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ETLA

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Keskusteluaiheita Discussion papers

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EUROPEAN INTEGRATION; SECTORAL
STUDY 2: THE DATA PROCESSING
EQUIPMENT INDUSTRY

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ABSTRACT: This paper analyzes the Finnish data processing equipment industry in an international context in relation to the EC integration process and presents future scenarios for the industry.

The moves towards a large single market have stimulated structural changes in European data processing industries. Mergers, acquisitions, cooperative agreements, and European-wide rationalization have escalated in recent years as companies prepare to take advantage of economies of scale and opportunities presented by specialization. The Commission's measures aiming for standardization and liberalization of public procurement policies exemplify the intensifying competition in Europe.

The Finnish data processing industry is presently geared toward the Nordic markets, but is keenly approaching the large European market that offers great opportunities for specialized suppliers. The developments in the whether negotiations with the EC, via EFTA or directly, will greatly determine the integration process turns out to be a threat or an opportunity for the industry. The effects of the EC integration and the future scenarios are presented in the conclusions of the paper.

KEY WORDS: data processing, EC integration, high technology

KEINÄLÄ, Severi, SUOMEN HUIPPUTEKNOLOGIATEOLLISUUS YHDENTYVÄSSÄ EUROOPASSA; Sektoriraportti 2: TIETOJENKÄSITTELYTEOLLISUUS, Helsinki : ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 1989. 44 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847 ; no. 304).

TIIVISTELMÄ: Työn tavoitteena on analysoida Suomen tietojenkäsittelyteollisuutta kansainvälisillä markkinoilla varsinkin suhteessa Euroopan yhdentymiskehitykseen ja luonnostella tulevaisuuden skenaarioita tälle teollisuudenalalle.

Euroopan integraatiokehitys on vauhdittanut Euroopan tietojenkäsittelyteollisuuden rakenteellista muutosta. Viimeaikoina huomattavasti lisääntyneet fuusiot, yhteistyösopimukset ja jo alkanut Euroopan laajuinen rationalisointi osoittavat yritysten valmistautumista hyödyntämään suurtuotannon etuja ja erikoistumista. EY-komission tavoitteet standardisoinnin ja julkisten hankintojen vapauttamisen alueilla lisäävät entistään integraation kilpailua lisäävää vaikutusta.

Suomen tietojenkäsittelyteollisuus operoi pääasiallisesti pohjoismaisilla markkinoilla, mutta suuntaa enenevästi mielenkiintoaan laajoille Euroopan markkinoille erikoistuneilla tuotteilla. EFTAn välityksellä käytyjen tai suorien neuvottelujen tulokset ovat ratkaisevia määrittäessä muodostuuko Euroopan integraatiosta uhka vai mahdollisuus ko. teollisuudelle. EY-integraation vaikutukset ja tulevaisuuden skenaariot on esitetty yhteenvetokappaleessa.

ASIASANAT: Tietojenkäsittely, EY-integraatio, huipputeknologia

PREFACE

The study on the future outlook of the Finnish high-tech industries in the light of the European Community's internal market program was initiated in late 1988. The project assesses the present position in selected high-tech sectors, especially in relation to the EC, and analyses the future scenarios in relation to the European integration process.

The study is carried out by Teräs-Kari Ltd Consulting with the financial support of the Ministry of Trade and Industry. The study is conducted by Research Economist Severi Keinälä under the supervision of Research Manager Harri Luukkanen.

ETLA, The Research Institute of the Finnish Economy, is conducting and organizing various studies related to European integration on both the microeconomic and macroeconomic levels. The present study on the data processing industry supports ETLA's ongoing activities in this field.

Previously a paper on the telecommunications equipment industry has been published, and this paper will be followed by a report on the pharmaceutical industry, also prepared by Teräs-Kari Ltd Consulting. The final report will be available in the beginning of 1990.

Pentti Vartia
Managing Director
ETLA

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LIST OF ABBREVIATIONS

CPU	Central Processing Unit
DP	Data Processing
DEC	Digital Equipment Corporation
Dram	Dynamic access memory
EIC	Electronics International Corporation
EISA	Extended Industry Standard Architecture
ESPIRIT	European Strategic Program for Information Technology
EUREKA	European Research Coordination Agency
IBM	International Business Machines
IDC	International Data Corporation
IT	Information Technology
LAN	Local Area Network
MCA	Micro Channel Architecture
PC	Personal Computer

1 Introduction

The data processing field is in transition. PCs have made a breakthrough in professional, educational and private markets. Technologies are still competing both in hardware and operating systems, alliances among the producers are rapidly reshaping, and the market leader IBM's move to PS/2 and OS/2 designs are being followed with intensity. What will the standards be in the future? Will the industry base its standard on Intel's 80386, what will be the effect of 80486? Will MCA gain the needed leverage over the EISA to be introduced later in 1989? What will be the position of Apple Macintosh based on Motorola's microprocessors?

The computer industry has rapidly shifted to personal computers from the traditional mainframe and minicomputer concept and its move towards open standards has hurt the producers insisting on their own operating systems. In Europe the cost of labor is high, R & D requires very high investments to keep up with the rapidly advancing technologies, and increased competition in the PC markets have forced the prices down at fast rate. All this puts pressures on companies to find alliances in R & D, production, and marketing.

Parallel to the developments in the DP sector the European economies are in the process of integration. What is the position of the Finnish DP industry in Europe, and what kind of effects does the EC integration process have on it? The purposed of this sub-report is to address this question.

2 Global Industry Background

In the following a broad picture of the industry will be drafted introducing products, markets, production and producers, as well as international trade in data processing equipment.

2.1 Products

Data processing equipment embraces a wide spectrum of hardware including the Central Processing Units (CPUs) and the peripheral equipment. CPUs range from the smallest Personal Computers (PCs) through mainframes to supercomputers. Peripheral equipment includes terminals, tape drives, disc packs, printers, and a whole array of devices to perform input, output or memory storage functions of data processing. Software is an essential element of data processing, but is not included in the scope of this study. A study on the software markets in integrating Europe has been prepared by TEKES and VTT.¹

On an aggregate level all segments of data processing equipment will be included in this study, but the main emphasis will be given to areas of Finnish production, namely PCs, non-intelligent terminals and Local Area Networks (LAN). Mainframe computers and the majority of the peripheral equipment are not being produced in Finland; consequently, they receive less attention in this study.

2.1.1 Personal Computers

The history of PCs is very short, while the rate of expansion has been phenomenal. Early prototypes of PCs were introduced in the mid-1970s, but the actual breakthrough was achieved in the early 1980s simultaneously with introduction of IBM's PC based on Intel's 8088 microprocessor and CP/M

¹ Ohjelmistovienti, 31.10.1988

operating system. During this decade the development has leaped ahead along with the development of exceedingly more efficient microprocessors. IBM has been setting the standards for the industry, with a significant exceptions of engineering workstations and the Apple system based on Motorola's microprocessors. IBM's leading role is eroding currently.

The IBM system has evolved from PCs and XTs with 8086 processor, through AT based on 80286 processor (16 bit), to the latest personal computers utilizing powerful Intel 80386 processor (32 bit) introduced in 1985. In early 1989 Intel Corporation announced the next generation of its microprocessors, the 32 bit 80486. This latest invention holds a total of 1.2 million transistors that will double or even quadruple the processing speed of the earlier 80386 processor that could hold "only" 0.25 million transistors. New applications are expected to reach markets in the near future, with a considerable price tag attached to it. Intel 80486 has a serious competitor in Motorola's processor 68040 that is equal in capacity to the 80486. Also Sun Micro has announced its plans to enter PC markets with an IBM-compatible system based on Sun's own SPARC microprocessor that is three times faster than the Intel 80386 chip.¹

Innovative activities in PCs have increased exponentially in the 1980's, but the development is expected to follow a S-curve and even out by the end of the century. During the peak years of 1982 and 1983, 123 new PC models were introduced annually. This had slowed down to 82 models by 1987, and it is expected to drop to six new models by the year 2000.² This does not imply reductions in PC markets, but a slowing rate in the new models being introduced.

¹ Kehoe, 28.9.1988

² Modis and Debecker, 1988, 267-278

On the other hand new inventions are expected in displays (size of the screen, resolution, flicker free displays), CPU -chip technology, storage (magnetic and optical), user interface, artificial intelligence and various other fields. In the highly competitive markets the firms are seeking for competitive edge from these emerging innovations. This is seen as the generator of further developments in PCs.¹

The development of microprocessors has allowed the size of the units to grow smaller, performance to increase, and prices to decrease. PCs are already challenging the performance of minicomputers and even mainframes, although the input/output performance of PCs is still quite inferior. A further step has been taken with the introduction of powerful lap-top PCs. Their performance is comparable to the desk-top models, although some compromises exist in the space available for quality displays and extensions of functions by additional cards, and naturally, in prices. The most optimistic lap-top promoters view the lap-top as a dominant form of PCs in the future.

The evolution of the PCs has been characterized by several competing industrial standards. IBM has been setting the standards to a large extent, and their latest move to Micro Channel Architecture (MCA) that was introduced two years ago was supposed to secure IBM's technological lead in the PC markets. The introduction of PS/2 system that incorporates the MCA technology has not been received by the markets too enthusiastically. Initially only two other producers announced their intentions to produce compatible hardware, namely Tandy and Olivetti,² but now there is several others as well (ie. Apricot, HP, Tulip, etc.).

The opposing system Extended Industry Standard Architecture (EISA) has been developed by the "Gang of Nine", namely

¹ Hallivuori, 1989.

² Nyström, 8.5.1989

AST, Compaq, Epson, NEC, HP, Tandy, Olivetti, Zenith and Wyse Technology. HP launched the first EISA 486-based PC in early October 1989. Olivetti belonged to the founder group of EISA, but is already launching two models incorporating IBM's MCA components. Markets will eventually decide its preference over the IBM's MCA or the EISA approach supported by Compaq and its allies.¹ The EISA system is taking advantage of the new 32-bit microprocessor power, while maintaining compatibility with existing 16-bit software and peripherals.

Besides the PCs themselves, the Local Area Networks (LAN) are becoming increasingly important. The LAN systems are growing rapidly along with the increased utilization of PCs linked together instead of CPU combined with non-intelligent terminals.

2.1.2 Non-Intelligent Terminals

The history of non-intelligent terminals is longer than that of intelligent terminals or PCs. The non-intelligent terminals have traditionally been used as extensions of the mainframe. The advances in PC technology have made some of the most powerful PCs powerful enough to act as a central unit for LAN systems. Now non-intelligent terminals are also being linked up with the powerful PCs, as they have been previously linked with mainframe computers. This widens the potential clientele to include even small firms that can operate with a network based on a PC.

2.1.3 Systems

The sales of computer systems has been commonplace in the mainframe and minicomputer markets, but this concept has

¹ Cane, 22.2.1989

also entered the PC world. Producers are not only supplying the PC itself or with few peripheral units, but also complete systems that are designed to perform tasks on a departmental level, or even throughout a company.

2.2 Markets

The total value of the global data processing equipment market was estimated to be between USD 103 billion¹ and USD 165 billion² in 1987. The triad of the USA, Europe and Japan combined represents roughly 90 per cent of total world computer demand. In the following table two estimates of the distribution of DP equipment is presented.

Table 1: World DP Market Distribution

	I	I	II	II
	USD mil.	%	USD mil.	%
Europe	52.000	32	32.960	32
USA	62.700	38	41.200	40
Japan	29.800	18	19.570	19
Other	20.500	12	9.270	9
Total	165.000	100	103.000	100

Source: I Electronics International Corporation
 II International Data Corporation (IDC)

The EIC estimates include mainframe and mini computers, PCs, peripherals, and manufacturers' services, while IDC covers the "worldwide computer market". The estimates of the total market vary greatly possibly due to differing definitions, but the percentage shares of the total world demand indicate similar patterns. The USA market represents the largest share (approximately 40 %), the European market roughly a

¹ International Data Corporation

² Electronics International Corporation

third, the Japanese a fifth, and the rest of the world around a tenth of the total world DP demand.

The total computer hardware market consists of large mainframes, medium and small minicomputers, and personal computers. In the following table the distribution of different computers is presented.

Table 2: 1987 Worldwide Computer Hardware Market

	%
Large Mainframes	24
Medium Minicomp.	20
Small Minicomp.	21
PCs	35

Source: International Data Corporation

PCs follow a similar pattern to the overall world DP market distribution, although the USA market has a relatively larger PC segment, while the Japanese seem to prefer mainframe and mini computers. In the following table the world PC markets are presented.

Table 3: World PC Market Distribution

	USD mil.	%
Europe	10.000	33
USA	14.000	47
Japan	3.200	11
Other	2.800	9
Total	30.000	100

Source: Electronics International Corporation (EIC)

The EIC estimate USD 30 billion for the PC segment represents 18 per cent of their estimate for the total global computer market. The IDC estimates of the global PC markets are

slightly higher, USD 36 billion, and 35 per cent of their world DP market estimate.

The estimates for European PC markets vary significantly between different sources. Electronics International Corporation estimates that the European markets for PCs was roughly USD 10 billion, or in other terms 3.2 million units in 1987. The PC shipments were projected to reach 4.3 million units in 1988 by Intelligent Electronics / Dataquest. International Data Corporation estimate that 6.8 million PC were sold in Europe in 1988, total value being USD 17.8 billion. The differences can largely stem from inclusion of different categories of PCs into estimates (professional - hobby, different price categories, etc.).

The four largest European countries, (France, West Germany, the UK and Italy) dominate over 66 per cent of the total European demand. In the following the market sizes of European countries are presented.

Table 4: West European PC Sales in 1987

Country	1000 units	%
France	590	19.5
W.Germany	580	19.2
UK	530	17.5
Italy	310	10.2
Netherlands	210	6.9
Spain	150	5.0
Sweden	140	4.6
Switzerland	120	4.0
Belgium	90	3.0
Denmark	80	2.6
Norway	75	2.5
Finland	60	2.0
Others*	90	3.0
Total	3,025	100.0

* Austria, Greece, Iceland, Ireland and Portugal
Source: Intelligent Electronics / Dataquest

The lap-top market is in its infancy in the rapid growth stage. In 1987 the European lap-top market was estimated to

be 128,860 units¹ and it had reached 250,000 units in 1988.² This represents only 5.8 per cent of the total PC sales in Europe. The lap-top segment is expected to continue its rapid growth (23 to 55 per cent annually) in the coming years.

According to Logica the installed base of LANs in the beginning of 1988 in Western Europe was 91.400 units, and they expect it to grow to 586.000 units by 1994 - at an average annual growth rate of 36 per cent. The growth in the value of LAN shipments is expected to grow modestly by 17 per cent annually, since the prices are estimated to fall around 15 per cent per year.³

The inclusion of information on terminal markets would be beneficial for this study, but as of now no relevant data or statistics are available.

Besides the geographical markets presented above, and the market shares held by various producers introduced in next chapter, PC markets can be divided according to the operating system of the machine. These segments are competing and not compatible, although in certain cases they can utilize the same data files and communicate between different systems. The leading US software house Microsoft views that by 1991 MS/DOS machines will still have around 60 per cent of the market, OS/2 around 25 per cent, Apple Macintosh machines 10 per cent, and Unix only about 5 per cent. The MS/DOS is seen to remain dominant in individual workstations to develop individual productivity, while large corporations are expected to increasingly use OS/2 for its advantages in networking the PCs.⁴ Other specialists argue that the OS/2

¹ Dataquest / Intelligent Electronics, 1988

² Toshiba mikrotehdas..., Helsingin Sanomat 14.4.1989

³ The rise of local area networks, 22.2.1989

⁴ Cane. Personal Computers. 14.9.1988

estimates are too optimistic, while MS/DOS and Unix have been underestimated.¹

2.3 Production

Data processing equipment production is characterized by extreme internationalization. Components are produced in numerous firms, others supply certain parts as disk drives, and final production or assembly is conducted in various factories of large, medium and even small-sized companies. At times the line between production and assembly is fairly vague. In addition large multinationals produce computers on all continents and transfer both parts and final products across frontiers. This phenomena of extreme internationalization of production erodes the significance of "production by geographic zone." Consequently the figures must be treated as rough estimates.

In the following table the world production distribution of DP equipment is being presented. The share of European production is relatively lower than the market size would suggest, while Japanese production is considerably higher in relation to the market size.

Table 5: World DP Markets and Production in 1987

	Markets		Production	
	USD mil.	%	USD mil.	%
Europe	52,000	32	40,100	24
USA	62,700	38	65,000	39
Japan	29,800	18	40,300	24
Other	20,500	12	20,000	13
Total	165,000	100	165,000	100

Source: Electronics International Corporation (EIC)

¹ Hallivuori, 1989.

In the PC segment the European production shares are relatively even lower, and the figures also indicate the production of PCs has moved strongly to other countries, mainly South-East Asian newly industrialized developing countries.

Table 6: World PC Markets and Production in 1987

	Markets		Production	
	USD mil.	%	USD mil.	%
Europe	10,000	33	2,000	7
USA	14,000	47	16,000	53
Japan	3,200	11	4,900	16
Other	2,800	9	7,100	24
Total	30,000	100	30,000	100

Source: Electronics International Corporation (EIC)

Up to 60 per cent of the PCs sold for use within Europe are manufactured inside Europe (55 % production, 5% assembly).¹ The remaining 40 per cent is controlled by the South-East Asian manufacturers. The European "manufacturers" range from large multinational corporations like IBM to small attic operators assembling less than 50 PCs a month.

South East Asian producers have been seen as a threat to European PC production for quite some time. Today the costs of advanced PC production are estimated to originate largely from materials, up to 80-90 percent, while the share of labor costs is around 10-20 percent. This demonstrates the importance of the supply of parts and components, and lesser significance of cost of labor. The argument of cheap South East Asian labor seems to be more valid for earlier PC models that can be assembled from widely available components.

¹ Dataquest / Intelligent Electronics, Dec. 1988

2.3.1 Supply of Chips

The production of computers is strongly dependent on the supply of various chips. The production of PCs was limited by a serious world wide shortage of dynamic random access memory (Dram) chips, although adequate supply levels have been achieved since. The shortages had an impact on all producers, but especially on smaller manufacturers. They had difficulties obtaining chips at all or at prices that would not allow them to continue operating in the low priced market segments. Japan supplies an estimated 80 per cent of the world's memory chips.

Several producers reported limitations in their production due to chip shortages (Compaq, British Amstrad) and some purchased large quantities of overpriced chips (Apple). Some producers have secured the supplies by establishing their own chip production (IBM) or have initiated their own production in cooperation with another company (Siemens with Philips). Also acquiring shares of chip producing companies is expected to be a widely utilized method of securing the chip supplies in the future (British Amstrad's equity share of Micron Technology of the USA).¹

European electronics companies have formed the STACK consortium to strengthen their position as component purchasers. The consortium includes British Telecom, GEC, Plessey, Olivetti, Italtel, Bull and Nixdorf.² The possibility of Nokia joining the consortium has been brought up in the media.

¹ Kehoe, 22.2.1989
 Kehoe, 14.9.1988
 Cane, 14.9.1988
 Siemenssiin uutta potkua, 2.3.1989

² Uotinen, 16.2.1989

2.3.2 Producers

In the world markets IBM remains in its position of the most powerful market leader. Another US based firm, Apple, and Japanese NEC have gained over 5 per cent world market shares, while all European and South-East Asian producers hold only marginal shares of the world PC markets. In various national markets national champions have gained very strong positions. These figures are somewhat outdated, but they give a good indication of the concentration of the industry.

Table 7: World's Major PC Companies in 1987

Market Share	Companies
> 10 %	IBM
5 - 10 %	Apple NEC
2 - 5 %	Amstrad Commodore Compaq HP Olivetti Tandy Toshiba Unisys Zenith
Top 5 hold 42 %	
Top 10 hold 56 %	

Source: EIC 1988

In the European market IBM has held the dominant position, although it has lost ground from a quarter of the market in 1985 to less than a fifth in 1987. Other main suppliers include the large national champions and large multinationals.

Table 8: West European PC Market Shares
Shipments in 1988

Company	% value
IBM	16.9
Olivetti	6.8
Apple	5.4
Compaq	5.4
Commodore	5.2
Amstrad	4.8
Hewlett-Packard	3.9
Atari	3.1
Tandon	3.1
Bull HN	2.7
Toshiba	2.5
Victor	2.2
Nokia	2.0
Zenith	1.7
DEC	1.7
Sun	1.6
Philips	1.5
Siemens	1.4
Nixdorf	1.4
Goupil	1.4
Epson	1.3
Apollo	1.2
Schneider	1.2
NCR	1.2
Tulip	1.1
Unisys	1.0
Others	17.5

Total USD 17.8 billion and 6,761,300 units
All PC types in 17 European countries

Source: International Data Corporation

Presenting the market shares in terms of value gives more realistic picture of the situation. If the market shares are expressed in terms of units sold Commodore and Amstrad would show much higher market shares (21.0 and 14.7 percent) since they concentrate on smaller and cheaper PC models. In the following table market shares by shipped units in three price categories are presented.

Table 9: West European PC Market Shares by Price Categories in 1988

	Under \$2,000	\$2,000- \$8,000	\$8,000- \$15,000
Altos	-	+	4
Amstrad	39	2	-
Apple	+	14	10
Atari	2	+	-
Bull	+	4	4
Commodore	4	2	+
Compaq	-	13	11
Digital	-	+	6
HP	-	4	7
IBM	14	19	18
ICL	+	+	3
Nixdorf	-	2	4
Nokia	+	2	3
Olivetti	6	7	9
Siemens	-	2	3
Tandon	+	2	+
Toshiba	3	5	2
Unisys	-	+	2
Zenith	3	+	+

Includes companies with over 2% market shares
+ less than 2%

Source: International Strategic Consultancy

Intelligent Electronics / Dataquest estimated the total PC shipments in Europe to be 3.2 million units in 1987, from which 51.6 per cent were manufactured in Europe. The projected corresponding figures for 1988 are 4.3 million units and 55.2 per cent manufactured in Europe.

IBM, Olivetti, and Apple together produce over half of the total European production. An interesting omission from the following table is Philips that manufactures the majority of its PCs in Canada. It is yet to be seen if Philips will again start its production in Europe, especially in the view of the pressures which 1992 will bring. Tandon opened its Austrian factory in September 1988, and Sun Microsystems has announced its intention to open a factory in Scotland in early 1989. This might be the beginning of a new move by companies to invest more in Europe prior to 1992.

Table 10: Production of PCs in Europe

MANUFACTURER	PLANT LOCATION BY COUNTRY	EST. ANNUAL OUTPUT		
		1000 UNITS		%
		1987	1988	1988
IBM	UK	700.0	850.0	30.9
OLIVETTI	Italy/Spain	380.0	425.0	15.5
APPLE	Ireland	200.0	260.0	9.5
HP	France	49.0	150.0	5.5
COMMODORE	Germany	73.0	122.0	4.4
COMPAQ	UK	1.0	100.0	3.6
ZENITH	Ireland	75.0	85.0	3.1
ACORN	UK	N/A	70.0	2.5
NCR	Germany	60.0	67.5	2.5
NOKIA/ERICSSON	Finland/Sweden	50.0	60.0	2.2
TULIP	The Netherlands	32.0	60.0	2.2
SMT GOUPIL	France	40.0	52.0	1.9
WANG	UK	35.0	50.0	1.8
BULL	France/Spain	37.2	48.0	1.7
SIEMENS	Germany	25.0	45.5	1.7
APRICOT	UK	35.0	45.0	1.6
NORMEREL	France	12.0	35.0	1.3
RML	UK	25.0	29.0	1.1
NIXDORF	Germany	13.0	19.0	0.7
LEANORD	Austria	12.0	15.0	0.5
TANDON	UK	0.0	10.0	0.4
OPUS	Germany	4.0	10.0	0.4
TRIUMPH ADLER*	Germany	9.5	7.0	0.3
FUJITSU	Spain	1.7	3.5	0.1
RC	Denmark	3.1	2.8	0.1
FERRANTI	UK	2.4	2.8	0.1
TIKIDATA	Norway	2.5	1.5	0.1
FORUMINT'L	France	1.5	1.3	0.0
GIGATRONICS	Greece	N/A	0.8	0.0
TELENOVA	Sweden	1.5	0.8	0.0
DAVA**	Finland	1.9	0.6	0.0
Clones	Local assembly	60.0	100.0	3.6
Others		25.0	20.0	0.7
TOTAL	Europe	1,967.3	2,749.1	100.0

*acquired by Olivetti

**acquired by Nokia

Source: Intelligent Electronics / Dataquest, Nov 1988

The tables above present the European PC market shares and production shares. In these comparisons Nokia is in 13th position in overall PC markets, 10th in high price category, and 10th in production share estimate. When extending the approach to include all computers Nokia falls behind the national champions like Siemens, Olivetti, Nixdorf, Philips,

Bull and ICL. Nokia is at its strongest at high priced PC markets especially in the Nordic area.

2.3.3 Recent Developments

Large US groups hold a dominant position in European markets. IBM, Apple and HP are well established in Europe through their own production subsidiaries and dominate a large share of the total European market. US companies are approaching Europe as a single continental market, while European producers have been concentrated more on national markets. US suppliers also have the benefit of stronger financial and technological muscle compared to many European suppliers.

Larger European firms are also beginning to move beyond their national markets. Olivetti has acquired West German Triumph Adler and in addition increased its efforts in European scale. Siemens has established a strong presence in Italy, and is starting to invest heavily in both the UK and France. In the latter Siemens purchased the information technology group IN2. Also the French Bull is increasing its market presence especially in the UK market. Finnish Nokia acquired Ericsson's computer production of Sweden, and Dava of Finland. The industry is following with great interest the developments among the largest European computer producers, namely Siemens, Nixdorf, Bull, Olivetti and ICL.¹ It is foreseen that the European computer industry will change rapidly and decisively.

The PC segment is strongly emphasized in this study, but the developments in the overall computer industry can not be ignored. One interesting development is the joint venture between Apple and Digital Equipment Corporation (DEC) to counterbalance the dominant position of IBM. Apple and DEC

¹ Dodsworth, 22.2.1989

agreed early in 1988 to work together on the development of software that will enable their products to be closely linked on computer networks. IBM's USD 52 billion sales in 1987 are vastly larger than Apple's USD 2 billion or DEC's USD 9 billion sales, but the analysts see weaknesses in IBM's "mid-range" and PC segments. This is where Apple and DEC are aiming at. Apple's experience in PC markets and DEC's dominant position in minicomputers and networks supplement each other.¹ In addition Apple has made a move to bring itself closer to the IBM world by increasing the possibilities of communication between these two technologically distinct product groups.

Another significant alliance was formed between Groupe Bull, Honeywell and NEC in 1987 - a non-orthodox alliance between European, American and Japanese. In early 1989 Groupe Bull acquired a large share of Honeywell's stake, gaining a dominant 65.1 per cent position leaving 19.9 per cent for Honeywell, and the original 15 per cent for NEC. Along with this move the group changed its name to Bull HN Information Systems. This process increased Groupe Bull's position in the world's information technology markets, gave an opportunity for Honeywell to reduce its presence in the computer industry, and allowed NEC to find marketing channels to Europe and to the USA for its high-performance mainframe computers.²

Already during the summer of 1988 Olivetti announced its plans to make Olivetti PCs compatible with DEC's networks. This has evolved into the OEM agreement between these two manufacturers. Olivetti will be manufacturing PCs according to DEC's requirements, and DEC will be distributing and servicing the equipment. This combines DEC's relative weakness in the PC sector with Olivetti's success in the

¹ Kehoe, 18.1.1989

² Cane, 1.2.1989

European market. Previously DEC has made a similar arrangement with Tandy.¹

Thomson quit its PC production, Norsk Data and Nixdorf suffered great losses in 1988, and Ericsson sold its PC production unit to Nokia. Still Intelligent Electronics/Dataquest forecasts that the production of computers will not shift to Asia from Europe. The production of computers have been increasingly automated; consequently, the share of labor cost is diminishing. The importance of being near the markets overrides the benefits of low-cost labor, especially since this opens the road inside the market and prevents protectionist measures. Amstrad is planning to establish a new production unit possibly in England for the more expensive models, while the cheaper models are being produced in Asia. Still the problem of component supplies remains. Dataquest also expects mergers and/or withdrawals among the mid range producers (around 60,000 units annually), namely Nokia, Tulip, Siemens, Apricot and Nixdorf. In the future all of these companies are not expected to remain profitable.²

Also the Japanese have made their first move to start computer production in Europe. Toshiba announced its plans to establish an assembly unit for PCs in West Germany. Two years ago Toshiba initiated production in California, and the move to Europe further strengthens its position in the world PC markets. Production is planned to start in 1990 with a monthly capacity of 5,000 units. In two years this should increase to 15,000 per month. The plant will be highly automated functioning with only slightly over 100 employees. Toshiba is aiming to strengthen its position in

¹ Olivetti tekemään mikroja..., 26.4.1989
DEC myymään Olivetin mikroja, 28.4.1989

² Brown, 10.3.1989

Europe not only by establishing a production unit, but also by evolving from equipment supplier to system supplier.¹

2.3.4 Lap-top Production

The major lap-top manufacturer in Europe is Toshiba by an impressive 40 per cent market share. Zenith is its nearest competitor with Olivetti closely behind. Besides those presented in the following table, Apple and Compaq also have introduced a lap-top model, and the launch of NEC's lap-top models are expected.

Table 11: The European Lap-top Market 1987 according to value

Company	%
Toshiba	40.0
Zenith	12.5
Olivetti	9.2
IBM	4.5
Wang	3.5
Hewlett Packard	3.0
Grid	2.4
Sharp	2.7
Nokia/Eriksson	2.6*
Others	19.2

Source: Intelligent Electronics / Dataquest 1988
* discontinued

European sales in lap-top computers reached 250,000 units in 1988. Toshiba's share was nearly half, 120,000 units. Toshiba has also introduced color display for lap-top PCs in cooperation with IBM. Lap-top PCs are seriously challenging the desk-top markets. Japanese strength in the lap-top segment can threaten the dominance of US producers in PC trade.²

¹ Toshiba mikrotehdas..., 14.4.1989

² Toshiba mikrotehdas..., 14.4.1989

3 Areas of Change in the European Community

Data processing along with the entire information technology (IT) industry is one of the most affected by the integration process in Europe. IT industry plays an important role in the EC economy and the Commission's initiatives strongly promote a common market for information technology products.

The effects are realized in the IT sector both directly by changes in the environment in Europe and indirectly through changes in the demand in various sectors caused by the integration process.

The common market will provide the vendors with a larger market where they can utilize the economies of scale and European-wide rationalization. The rationalization includes not only intra-company measures, but also various forms of alliances and mergers across the industry. In a larger market the possibilities for specialization and tighter definitions in segmentation are increased. Mergers, acquisitions, and cooperative agreements are already taking place, but this is seen only as the beginning of greater structural changes in the DP industry.

The integration process is also seen as intensifying intra-European competition in the entire IT sector. Standardization is bringing the products of different vendors closer together, diminishing compatibility problems, and lowering the switch over costs. In the same manner the opening of public procurement has the potential of increasing the competition; adding competitive pressures on the national champions presently dominating the public markets. The PC sector has been highly standardized, although differing systems operate in the markets, but the liberalization of the public procurement field is yet to be seen. Skepticism in the rate and degree of the opening of public procurement is wide spread. As in the other industrial sectors the

effects and degree of an opened public procurement remains a huge unanswered question.

EC research programmes (ESPRIT) and the wider European EUREKA promote intra-European collaboration in pre-competitive research efforts. Common research activities not only have the potential of strengthening the European technological position, but also promote the common standards and overall removal of internal market barriers.

The indirect effects stem from overall changes and especially the ones in the service sector. Services such as banking, insurance, transport and tourism are facing major changes in a European wide context allowing liberalized operations across frontiers. This will impose altered demand structures on the entire information technology, including the DP segment.

The direct and indirect changes will require a re-evaluation of the European strategies for the IT industry. Flexibility is the key concept. Changes in various fields ranging from gradually unifying standards and possibly opening public markets to rapid changes in regulations concerning road transport, finance, and other fields affecting the demand side of DP segment are expected to take place in the near future. Flexibility will allow the firms to react rapidly to the changing environment and to benefit from potential cost reductions.

On the other hand the benefits of European-wide economies of scale in R & D, purchasing, manufacturing, marketing, sales, distribution and after sale services and training gives an additional element to increase the firm's productivity within Europe. Some functions require centralization as in the purchasing operation, while a local approach is needed for functions such as servicing and training. Flexibility in utilizing various elements in European-wide operations has

the potential of being the decisive factor in an increasingly competitive climate.

Although numerous changes are anticipated in the near future, the European market is expected to remain fairly fragmented in the short to medium term (2-5 years). International Data Corporation bases this argument on the following factors:

- customer confusion,
- existing customer/client relationships,
- continuing differences in product standards,
- perception of the foreign firm's local service,
- familiarity of local firms with national rules and regulations,
- national preference,
- cost of switching over, and
- local firm's knowledge of language/customs¹

The EC trade policy is often accused of constructing a "Fortress Europe" by building a protectionist wall around the EC area. In the DP sector this surfaced recently by Community action against Japanese printers and daisywheels. It is yet to be seen how EFTA computer manufacturers will be viewed.

¹ Europe 1992, International Data Corporation

4 Finnish Data Processing Industry

The Finnish DP industry consists of Nokia Data and the newly established Mikrolog Oy. Nokia Data is in the process of expanding to Western European markets after gaining a leading position in the home market, and substantial market shares in Nordic markets. Mikrolog, on the other hand, is still pushing for larger market shares in the domestic market, although the Soviet market is also in their interests.

4.1 Products and Producers

Finnish DP production is fully concentrated on the PC, terminal (including banking terminals/printers) and LAN production. Nokia Data also sells mainframes as a part of the total system. Nokia Data is the only DP equipment producer after Nokia's acquisition of Dava, while Mikrolog Oy should be treated as a small domestic assembly unit.

4.1.1 Nokia Data

Nokia Data markets itself as a system supplier that specializes in complete integrated systems solutions and associated services. The products include PCs, non-intelligent workstations and network products, as well as software elements. PCs are supplied under both the Finnish Mikro Mikko and international Alfaskop families based on Intel 286 and 386 processors. Non-intelligent workstations belong to Alfaskop family, as do the LAN networking products. Each of these three groups represent roughly a third of the sales. Non-intelligent terminals are the largest group counted in units, while PCs accumulate larger earnings. Networking products are still the smallest of the groups, but their growth expectations are the highest. With the acquisition of Ericsson's DP operations, Nokia Data received

also lap-top PCs, but their production has been discontinued.

Nokia Data has some 900 people working in R & D in both Sweden and Finland. R & D effort is the central competition factor in the present DP markets where implementation of new technologies into new products separates winners from losers. Nokia Data is investing some SEK 550 million annually, or eight per cent of the turnover to R & D work. Nokia Data emphasizes the importance of remaining at the forefront of the latest proven standards as well as giving special attention to human interface, networking and security.

Nokia Data is not directly cooperating with any other DP corporations or pan-European research projects. Through the Nokia Group's research center they are involved in precompetitive research projects of EUREKA and ESPRIT. Nokia Data has also joined the X-OPEN (UNIX interface).

Production is divided between three locations in Finland (Kilo, Lohja) and two in Sweden (Ronneby and Bräkne-Hoby). Only Kilo and Ronneby production units produce both PCs and non-intelligent terminals, while the Lohja unit concentrates on non-intelligent terminals, and Bräkne-Hoby supplies circuit boards, keyboards and software. Nokia Data employs a total of 8,000 persons. In 1988 Nokia Data produced 60,000 PCs and 85,000 non-intelligent terminals.

4.1.2 Mikrolog Oy

Mikrolog Oy initiated the assembly of PCs in 1986 with 1,000 units, growing to 2,700 in 1987, and to 4,850 in 1988. The target figure for 1989 is 8,000 units to be produced in their new facilities with a capacity of approximately 10,000 units annually. Reaching the targeted figures Osborne would be competing for the fourth position in Finnish markets

with Olivetti, Commodore and Amstrad, while Apple holds third position (estimated 11,000 sales in 1989), and IBM and Nokia compete for the leading position.

Mikrolog Oy has production facilities in Karkkila. In addition to PC assembly they represent various suppliers of memory units, printers and lap-top PCs. Their own PC production represents half of the turnover, and it is expected to climb to 60 percent. Suppliers of components are Taiwanese, American, Japanese and Finnish. The Finnish share of the final value is over 50 percent.¹

4.2 Trade

From the Finnish DP industry's point of view it is logical to divide the markets into domestic, Scandinavian, and the rest of the Europe, since nearly all of the sales occur in these markets. Only fractional and non-regular exports are directed to other markets.

In domestic markets Nokia Data has a narrow lead over IBM for the market leader position in the PC segment. In 1988 Nokia Data sold some 18,500 Mikro Mikko PCs, but after adding the latest acquisition of Ericsson and Dava the figure climbs to around 25,000. This leaves IBM in second place with 1988 sales at 20-21,000 units. The third position is held by Apple, and Mikrolog Oy is competing for the fourth place with Olivetti, Commodore and Amstrad.²

Nokia Data's market share is roughly 22 per cent of the domestic DP market.

Mikrolog Oy operates yet only in the domestic market, while Nokia Data is cumulating some 65 per cent of its income from sales to other European countries. Of the total USD 1172

¹ Mikkonen. 19.5.1989.

² Kolmannes..., Helsingin Sanomat, 28.1.1989.

million Nokia Data sales 38 per cent are contributed by the Finnish market, another 32 per cent by the other Scandinavian countries (mainly Sweden, 24 per cent), and the remaining 30 per cent by other European markets. EC markets have the highest growth potential.

Table 12: Nokia Data Sales by Geographic Area in 1988

	Per Cent
Finland	38
Scandinavia	32
Rest of Europe	30

Source: Nokia Data

Of the Central and South European countries West Germany, Spain and Netherlands are the most important, while in the remaining countries the market shares are insignificant. In the following tables Nokia Data's market shares sales in Europe are presented.

Table 13: Estimated Market Shares
Nokia Data Shares of All PCs
Shipments in Units

	1987		1988	
	Shipts	%	Shipts	%
EFTA				
Finland	11,927	21.0	19,150	20.7
Sweden	9,500	7.5	14,500	7.5
Norway	1,500	2.0	1,750	1.8
Switzerland	550	0.4	660	0.4
Total	<u>23,477</u>		<u>36,060</u>	
EC				
West Germany	8,500	1.3	12,850	1.2
Netherlands	3,050	1.4	2,650	0.6
Denmark	2,200	2.9	1,670	1.6
Spain	1,200	0.7	610	0.2
United Kingdom	0	0	0	0
France	0	0	0	0
Belgium	0	0	0	0
Portugal	0	0	0	0
Total	<u>14,950</u>		<u>17,780</u>	
Europe Total	38,427		53,840	

Source: Dataquest / Intelligent Electronics, June 1989

Table 14: Nokia Data's Turnover by Countries
in 1988

	Million SEK
Finland	2,700
Sweden	1,700
West Germany	710
Denmark	340
Spain	270
Norway	210
Netherlands	200
Great Britain	140
France	100
Switzerland	90
OEM and Others	235
Total	7,070

Source: Optio 31.8.1989

The information in the Dataquest estimates and Optio's figures are slightly contradictory, but the essence of Nokia Data's position in its main markets is clear. Finnish

and Swedish markets lay the foundation for the operations, while the other European national markets combined play a considerable role in Nokia Data's earnings, Nokia Data is still a minor operator within these markets.

Despite low market shares Nokia Data has established subsidiaries in 10 European countries and has distributors in 12 countries. The network of subsidiaries covers the main European national markets leaving the small (Belgium, Austria, Ireland and Iceland), southern (Greece and Portugal), and very difficult (Italy) outside. The Italian market is strongly dominated by the European giant Olivetti, making it less attractive for Nokia Data.

Nokia Data's sales in many national markets are based largely but not solely on a single achieved contract. In Finland and Sweden the customer base is wider, and in West Germany the distributor network is reaching larger number of customers.

Table 15: Nokia Data's Main Contracts in 1988-89

Finland	Alko, SOK, Pohjola, Sampo
Sweden	Pension funds, Konsum
Norway	Drugstores
Great Britain	Midland Bank
France	State Railways
Spain	Banesto (large bank)
West Germany	Deutsche Beamten Versicherung
Switzerland	Postal office
Netherlands	Postal office
OEM contract	Associated Press

Source: Optio, 31.8.1989

As stated above, Nokia Data is competing for system sales, that is mainly to the retail sector, finance and insurance companies, manufacturing enterprises and public organizations. In the following table the sales by market segments are presented.

Table 16: Nokia Data Sales by Market Segments in 1988

	%
Retail	25
Finance/Insurance	20
Manufacturing	19
Governmental	18
Other	18

Source: Nokia Data

When approaching the size of Nokia Data's operations in context of a total European DP market they represent less than one percent of the total market. In the PC segment Nokia Data's market share is slightly over two percent, and when this is narrowed down to IBM compatible PCs and terminals the market share climbs up to 5 to 15 percent. Data on LAN markets has not been compiled to form similar estimates.

Overall this shows that Nokia Data is a large supplier in the small markets of Finland and Sweden, and a small or even insignificant supplier in the large markets of Central Europe. In certain specific applications of local networks, ie. for banking and retail sectors, their importance as a considerable supplier is more pronounced.

4.3 Strengths and Weaknesses of Finnish Producers

The evaluation of strengths and weaknesses of the Finnish data processing industry is based on the preceding desk research and interviews with the industry representatives. In addition the DP sector is being compared to the findings in the previous sub-report on the telecommunications equipment industry.¹ In the following table the views of the interviewees are presented.

¹ Keinälä, 12.10.1989

Table 17: Strengths and Weaknesses of the Finnish DP Industry

<u>Strengths:</u>	<u>Weaknesses:</u>
- small and flexible	- smallness, units small in Europe
- good knowledge of local networks and banking systems	- high dependency on Finnish market
- smallness allows to supply to special requirements of clients	- unknown in European markets
- production follows the orders	- R & D cost relatively high due to smallness
- good connections to local decision makers	- practically no direct access to the very latest technology

In comparison to the telecommunications industry, the strengths and weaknesses stem largely from the smallness of the domestic market and the unit sizes. On one hand the smallness provides flexibility and adaptability to customer requirements, but at the same time it brings inefficiencies in unit sizes, relatively high R & D inputs, and unfamiliarity of the company name and trade mark.

In the case of Nokia Data the operations have adapted to utilize the advantages of the smallness. The production is not geared towards production of bulk products and individual PCs for mass market, but instead the approach is system orientated to provide solutions for specific customer needs. The production takes place according to the orders; consequently, specific customer desires can be fulfilled eg. in specific keyboard adaptations. Nokia Data's approach is not very attractive for large suppliers since the niches are often too small for their scale.

Furthermore a small operator can find sufficiently large segments for profitable operations in very specialized markets, as in banking systems. Expertise in these specialized fields provides a competitive edge needed to

compensate for the inefficiencies of a smaller scale production.

Smallness in relation to R & D and personnel resources is discussed in the telecommunications sub-report. In brief the small domestic market and small unit sizes supports the strategy of following technological innovations and adapting them to specific niches and to a further refining of the product. Specialization has developed a good knowledge of local networks and banking systems within Nokia Data, and this is one of the strengths in their operations.

The Finnish DP equipment industry differs from the telecommunications equipment industry radically in the product range. While the telecommunications equipment industry provides nearly a full range of products, the DP industry has concentrated on PCs, terminals and LANs. Telecommunications has concentrated on the most complex, advanced and large products; while the DP sector does not produce mainframes or even mini computers. A wide product range was seen as a strength for the Finnish telecommunications industry, and the DP sector is lacking this.

The positioning of Nokia Data as large in small markets and small in large markets creates a weakness in the disproportionately high dependency on Finnish markets. On the other side of the coin is the rather unknown name of Nokia in the European markets. To combat this dilemma Nokia Data seems to be increasingly striving to gain a stronger penetration of the EC markets.

The peripheral location of Finland, the short history of the Finnish international trade, cultural distance and language barriers were not touched upon during the interviews, but we can safely assume that these are basic limitations of the competitiveness of Finnish firms in general in the international arena. In the DP section the peripheral location can also be seen as an advantage that

has allowed the industry to develop, without disturbing interference by the large multinationals. The markets are small and distant and the small northern producer does not initially seem a challenge. The cultural differences and the short history of Finnish international trade are quite evidently the soft spots of most Finnish industries.

4.4 Opportunities and Threats of EC Integration

Nokia Data takes a significantly different view on the significance of the EC integration process compared to most other high technology representatives approached during the study. Both in the numerous articles of the president Kaarlo Isokallio¹ and in the interviews the company representatives saw the effects of EC integration to be merely "slightly significant" or "significant."

Table 18: Significance of EC Integration for Nokia Data
Answers to question "How significant is the EC integration process for your firm/unit, for the industry you represent (data processing equipment), and for the Finnish economy as a whole?"

	Firm/Unit	DP Industry	Finnish Economy
Not significant	-	-	-
Slightly significant	1	-	-
Significant	1	1	2
Quite Significant	-	1	-
Very Significant	-	-	-

This could be interpreted in several ways. It can be due to the highly internationalized nature of the DP equipment production that it is not likely to face EC integration with major changes, or it can stem from the lack of confidence in the ability of the Commission to carry the plans through. It can also be a stabilizing message to the overly enthused

¹ Kervinen, 16.12.1988, et al.

interest groups to bring attention to other important issues besides the EC integration.

Although the interviewees stated that the EC integration process is not significantly neither an opportunity or a threat, a few areas of potential opportunities and threats were mentioned. In the interviews the threats were more emphasised.

Table 19: Opportunities and Threats of EC Integration

Opportunities:	Threats:
- possibly public procurement opens possibilities	- possibly rules of origin
- cost savings from lowered barriers	- possibly intellectual and industrial property rights
	- possibly technical barriers to trade
	- protectionist measures

Although the direct opportunities and threats are seen to effect Nokia Data's operations only slightly, the indirect effects have a potential of changing the competitive structures to a much higher degree. Kaarlo Isokallio states that the further development of various "blocks" in European DP production structures could be an unpleasant surprise for Nokia Data.¹

Europe has been divided to five approximately equal blocks. Olivetti dominates Italy, Bull is very strong in France, British ICL in its domestic market, West Germany has two strong producers - Siemens and Nixdorf, and Nokia Data is strong in the Scandinavian markets. According to Isokallio the only potential merger could be between Siemens and Nixdorf², and that Nokia Data is an essential partner in all

¹ Sahiluoma, 31.8.1989.

² Mikkonen, 21.4.1989.

negotiations concerning the Scandinavian markets.¹ Nokia has already been seen as a potential partner for Olivetti's alliances by Business Week earlier this year.²

Any alliance among the largest European DP producers would be very significant for Nokia Data. Either an opportunity if Nokia Data is included in the negotiations, or a threat if left outside the negotiating table.

The creation of a large single market in Europe would increase the opportunities of the tight segmentation since a larger market would make even the narrow segments quite large. This could create an opportunity for Nokia Data since they are already practicing a narrow segment strategy.

On the other hand Nokia Data representatives see potential threats in the general threat of being "left outside" of the integrating market. Increased customs tariff is seen as potential threat in short term, and this is only emphasized by possibility of increased technical barriers to trade and negative effects of emerging rules of origin. Maintaining the low barriers in West European computer trade is given high priority by the industry representatives.

¹ Sahiluoma, 31.8.1989.

² Mikkonen, 21.4.1989.

5. Conclusions

In estimating the effects of EC integration on Finnish data processing industries a certain background knowledge is essential for understanding the competitive structures of European (and to some extent global) markets, as well as the nature and the size of the Finnish DP industry in an international context. This has been roughly drafted in preceding chapters.

Following this one needs to identify and evaluate the significance of the EC market for the DP industry both as an export market as well as a source for cooperation partners. Finally the effects of EC integration on the Finnish DP industry need to be discussed. The purpose of this chapter is to address these questions.

5.1 Significance of the EC for the Finnish DP Equipment Industry

The EC area represents roughly a third of Nokia Data's overall sales. Absolute volumes are very low in a European context and the total market share of the DP sector is less than one percent, but these volumes are considerable shares of production for a small producer.

The importance of the EC area is emphasized by the large potential that the EC markets carry. Nokia Data has large market shares in small Finnish and Swedish markets; consequently, finding room for growth in these markets is relatively more difficult than in the EC markets. Also the size of Nokia Data's operations in Europe is still small enough that it does not initiate countermeasures by its large competitors.

Nokia Data is seriously approaching the EC markets. It has established marketing subsidiaries in most of the Western

European countries, excluding Italy and some smaller and southern nations. The process for gaining a stronger foothold in the continental markets is still at its early stages, channels have been established and a few larger orders in several markets have been received. It is very much in Nokia Data's interests to increase the weight of the EC nations as export markets.

Nokia Data does not have production in the EC area, but according to Isokallio, initiation of the production is a relatively simple exercise and not yet necessary.¹ Neither does Nokia Data have a R & D unit inside the EC area, but this is quite likely in the near future.

Nokia Data does not have close cooperation agreements with other European producers in the same way as Nokia's telecommunications sector does. They are a member of the X-OPEN unix interface group. The Nokia research center is also connected to the pan-European EUREKA programmes and the EC's ESPRIT programmes developing new technologies at a precompetitive stage. Other technology cooperation links with the EC area were not identified.

As a whole the significance of the EC area seems to be mainly an export market spiced with a considerably large growth potential. In the future, increased technology cooperation could become an important link between Finnish DP equipment producers and the EC. Further the changes in the production structures within Europe have an impact on the operations of Nokia Data not only in the EC markets, but in Scandinavia as well.

¹ Kervinen, 16.12.1988.

5.2 Effects of EC Integration on the Finnish DP Equipment Industry

The effects of the EC integration extend not only to the EC area, but also to the Scandinavian markets, and potentially to the competitive structures of the global DP equipment trade. Increasing the weight of European industries in the global context is one of the aims of the Commission.

In the short term, two to three years, the EC integration process is not likely to have much of an effect on the Finnish DP equipment industry. Some of the Commission's measures dealing with border formalities and other less radical issues can be implemented without much of an immediate effect. The more significant changes in the larger issues of taxation, public procurement, standardization and other possible measures are expected to have their impact after some time, if at all.

The measures taken by the Commission cumulatively filter down to the industrial structures of the DP equipment industry throughout the process. The restructuring in the industry has already been started, and further alliances, mergers and acquisitions are yet expected.

Restructuring the production and marketing organizations is a slow process that requires great amounts of organizational energy. Even if some large European firms would merge or agree on close production cooperation and market sharing schemes the effects on trade would be felt after a considerable time lag.

In the longer term the effects of EC integration are most likely strongly felt in the restructuring of the DP industries. It has been foreseen by numerous specialists that further mergers and alliances are most likely future scenarios. It has also been argued that even without the

integration process the number of DP suppliers is too great in the slowing markets.

What does this mean for Nokia Data? Initially it implies the increased need to follow the developments and to actively seek for participation. Being left out is the standard fear of Finnish industries, with a good reason. The negotiating weight of Nokia Data has increased with the acquisition of Ericsson's DP sector, but it still remains a fairly small operator. Only when the Scandinavian markets are being discussed is Nokia Data's weight considerable. Further concentration of the European "giants" without inclusion of Nokia Data into the cooperation could drastically weaken its possibilities to increase its European operations and even threaten its position in the strong areas of Sweden and even Finland.

Ultimately if a group is formed to generate a strong European DP supplier to challenge the long dominance of IBM, Nokia Data would be a prime target for acquisition attempts. By acquiring Nokia Data a group or even an individual company could gain strong footage in Scandinavian markets. This is not to demonstrate that such activity would be in sight, but when speculating on the potential moves in restructuring of the European DP industry this seems much more potential and feasible than Nokia Data acquiring of one of the larger European producers. Status quo, that is Nokia Data remaining a small independent supplier of niche products seems much more likely at the present stage.

The uncertainty in the course of future developments makes these speculations quite vague. First of all it is not by no means clear how far the EC integration can proceed in the central issues of the "EC central bank", common currency, tax policies, competition laws and other issues with far reaching and yet unknown effects. On the other hand the relationship between the EFTA and EC nations, or Finland and the EC is still under negotiations. Increasing

cooperation seems to be the preferred course by all parties, but to what extent is unclear.

The clarification of the issues related to the creation of the European Economic Space (EES) will show if the potential threats of rules of origin, intellectual and industrial property rights and technical barriers will become a real threat, or will the Nordic suppliers be able to benefit from the unification of regulations in these areas equally with the EC producers.

The creation of the common market is said to enhance the possibilities of profitable exploitation of narrow segments. In the case of Nokia Data this would mean an increased potential in their areas of specialization, namely local area networks and specific applications for certain sectors such as banking. Europe would provide a large market where large investments in R & D to develop specialized systems could be regained.

In short, the EC integration process has a potential of strengthening and further concentrating the European DP production. Finnish participation in the integration process increases the opportunities of Finnish DP producers in niche markets in Continental markets, but at the same time potentially threatens the position and even the existence of the small Nordic PC, terminal and local area network system supplier.

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