The Estonian ICT Manufacturing and Software Industry

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The ICT Unit of the Institute for Prospective Technological Studies – Directorate General Joint Research Centre of the European Commission initiated a research project in 2003 which was aimed at analysing trends in the development of ICT manufacturing and software industries in certain EU candidate countries and then to elaborating various policy recommendations. This paper provides an overview of the situation in Estonia. For a full version of the report [1], please see www.praxis.ee.

THE ROLE OF ICT INDUSTRIES

The existence and development of the ICT manufacturing and software industries is of great importance in the long run for any country. This is because the export of goods and services is the only way to ensure sustainable economic development. Today, these exports mostly consist of manufactured goods, but the role of medium and high-tech trade in the manufacturing industries is increasing at the expense of low-tech industrial goods. The five fastest-growing products in world trade between 1980 and 1997 were all a part of the high-tech information and communications technology field [2]. Thus, if small economies such as those in the Baltic States are to play an active role in the global economy, it is vital that they upgrade their economic systems toward more technology-intensive industries – particularly because the three economies are very open. Generic technology industries (including the field of ICT) have a spill-over effect for all other sectors of the economy. This article reviews the Estonian ICT manufacturing industry from this perspective.

Although software industries presently represent less than 10% of the total ICT market [3], they are growing rapidly, and they are facing many challenges. Compared to ICT manufacturing industries, where efficiencies of scale and sales are on a global level, the local clustering of the software industries with other local sectors is more evident. We will, therefore, also be taking a closer look at the Estonian software industry.

The focus of this paper will be on the largest ICT manufacturing and software companies as of 2003. Issues such as the R&D intensiveness at Estonian ICT firms, linkages between companies and universities, etc., have been thoroughly analysed elsewhere and are not the central issue in this article.

The article is based on the methodology of the Institute for Prospective Technological Studies and offers a statistical view, a listing of the leading companies and universities, etc., and the application of technologies, work organisation and know-how that have been imported from the more advanced countries; several major challenges, however, still lay ahead [5].

Estonia’s Transition

Estonia is often described as one of the most positive and successful examples of the post-Soviet transition process, one with an emerging and innovation-based economy. One of the key factors to Estonian economic development has been the influx of foreign investment and technology transfers, along with improvements in management skills and the emergence of more effective market competition.

Most foreign direct investment (FDI) in Estonia has come from the Nordic countries – Sweden and Finland ranked at the top of the list in 2002, with 40.9% and 26.9% of direct investment stock respectively. A relatively low share of foreign investment has been attracted by the country’s manufacturing industry, however – it is in third place as an investment target. This is the result both of the manufacturing industry’s weakness and of the relative strength of the transportation and finance sectors. In 2000, only 2.9% of FDI in the area of manufacturing was put into the manufacturing of radio, TV and communications equipment, and there was no FDI at all in the manufacturing of office machinery and computers. Only two electronics manufacturing companies were among the top 50 foreign investors in Estonia [4]. Estonia, like other transitional countries in Central and Eastern Europe, has had competitive advantages mainly in the labour intensive (textiles) and resource intensive (timber) industries, while capital and technology intensive industries (chemicals, machinery and equipment) remain relatively uncompetitive. The Estonian economy has, however, been successful in catching up with developed countries via the application of technologies, work organisation and know-how that have been imported from the more advanced countries; several major challenges, however, still lay ahead [5].

Various international reports on Information Society development have praised Estonia for a good ICT infrastructure and a decent online environment. The United Nations Development Report 2002, for instance, ranked Estonia 30th in the world in terms of general technological achievement. A McConnell International report in 2001 placed Estonia not only ahead of most Central and Eastern European coun-
During Soviet times, the radio-electronics and semi-conductor industries were well developed in Estonia. 20,000 people were involved in the manufacturing of electrical machinery and apparatus in 1989. By the early 1990s, however, the entire industry had collapsed.

Between 1992 and 2001, output from the Estonian ICT manufacturing industry grew an average of 30% each year, and the current figure is EUR 234 million (Table 1). The share of the ICT manufacturing industry’s output in all manufacturing output grew from 3.8% in 1995 to 5.1% in 1998 and 6.1% in 2001. In 2002, there were reportedly 9,400 people employed in the manufacturing of electrical machinery and apparatus (down from 10,600 in 2000 and 10,700 in 2001), although this figure seems to be overestimated.

Employment has remained fairly stable since 1994, although production volumes have increased over time, thus demonstrating the capital-intensiveness of the industry.

As far as production volumes are concerned, the Estonian ICT manufacturing industry is around 30 times smaller than the Hungarian industry and eight times smaller than the industry in Poland. Bulgarian production, however, is at a level of only 60% of Estonian production [8].

The three leading ICT manufacturing branches are heavily export-intensive, the main markets being Finland and Sweden. The most export-intensive branch is “manufacture of radio, television and communications equipment and apparatus” (91% of industrial sales in 2001).

The Helsinki and Stockholm metropolitan areas, both of which are close to Estonia in geographic, economic and cultural terms, have some of the leading clusters of ICT-related production and R&D in all of Europe, and these links have made the Estonian ICT sector a part of the larger Nordic IT cluster, mostly through subcontracting in lower value-added activities. This is particularly true for the ICT manufacturing industry.

### Table 1. Estonian production in ICT manufacturing, 2001, current prices

<table>
<thead>
<tr>
<th>Industry (NACE)</th>
<th>Value (million EUR)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture of radio, television and communications equipment and apparatus (NACE 32.1-32.3)</td>
<td>88.2</td>
<td>37.7</td>
</tr>
<tr>
<td>Manufacture of electrical machinery and apparatus (NACE 31.1-31.6)</td>
<td>77.0</td>
<td>32.9</td>
</tr>
<tr>
<td>Manufacture of medical, precision and optical instruments (NACE 33.1-33.5)</td>
<td>52.7</td>
<td>22.5</td>
</tr>
<tr>
<td>Manufacture of office machinery and computers (NACE 30.0)</td>
<td>16.0</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>233.9</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Statistical Office of Estonia.

**THE ESTONIAN ICT MANUFACTURING INDUSTRY**

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![Figure 1. The production value of Estonian ICT manufacturing, millions of euros, current prices. Source: Statistical Office of Estonia.](image-url)
“Manufacture of machinery and equipment” and “manufacture of electrical machinery and apparatus” are also largely focused on foreign markets (57% and 53% respectively), although local consumers, mostly in the construction industry, are also important.

An obviously smaller segment of the Estonian ICT manufacturing industry (% of production in 2001) is office machinery and computer manufacturing. This sector mainly supplies the small local market, with only 1.2% of sales being represented by exports in 2001. The output of locally manufactured computers was estimated to be at a level of 25,000 (2001).

Estonia’s export of commodities is heavily dominated by electrical machinery, equipment, and components. In 2002, total exports of the Estonian ICT manufacturing industry accounted for 21% of all Estonian exports of commodities, amounting to EUR 764 million (in 2000 and 2001 exports in this area amounted to more than EUR 1 billion). Such high figures, however, are balanced by imports on a similar scale (18% of imports, EUR 910 million in 2002). This can be explained through the subcontracting nature of the Estonian ICT manufacturing industry and through imports that are received for inward processing. The situation has also been linked to transfer pricing which seeks to take advantage of Estonia’s tax system.

**Table 2. The number of companies in the ICT manufacturing and software sectors of Estonia in 2001**

<table>
<thead>
<tr>
<th>No</th>
<th>%</th>
<th>Active companies</th>
<th>Activity</th>
<th>NACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2</td>
<td>0.3</td>
<td>Manufacture of office machinery</td>
<td>3001</td>
</tr>
<tr>
<td>12</td>
<td>2.3</td>
<td>2.0</td>
<td>Manufacture of computers and other information processing equipment</td>
<td>3002</td>
</tr>
<tr>
<td>4</td>
<td>0.8</td>
<td>1.0</td>
<td>Manufacture of insulated wire and cable</td>
<td>3130</td>
</tr>
<tr>
<td>37</td>
<td>7.1</td>
<td>9.8</td>
<td>Manufacture of electronic valves and tubes and other electronic components</td>
<td>3210</td>
</tr>
<tr>
<td>3</td>
<td>0.6</td>
<td>0.3</td>
<td>Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy</td>
<td>3220</td>
</tr>
<tr>
<td>16</td>
<td>3.1</td>
<td>3.0</td>
<td>Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods</td>
<td>3230</td>
</tr>
<tr>
<td>33</td>
<td>6.3</td>
<td>7.8</td>
<td>Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment</td>
<td>3320</td>
</tr>
<tr>
<td>15</td>
<td>2.9</td>
<td>2.7</td>
<td>Manufacture of industrial process control equipment</td>
<td>3330</td>
</tr>
<tr>
<td>380</td>
<td>72.8</td>
<td>68.6</td>
<td>Software consultancy and supply</td>
<td>7220</td>
</tr>
<tr>
<td>13</td>
<td>2.5</td>
<td>2.7</td>
<td>Data processing</td>
<td>7230</td>
</tr>
<tr>
<td>8</td>
<td>1.5</td>
<td>1.7</td>
<td>Database activities</td>
<td>7240</td>
</tr>
</tbody>
</table>

**Total**

Source: Centre of Registers, Ministry of Justice, Central Commercial Register, May 2003

**THE ESTONIAN SOFTWARE INDUSTRY**

If the Estonian ICT manufacturing industry is consolidated, heavily export-intensive and based on foreign capital, then the Estonian software industry (defined here in accordance with NACE 7220 – “Software consultancy and supply”) is very different. There are a great many companies in the sector, but production volumes and exports are low, and areas of specialisation have not yet been established.

Although Estonia enjoys the presence of companies which represent major Western software firms such as Oracle, Microsoft, etc., these mostly limit themselves to the sale and servicing of software and, to a certain extent, to localisation.

Key driving engines for the Estonian ICT cluster have been the telecommunications sector, the banking sector and governmental structures [9]. Indeed, the establishment of a strong public sector, the emergence of a private banking system, and the rapid development of wholesale and retail trade – all of these have contributed to the emergence of the Estonian software industry. The impact of traditional Estonian industries on the emergence of the local ICT sector, however, has been marginal, because traditional industries in Estonia are supplier-intensive. The technologies that are used are developed elsewhere and with minimal participation by local companies.

The development of the Estonian software industry has been largely influenced by developments in the public sector. Legislation has created a favourable environment, and the public sector has been active in procuring innovative solutions from local companies. Examples include the online services of the Taxation Board, the “X-road” initiative aimed at modernising national databases, the Estonian ID card initiative, etc. The government has contributed a stable 1% of the national budget to the financing of ICT expenditures. As local companies have mostly been contracted to provide custom solutions, there has been a positive spillover effect. Public sector efforts to build up the Information Society in Estonia have been coupled with the efforts of NGOs.

The banking sector has played at least as big a role as the public sector has done. A modern banking system was in place in Estonia by 1993, and Internet banking services were first introduced in 1996 [10]. What was missing, however, was a strong software industry which could develop and service large-scale banking information systems. Estonian banks had to build up their own in-house capacity. As a result, banks have been the informal leaders of the software industry. The software divisions of Hansabank and the Estonian Union Bank have more personnel than even the biggest Estonian software companies.
The Estonian ICT manufacturing sector is fairly consolidated. Five dominant companies generate most of the turnover and exports, and they employ more than 4,000 people (Table 3). Among the leaders are Elcoteq Tallinn AS, which is the 17th largest foreign investor, with a total investment of EUR 17.5 million as of 2000. JOT Eesti OÜ, with a total investment of EUR 7 million, was in 43rd place among the leading foreign investors in 2000 [11].

**Elcoteq Tallinn AS**

Elcoteq Tallinn AS is a subsidiary of Elcoteq Networks Corporation, the leading electronics manufacturing services company in Europe, with headquarters in Finland. Its main areas of business include the production of terminal products and communications network equipment.

Elcoteq Tallinn AS mostly manufactures electronic sub-assemblies such as electronic parts and accessories for mobile phones, but it also provides engineering and after sales services. The company is by far the leading player on the Estonian ICT scene – it accounted for 83% of Estonian ICT exports in 2001. It was also the biggest Finnish company in Estonia and the biggest exporter in 2002, contributing 15% toward Estonia’s total exports.

As most of the production involves subcontracting work, Elcoteq Tallinn’s sales and performance have substantially relied on major subcontracting orders. At the beginning of 2000, Elcoteq witnessed remarkable export growth and employed as many as 3,600 people. The global telecom market slowdown in 2001, however, seriously affected the company’s business, which resulted in downsizing in Estonia (the number of employees dropped to 2,000 by August 2001) and in Hungary, as well as the conservation of a new plant in Tallinn. Beginning in December 2002, the market situation improved somewhat. The number of employees is now around 2,000 in Estonia, and the aforementioned plant is now in operation.

There have been discussions in the media about the possibility that Elcoteq might move its headquarters from Finland to Estonia, mostly for reasons of corporate income taxation schemes in the two countries. Most analysts do not believe that this will happen, however, and they question how long Estonia will remain attractive as a place for high-volume manufacturing, especially in light of the fact that Estonian salaries are increasing quite rapidly when compared to those in places such as China. Elcoteq Networks Corporation bought two manufacturing plants in China at the end of 2002, which substantially increased the proportion of net sales derived from the Asia-Pacific region, as well as the number of Elcoteq employees in that region.

**JOT Eesti OÜ**

JOT Eesti OÜ (JOT Estonia) was established in 1997 by Finland’s JOT Automation Group. It is presently a part of the Elektrobit Group, after a merger between JOT Automation and Elektrobit in May 2002.

The Elektrobit Group is a versatile engineering company, with customer groups including telecommunications manufacturers and operators, electronics contract manufacturers, component and subassembly manufacturers, automotive electronics manufacturers, industrial automation manufacturers and the defence and space industry. The

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**Table 3. The top 5 Estonian ICT manufacturing companies by turnover, 2001**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elcoteq Tallinn AS</td>
<td>FIN</td>
<td>Tallinn</td>
<td>3210</td>
<td>Pub LC</td>
<td>39.2</td>
<td>37.6</td>
<td>2,635</td>
</tr>
<tr>
<td>JOT Eesti OÜ</td>
<td>FIN</td>
<td>Tallinn</td>
<td>3330</td>
<td>Pri LC</td>
<td>17.2</td>
<td>15.4</td>
<td>186</td>
</tr>
<tr>
<td>Keila Kaabel AS</td>
<td>FIN+local</td>
<td>Keila</td>
<td>3130</td>
<td>Pub LC</td>
<td>17.2</td>
<td>15.4</td>
<td>57</td>
</tr>
<tr>
<td>Harju Elekter AS</td>
<td>Local</td>
<td>Keila</td>
<td>3120</td>
<td>Pub LC</td>
<td>12.5</td>
<td>13.1</td>
<td>673</td>
</tr>
<tr>
<td>Tarkon AS</td>
<td>SWE</td>
<td>Tartu</td>
<td></td>
<td>Pub LC</td>
<td>10.4</td>
<td>11.4</td>
<td>600</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>96.5</strong></td>
<td><strong>114.7</strong></td>
<td><strong>4,151</strong></td>
</tr>
</tbody>
</table>

Source: Centre of Registers, Ministry of Justice, Central Commercial Register, May 2003, and public sources
telecommunications industry makes up the company's main group of customers, however, accounting for around 80% of net sales.

JOT Eesti OÜ is involved in industrial automation production, which is entirely aimed at export. In 2000, JOT Estonia's export revenues and turnover amounted to EUR 37 million. JOT Estonia employed 186 people in 2001.

**AS Keila Kaabel**

The core business of AS Keila Kaabel, which was founded in 1992, is the production and wholesale of low-voltage, power, installation, telecommunications and specialised cables for the Baltic countries.

The leading owner of the company is Draka Holding N.V., which is one of the world's largest cable concerns and holds a 66% share in AS Keila Kaabel via Draka NK Cables (Nokia Cables until 1997). Employing more than 750 people, Draka NK Cables is headquartered in Finland and has subsidiaries in Estonia, Russia, Singapore, Sweden and other countries. The remaining 34% of shares belong to AS Harju Elekter.

AS Keila Kaabel's turnover amounted to EUR 21 million in 2002, when the firm employed a total of 67 people.

**AS Harju Elekter**

AS Harju Elekter (Harju Electricity, Ltd.) is the leading electrical equipment producer in the Baltic countries. Its core business is the production of electrical equipment for power distribution networks, and it also serves as a subcontractor in the production of cable harnesses and connection cables for the automotive and electronics industries. It is the only Estonian ICT manufacturing company that is quoted on the Tallinn stock exchange.

The company had 351 employees in 2002 and belongs mostly to Estonian shareholders. Net sales in 2002 amounted to EUR 17.3 million, of which the export share was 44.5%.

**AS Tarkon**

AS Tarkon's predecessor – the telephone factory Edisson-Kompagnie – was established in August 1907. During World War I, it produced more than 13,000 telephones. During the Soviet era, the company operated under the name of the Tartu Control Equipment Factory, and it was focused on the production of “black boxes” or flight recorders for civil and military aircraft. Reorganised as a state company, RAS TARKON, in 1992, it was then privatised in 1996, when it was sold to Hallberg Sekrom AB of Sweden.

Right now the company focuses on the manufacturing of fine mechanical components and diverse assembly works, including cables, telecommunications systems electronics, the automotive industry and apparatus building.

The company has 600 employees. Turnover in 2000 exceeded EUR 11 million, and exports of EUR 7 million came from subcontracting for Scandinavian companies, among which the leading ones were Elcoteq and Ericsson.

**SOFTWARE CONSULTANCY AND SUPPLY COMPANIES IN ESTONIA**

Although 380 companies are officially registered as software supply and consultancy companies (NACE 7220-2001) in Estonia, experts estimate the actual number to be much smaller, perhaps 150 or so [12]. Some of the major players are presented in Table 4.

The largest of the companies in Table 4 is owned by the state and has close links to the academic sector. Companies which produce software for Western clients, for large local enterprises, and/or for large-scale public projects tend to be the most successful ones.

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**Table 4. Estonia’s top 5 software companies by turnover and employment, 2001**

<table>
<thead>
<tr>
<th>Name</th>
<th>Company Info</th>
<th>Work-force (2001)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cybernetica AS</td>
<td>Cybernetica AS, established in 1997 as a spin-off of the Institute of Cybernetics, is an information security (communications security products, digital signature technology), information systems (development of mission-critical systems) and navigation systems (visual navigation, signalling and telematics systems and their components) development company. Its main clients are public organisations, banks, telecom companies and ports. It has been an active participant in EU R&amp;D programmes.</td>
<td>92</td>
</tr>
<tr>
<td>Abibase Systems AS</td>
<td>Abibase Systems AS, established in 1990, was, according to the newspaper Aripäev, the best IT company in Estonia in 2001. The company is the Estonian representative for many world-leading IT corporations. Next to hardware retail and support services, it is heavily involved in information systems development, using Oracle software-based client-server applications; component technology-based Web solutions of tiers; analytical data warehouses and geo-information systems.</td>
<td>59</td>
</tr>
<tr>
<td>MicroLink Süsteemid AS</td>
<td>MicroLink Süsteemid AS, a subsidiary of the largest Baltic IT company and with a total of around 650 employees, is the largest of the five business units and contributed 42% of MicroLink Group sales in the 2001/02 fiscal year. The company has started to focus on systems development (based on Oracle, Microsoft, Progress) rather than purely on product sales. Its main clients in Estonia in 2002 were media agencies and public sector institutions.</td>
<td>90</td>
</tr>
<tr>
<td>Helmes AS</td>
<td>Helmes AS, established in 1991, provides services to corporate and government organisations. The company specialises in Microsoft .NET-based software development, XML, EDI.</td>
<td>60</td>
</tr>
<tr>
<td>Cell Network AS</td>
<td>Cell Network AS, a subsidiary of the Swedish company Cell Network AB, is involved in the development of system and application software and sales of computers and relevant peripherals.</td>
<td>76</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td></td>
<td><strong>285</strong></td>
</tr>
</tbody>
</table>

Source: Centre of Registers, Ministry of Justice, Central Commercial Register, May 2003, and public sources.
CONCLUSIONS

On the basis of this overall national analysis, a number of provisional conclusions can be drawn about the Estonian ICT manufacturing and software industries:

• Over the course of the last decade, the Estonian economy has been modernised by foreign direct investment, mainly from Sweden and Finland. However, the manufacturing industry is only the third largest target for investment. Radio, TV and communications equipment manufacturing received 3% of total investments in 2000. There were two ICT manufacturing companies among the top 50 foreign investors in Estonia.

• Estonian ICT manufacturing production amounted to EUR 234 million in 2001, dominated by the manufacture of radio, television and communications equipment (38% of total manufacturing in that year), followed by the manufacture of electrical machinery and equipment (33%). Total production is 30 times smaller than Hungarian output and eight times smaller than Polish production.

• Estonian ICT manufacturing branches are largely export-intensive. Office machinery and computer manufacturing, however, is a smaller segment in the Estonian ICT manufacturing industry, mostly supplying the small local market.

• The Estonian ICT manufacturing sector is dominated by five companies, most of them owned by investors from Finland. Companies in the area of cable manufacturing, however, mostly belong to Estonian shareholders.

• The role of the ICT manufacturing and software industries in Estonia is moderate when compared to that of other industries.

• The Estonian software industry is small and highly fragmented. Its development has been strongly influenced by the needs of the local market (especially banking, telecommunications and the public sector). Most companies still work for the local market.

The bottom line is that the Estonian ICT manufacturing industry is actually a part of the larger Nordic IT cluster. Estonian ICT manufacturing companies and, to some extent, software companies, too, are currently involved in lower value-added activities. For these two reasons, the Estonian ICT sector is strongly dependent on the health of a number of Nordic companies. Most analysts, however, question Estonia’s ability to remain attractive as a place for high-volume ICT manufacturing, because other low-cost production areas are emerging in the world. This means that serious efforts must be made in terms of transforming the existing ICT manufacturing industry towards greater knowledge-intensive activities. In addition to changes in the systems of higher education and R&D, this will require the heavy involvement of foreign company owners. It is also crucial to come up with an understanding of the way in which Estonia can attract high-quality FDI in the future – investments that could go, for instance, into R&D and help in providing access to global production networks. There are a number of successful examples from which Estonia can learn – Finland, Ireland, South Korea, the Dresden semiconductor cluster, etc. The specifics of small countries in the context of ongoing globalisation processes must be taken into account.

It is also clear that future economic development in Estonia will be strongly dependent on biotechnologies and, especially, the clustering of ICT and biotechnologies. This should certainly be one of the R&D financing priorities, and it is listed in the strategic document “Knowledge-based Estonia”. In the near future, the clustering of Estonia’s traditional industries with the ICT manufacturing and software industries should be actively encouraged as a part of Estonia’s industrial policy, with the relevant social issues (increasing health expenditures, for instance) as a part of the mix.

REFERENCES

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