, the second highest in the north.

To obtain a more accurate picture of the targets acquired by foreign firms, in Table 2.2 we summarise cross-border M&As by country of origin. As the table reveals, Swedish firms have shown the largest interest in acquiring firms in Finland followed by US, Danish and UK firms. Nordic countries have accounted for roughly half of the cross-border acquisitions; the share increased from 47% in the first half of the observation period to 52% in the latter half. However, the table shows that the share of different countries has maintained surprisingly stable during 1989-2001.

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[2] We use as a proxy of potential targets the number of business units in the region in 2001.

Table 2.2 The number of cross-border M&As by country

	1989-2001		1989-1994		1995-2001	
	Number	Share	Number	Share	Number	Share
Sweden	261	36%	71	36%	190	36%
USA	92	13%	26	13%	66	12%
Denmark	62	8%	12	6%	50	9%
UK	59	8%	10	5%	49	9%
Norway	46	6%	10	5%	36	7%
Switzerland	35	5%	15	8%	20	4%
Germany	31	4%	5	3%	26	5%
Netherlands	20	3%	2	1%	18	3%
Belgium	10	1%	4	2%	6	1%
France	9	1%	4	2%	5	1%

3 Technology transfer through M&As

We combine two datasets in order to analyse international technology transfers. To measure the technology stock of firms, a patent dataset (the National Board of Patents and Registers) is used. The M&A data described in Section 2 have been merged with this patent data.[3] Since our main focus is on international technology transfer, we exclude targets acquired by domestic firms in the discussion in this section.

To shed light on technology areas that have attracted foreign companies, Table 3.1 and Table 3.2 present the volume of Finnish target firms' patents by patent classification. Foreign firms acquired about 1500 patents in Finland via M&As during 1989-2001, representing roughly one percent of the total patent stock during that time period.

Table 3.1 summarises the number of acquired patens by section level. Most patents have been acquired from technology areas related to paper-making and other process-industry technologies (Sections D and B). To obtain a more accurate picture of the acquired technologies, Table 3.2 depicts in more detail the technology areas (IPC 3-digit level) from which foreign firms have acquired the largest number of patents. The three largest areas have been technologies related to paper-making, earth/rock drilling, and measuring/testing.

[3] As patent and M&As datasets do not include a common firm code the merging of data was primarily based on company names and their modifications.

Table 3.1 The number and share of acquired patents by patent classification in 1989-2001

International patent classification, section level	The number of patents acquired by foreign firms due to M&As	Share of acquired patents of the total number of patents in the class in 1989-2001
Section A - Human Necessities	103	0.5%
Section B - Performing Operations; Transporting	337	1.1%
Section C - Chemistry; Metallurgy	68	0.2%
Section D - Textiles; Paper	351	3.8%
Section E - Fixed Constructions	195	1.8%
Section F - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	158	1.2%
Section G - Physics	163	1.5%
Section H - Electricity	152	1.0%
Total	1,527	1.0%

Table 3.2 Ten largest patent classes of acquired patents by the IPC three-digit level in 1989-2001

International patent classification, 3-digit level	The number of patents acquired by foreign firms due to M&As	Share of acquired patents of the total number of patents in the class in 1989-2001
D21 - Paper-Making; Production of Cellulose	346	4.6%
E21 - Earth/Rock Drilling; Mining	149	16.4%
G01 - Measuring; Testing	144	2.6%
B01 - Physical/Chemical Processes/Apparatus	129	4.1%
H01 - Basic Electric Elements	110	3.3%
F16 - Engineering Elements/Units	73	1.7%
A61 - Medical/Veterinary Science	45	0.7%
B65 - Conveying; Packing; Storing	42	0.5%
B63 - Ships/Other Waterborne Vessels	36	2.1%
E04 - Building	31	0.7%

Our next step is to analyse whether firms of different origins have been interested in different technology areas. To do that, we cross-tabulate data on acquired patents by the nationality of the acquirer and patent class. Breaking the data by the nationality of acquirer companies in Table 3.3 reveals that the three largest countries of origin have been Sweden, the UK and Austria.

It seems that different technology areas have been attractive to different countries. For instance, while Swedish companies have acquired companies with patents related to earth/rock drilling and paper-making, UK and US companies have been interested in companies with patents

Table 3.3 Acquired patents by the nationality of acquirers in 1989-2001

Nationality of acquirer	The number of acquired patents	The patent class with the greatest number of acquired patents (IPC 3-digit)	The patent class with the second greatest number of acquired patents (IPC 3-digit)
Sweden	525	E21 - Earth/Rock Drilling	D21 - Paper-Making; Prod. of Cellulose
UK	288	H01 - Basic Electric Elements	G01 - Measuring; Testing
Austria	257	D21 - Paper-Making; Prod. of Cellulose	B01 - Physical/Chem. Processes/Appar.
Norway	122	B63 - Ships/Other Waterborne Vessels	D21 - Paper-Making; Prod. of Cellulose
USA	110	G01 - Measuring; Testing	H01 - Basic Electric Elements
Denmark	99	A23 - Food/Foodstuffs	H01 - Basic Electric Elements
Germany	54	A61 - Medical/Veterinary Science	C07 - Organic Chemistry
Switzerland	26	F24 - Heating; Ranges; Ventilating	G01 - Measuring; Testing
France	24	G07 - Checking-Devices	A47 - Furniture; Kitchen Eq.; Cleaning
Indonesia	4	D01 - Threads/Fibres	C08 - Org. Macromolecular Compounds

Table 3.4 Cross-border targets with the greatest number of patents in 1989-2001

Target company	The number of patents in the acquisition year	Largest patent class (IPC 3-digit)	Acquisition year	Acquirer's nationality
Tamrock	421	E21 - Earth/Rock Drilling; Mining	1997	Sweden
Ahlström Machinery	134	D21 - Paper-Making; Production of Cellulose	2000	Austria
Labsystems	126	G01 - Measuring; Testing	1993	UK
LK Products	95	H01 - Basic Electric Elements	1998	UK
Safematic	67	F16 - Engineering Elements/Units	1998	UK
Tampella Power	49	D21 - Paper-Making; Production of Cellulose	1996	Norway
Cultor	45	A23 - Food/Foodstuffs	1999	Denmark
Leiras	45	A61 - Medical or Veterinary Science	1996	Germany
Masa-Yards	40	B63 - Ships or Other Waterborne Vessels	1990	Norway
Wallac	39	G01 - Measuring; Testing	1993	USA

in basic electric elements and measuring/testing classes. However, it is possible that these statistics are driven by only a few targets with a large number of patents. Therefore, Table 3.4 lists the top ten target companies of cross-border M&As which have had the largest number of patents in the year of acquisition.

In term of the number of patents, Tamrock has been the most "innovative" cross-border target company. The company had more than

420 patents in Finland the year it was acquired. Although Tamrock's patent portfolio spread across several technology areas, this single deal explains the high ranking of the earth/rock drilling technology area in Table 3.3. In addition to Tamrock, other target companies with a large patent portfolio have been Ahlström Machinery, Labsystems and LK Products.

4 Conclusions and discussion

In this study, we have examined international technology transfer through mergers and acquisitions. Our starting point was to examine the extent to which Finnish companies have become targets of cross-border acquirers. During the past 10 years, the share of foreign acquired targets has increased drastically. Currently, approximately one fourth of all targets in Finland are acquired by foreign companies. Most of these targets have been located in the southern part of Finland. This result holds even after controlling for the total stock of business units by area. Breaking the data down by the nationality of acquirer revealed that the most active acquirers have been Swedish and US companies.

In order to get a deeper understanding of international technology transfers through M&As, we analysed the patent stock of target firms. During 1989-2001, foreign firms acquired more than 1500 patents, representing roughly one percent of the total patent stock during that period. Most of the patents have been acquired in technology areas related to paper-making and other process-industry technologies. While the second most attractive technology area seems to be earth/rock drilling, a more detailed analysis revealed that this ranking was almost totally explained by a single acquisition.

To our knowledge, no existing research exists using patent and M&A datasets to examine what kinds of technologies have attracted foreign companies. An interesting area for future research would be to examine econometrically the impact of firm's technology knowledge stock on the likelihood of becoming a target for acquisition. Another interesting field would be to extend our study by examining the quality or value of patents. Acquirers might be more interested in obtaining specific patents or knowledge rather than merely a large amount of them.

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Appendix 1.

The number of M&As by year in 1989-2001

Year	All M&As	Acquired by domestic firms		Acquired by foreign firms	
		Number	Share	Number	Share
1989	560	534	95%	26	5%
1990	404	368	91%	36	9%
1991	381	338	89%	43	11%
1992	233	201	86%	32	14%
1993	289	251	87%	38	13%
1994	205	180	88%	25	12%
1995	258	196	76%	62	24%
1996	232	183	79%	49	21%
1997	273	204	75%	69	25%
1998	284	221	78%	63	22%
1999	368	283	77%	85	23%
2000	464	353	76%	111	24%
2001	385	292	76%	93	24%
Total	4,336	3,604	83%	732	17%