INSIGHTS INTO THE ICT INDUSTRY IN TURKEY

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EXECUTIVE SUMMARY

In order to understand the socio-economic impact of ICTs in the New Member States and Candidate Countries,[1] the Institute for Prospective Technological Studies (IPTS), part of the European Commission's Joint Research Centre, has launched a number of studies as part of a project on Foresight in Information Society Technologies in an Enlarged Europe (FISTE).[2] This paper is one in a series of national contributions[3] which aim to provide data on the size of the ICT manufacturing and software industries and their development trends in the New Member States and Candidate Countries, and on the largest companies in both industries. It also provides an insight into the challenges these countries and companies must face, if the Lisbon objectives are to be achieved.

This paper uses the methodology provided by IPTS and offers a statistical view and a listing of leading companies with some anecdotal evidence on each. The paper is based on existing studies on the topic. In addition, data from the State Institute of Statistics of Turkey and from the Turkish Undersecretary of the Treasury has been used. However, the methodological issues raised when exploring such questions are numerous, starting with the scarcity of up to date data, the absence of commonly agreed frameworks and the resulting difficulties with comparing data between countries.

The report, nevertheless, tries to document these complex issues by analysing and contrasting available data from various sources, including interviews or press releases. International sources have been used in a traditional way, but further information at micro-level provides a close-up of the dynamics of a rapidly evolving economic sector. This gives originality to the contribution, which offers a genuine insight into the ICT manufacturing and software industry in Turkey, its current status and future outlook.

[1] Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Turkey.

[2] http://fiste.jrc.es/

[3] See also Tarmo Kalvet, *Insights into the ICT Manufacturing and Software Industry in Estonia, and* Corina Pascu, *Insights into the ICT Manufacturing and Software Industry in Romania*, EN, Spain: Joint Research Centre (DG JRC), IPTS, 2004

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1 AN OVERVIEW

Turkey is the largest European candidate country in terms of both area and population with a population of 68 million and 814,578 square km of territory. It is also one of the biggest economies in terms of GDP value and the second biggest market among the New Member States and Candidate Countries (NMS & CCs).

Basic statistical data[4]

Population (2000)	Size (km2)	Employment rate (2002)	Unemployment rate (2002)	% Of employment in industry (2002)	GDP per capita $ (2003)
67.803.927	814.578	43,5 %	10,6 %	19,2 %	3383
FDI (M € – 2000)	**R&D expenditure as % of GDP (2000)**	**Total ICT production value (M$ - 2001)**	**Total ICT Spending * (M € - 2001)**	**Total IT Spending * (M € - 2001)**	**IT spending/ GDP in % (2001)**
3044	0,64 %	2,298	10,749	2,467	1,49%

Turkey faced major economic crises throughout the 1990s. These crises were so severe that the GDP per capita in 2001 (2,123 USD) was lower than it was in the 1990s (.2,682 USD). Although it increased to 2,584 USD in 2002, it remained lower than it was in the 1990's. In the same context, the unemployment rate increased to 10.6% in the year 2002. The overall employment rate was 43.5% in 2002 (19.2 % in industry).

Total foreign direct investment was 13.1 billion USD from 1990 - 2001. For the years 1999, 2000 and 2001, the largest amount of FDI came from France (17.7 %) followed by Holland (13.6 %), Germany (12.8 %) and the USA (11.6 %).[5]

Basic statistical time series

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Gross National Product per Capita ($)6	2682	2621	2708	3,004	2,184	2,759	2,928	3,079	3,255	2,879	2,965	2123	2584
Total FDI realizations (million $)7				1,016	830	1,127	964	1,032	976	817	1,719	3,044	
Number of foreign capital company				2,554	2,830	3,161	3,582	4,068	4,533	4,950	5,328	5,841	
Trade bal. (MUSD)8				-14.096	-5.166	-14.069	-20.417	-22.289	-18.965	-14.072	-26.706	-9.052	
Unemployment (% of labor force)9	8.0	8.2	8.5	9.0	8.6	7.6	6.6	6.8	6.9	7.7	6.6	8.4	11

R&D expenditure was 0.64%of GDP in 2000. The share of the business sector in the total R&D expenditure is around 43.3%. More than 55% of R&D is carried out by the university sector.[10] Most of the rest of the R&D infrastructure is in government laboratories, operated principally by the Council for Science and Technology

[4] Data Source: State Institute of Statistics, Turkey, and (*) EITO 2002

[5] Data Source. Turkish Undersecretariat of Treasury. Report prepared by General Directorate of Foreign Investment in 2001, titled "Investment In Turkey and Improving Investment Climate".

[6] Data Source. State Institute of Statistics, Turkey.

[7] Source: Turkish Undersecretariat of Treasury, http://www.investinginturkey.gov.tr/english/ybs/geneling.htm

[8] Trade Balance is calculated from the Import and Export/Import ratios as follow Trade Balance= Import x (Export/Import. Source for Import and Export/Import ratios is Treasury.

[9] Source: State Statistics Institute.

[10] OECD, Science, technology and Industry Outlook, 2002.

(TUBITAK) for civilian research and by the Ministry of Defense for defense purposes. Practically all the R&D infrastructure is located in the Ankara and Istanbul areas.

Turkey is the only country which made custom Union agreement with the European Union without getting full membership. Turkey signed this agreement in 1995 and fully opened its market to EU countries. This agreement was one of the factors, which negatively influenced Turkey's trade balance as well as its ICT industry trade. Till 1994, there was a balance between ICT production and ICT import values. After 1995, however, the balance between ICT production and import values changed radically. Turkish ICT import value was 6,577,130 USD, which was 2.25 times its ICT production value. Although there has been a tremendous increase in ICT export value from 1997, the export/import rate has not changed.

Electronics Industry between 1992-2001[11] (000$)[12]

DISTRIBUTION OF ELECTRONIC INDUSTRY PRODUCTION BY YEARS			
YEARS	PRODUCTION	IMPORT	EXPORT
1992	2,022,411	1,760,857	400,611
1993	2,010,804	2,013,846	383,251
1994	1,160,804	1,636,218	408,276
1995	1,230,883	2,235,455	502,247
1996	1,575,916	3,017,213	687,485
1997	2,290,500	3,886,177	849,222
1998	2,489,304	4,388,742	1,256,926
1999	2,561,600	5,450,885	1,163,310
2000	2,910,645	6,577,130	1,391,894
2001	2,298,720	4,118,332	1,515,710

Changes in the electronic industry's production, and import and export figures also reveal the structural changes in the ICT industry during last decade. GSM based technologies - namely base stations, mobile switches and handsets - were heavily imported in those years. The domestic production of PSTN based telecommunication devices declined in the same period. Consumer electronics made a major contribution to ICT exports. Despite these changes, electronic exports and imports were around 5% and 10% of the total export and import figures respectively from 1999 to 2001. The ICT share of total exports increased from an average of 3% during 1995-1997 to 5% during 1999-2001.

Total ICT production and spending were 2,298 million USD and 10,749 million € respectively in 2001. Total IT spending in 2001 amounted to 22.9% of ICT spending (2,467 million €).

Total Import/Export and the Share of the Electronic Industry (Million $)

TOTAL IMPORT/EXPORT and THE SHARE OF THE ICT							
	1995	1996	1997	1998	1999	2000	2001
TOTAL IMPORT	35,709	43,620	48,550	45,935	40,687	53,983	40,507
ICT IN IMPORT	2,235	3,017	3,866	4,399	5,451	6,577	4,118
% SHARE	6.3	7.1	8.0	9.6	13.4	12.2	10.2
TOTAL EXPORT	21,637	23,224	26,261	26,974	26,587	27,324	31,186
EXPORT IN ICT	502	688	849	1,257	1,163	1,392	1,516
% SHARE	2.4	2.9	3.2	4.7	4.3	5.1	4.9

[11] Source: TESID (Turkish Electronics & Information Industries Association)
[12] Source: Idem

Distribution of production, export and import figures among ICT sub sectors reveals the fact that export was highly concentrated in Consumer Electronics, while import was evenly distributed with a slight concentration in components and telecommunication sectors. Production was concentrated in consumer electronics, and reflected in the export figures.

Distribution of ICT Production, Export and Import by Years[13]

DISTRIBUTION OF ICT PRODUCTION, EXPORT and IMPORT BY YEARS						
	PRODUCTION (000 $)		IMPORT (000 $)		EXPORT (000 $)	
SUBSECTORS	2000	2001	2000	2001	2000	2001
Components	136,000	88,400	1,146,808	1,038,251	63,583	50,039
Consumer Equipment	1,480,025	1,083,085	523,691	401,348	873,116	904,307
Telecommunication Equip.	624,120	503,235	2,463,351	972,131	191,763	295,276
Other Prof.&Ind. Equip.	255,000	215,000	992,056	958,399	30,692	47,104
Defense Electronic	215,500	204,000	-	-	177,700	178,500
Computer	200,000	205,000	1,451,224	748,203	55,040	40,484
TOTAL	2,910,645	2,298,720	6,577,130	4,118,332	1,391,894	1,515,710

Distribution of export and import by regions reveals that 63% of ICT imports and 65% of ICT exports were made to or from European countries. ICT exports to the Far East (1% of the total) were much lower than the imports (20% of the total) as the Far East is a major source of components.

Distribution of ICT Export and Import by Region[14]

DISTRIBUTION OF TOTAL EXPORT AND IMPORT BY REGIONS IN 2001				
Group	Ratio%	Import (000 $)	Ratio%	Export (000 $)
North America	10.14	417,740	1.21	18,278
European Union	55.98	2,305,400	58.80	891,250
Other European Countries	7.34	302,299	5.87	89,031
North Africa Middle East	2.42	99,660	7.20	109,159
Caucasus	0.22	9,126	1.77	26,838
Russian	1.30	53,538	3.19	48,381
South America	0.28	11,407	1.06	16,041
Far East	20.33	837,294	0.98	14,836
Others	4.07	267,583	15.98	222,446
Defense Electronic	0.00	0	11.78	178,500
Total		4,118,332		1,515,710

[13] Source: Idem
[14] Source: TESID

2 THE TURKISH ICT MARKET[15]

The Turkish ICT market, valued at 10,749 million € in 2001, makes up 35.2% of the total CEEC market (estimated at 30,510 million €). This makes it the second biggest ICT market among CCs, after the Polish one. In 2001, the Turkish ICT market[16] showed a -27% year-on-year (negative) 'growth' (compared with 2000), growing again in 2002 to 12,285 million € (a 14.3% year-on-year rate), and reaching an estimated 14,728 million € in 2003 (a 19.9% year-on-year growth rate).

Telecom Services account for the biggest share, with 60.8% of the market, while the ICT equipment has a share of 29.2% of the total ICT market. Very small shares are left to the software market (2.8%) and the IT services market (7.1%). The growth of the ICT market is driven by telecom services and ICT equipment segments. The sharp downturn registered in 2001/00 for both segments caused a fall in the whole ICT market to -27%.

ICT Market values, 2001[17]

	% of Total	2000/99 %	2001/00 %	2002/01 % (estim.)
Total ICT equipment	29.2	21.7	-48.9	44.7
Computer hardware	9.9	-6.5	-11.6	5.3
Office equipment	1.8	11.5	-44.6	41.8
End user comm. equipm.	6.3	-23.4	-57.1	57.4
Datacomm. and network equipm.	11.2	149.3	-42.4	29.2
Telecom Services (incl. Internet and online services)	60.8	26.4	-12.9	3.3
Software products	2.8	19.2	-25.9	55.9
IT services	7.1	46	9.1	-19.2
Total ICT market	100	25.9	-27	14.3

In the telecom services market, telephone and mobile services have the biggest shares (53.6% and 41% respectively). The downturn of the telecom services market in 2001 was determined by the respective -10%, and -17.6% negative growth rates of these segments.

In the ICT equipment market, data communication and network equipment has the biggest share (38%), while computer hardware holds 34%. Although the growth rate for data communications was 150% in 2000, growth in the ICT equipment segment slowed as the computer hardware market shrank (37.9% growth rate of the PC sales, but –31.6% for the workstations market).

Support services make up the segment with the biggest growth rate in 2000/99 (46%) and share of the IT services market (55%). Their progression (80% increase in 2000/1999, but only 15% in 2001/00, and -15% in 2002/01) has thus driven the segment.

[15] This section on market data has been calculated and written by C. Pascu (IPTS), on the basis of data from EITO 2002

[16] Source of data: EITO 2002- CEECs ICT market values

[17] Source of data: EITO 2002, Calculation IPTS

2002 TOP 20 Telecommunication Service Providers, Computer Hardware, Software and Service Provider [18]

Rank	Company	USD (x1000)	Rank	Company	USD (x1000)
1	TÜRK TELEKOM	3.420.850	11	A-TEL PAZARLAMA	170.423
2	TURKCELL	2.099.988	12	ARENA	158.276
3	TELSİM	590.000	13	DIGITAL PLATFORM	126.284
4	ERICSSON	322.218	14	SIEMENS	122.765
5	KVK MOBİL TELEFON	317.451	15	KOÇSİSTEM	109.668
6	NETCELL	224.132	16	NORTEL NETWORKS NETAŞ	108.014
7	HEWLETT-PACKARD	202.772	17	METEKSAN SİSTEM	99.946
8	IBM	202.373	18	ALCATEL-TELETAŞ	89.402
9	GEN-PA TELEKOMÜNİKASYON	201.160	19	MICROSOFT	84.672
10	INDEKS BİLGİSAYAR	188.859	20	XEROX	71.253

According to an annual survey of the top 500 ICT firms[19], three telecommunication operators are the top ICT firms in terms of revenue in Turkey. Turk Telekom has been the leader of ICT firms since the end of the 90's.

Major ICT Firms and their Ranking in the Turkish Economy[20]

Firm	Rank	Turnover MUSD
Arçelik	5	773,7
Vestel	9	691,6
Beko	17	330,4
Siemens	29	231,8
Aselsan	35	208,5
Alcatel	42	177,1
Netaş	90	115,8

Arçelik, Vestel and Beko are three important consumer electronics producers in Turkey. Arçelik and Beko are subsidiaries of the same holding company, namely KOÇ Holding. Arçelik produces both electronic and white goods. Arçelik's business includes the production of white goods, as well as electronic goods. However, Beko and Vestel are almost solely electronic goods producers. The list also includes some foreign firms: Siemens, Alcatel and Netaş (a Nortel Networks subsidiary). These firms mainly produce PSTN related product and services in Turkey with the exception of Siemens, which has also some industrial electronics related business.

[18] http://www.interpro.com.tr/bilisim500/
[19] Interpro data
[20] Istanbul Chamber of Industry, http://www.iso.org.tr/

3 A COMPANY-BASED INSIGHT INTO THE TURKISH ICT SUPPLY SIDE

Consumer electronics and telecommunication are two important ICT sub-sectors in terms of production, and export and import figures and both deserve a closer look as they could reveal the effects of different policies. These two sub-sectors have their own development trajectories with completely different drivers and different outcomes.

Telecommunications equipment and consumer electronics are the two sub-sectors that contribute most to economic activities in the ICT market. This fact is easily observable from the sub-sector distribution.

Turkey made big telecommunications investments in the 90s and enlarged and modernized its fixed line capacity. It attempted to develop a public policy with a strong emphasis on generating manufacturing and technological capability in the telecommunication sector. As a result of this policy, Turkey gained significant production and limited research and development capability between 1980 and the beginning of the 1990s. With this limited R&D capability, Turkey was generally recognized as a potential intermediary producer country in the region.[21] Having failed to persist with the implementation of this policy, however, Turkey has lost most of its production capability since then.

On the other hand, despite the fact that Turkey has not followed any well-defined or concentrated national policy to obtain production and technology capability in the consumer electronics sub-sector (other than the policy giving general incentives and support to all industries), Turkey has gained an important production and technology capability in that sector.

3.1 The Consumer Electronics (CE) Subsector

The consumer electronics (CE) market has been an important field of activity in Turkey. This sector has mainly depended on the large domestic market since the 1990s. Additionally, a closer look at CE production and export figures reveals that 95% of the total CE production and 97% of all its exports are in the Colour TV segment.

The domestic market has created a good climate for building technological capability. There is a highly developed broadcasting and content sector in Turkey. There are more than 20 channels broadcasting nation wide, 5 of which are public broadcasting stations. There are also more than 300 channels available locally or regionally. This highly developed broadcasting and content sector and its large domestic market has supported the development of consumer electronic sector.

[21] Richard Hawkins, "Prospect for a Global Communication Infrastructure in the 21st century : Institutional Restructuring and Network Development, "Media in Global Context: A Reader, New York: Edward Arnold Publishing Corp, 1997, page 177-193

Consumer Electronics Sub Sector: Production, Import and Export[22]

CONSUMER ELECTRONICS SUBSECTOR DISTRIBUTION OF PRODUCTION, IMPORT AND EXPORT BY YEARS						
PRODUCTS	PRODUCTION(000 $)		EXPORT (000 $)		IMPORT(000 $)	
	2000	2001	2000	2001	2000	2001
Color TV	1.385.300	1.028.500	844.339	878.581	147.475	92.524
Audio Equipment	29.050	6.500	902	2.435	109.834	74.033
Video Players	850	1.440	886	975	53.708	30.785
Cash Registers	16.750	14.895	783	3.133	55.964	35.296
Electronic Calculators	2.050	1.550	203	78	10.947	12.964
Audio Video Tape	16.165	14.000	15.446	12.365	69.691	95.754
Radio and TV receivers antenna trans.	24.000	12.000	9.302	5.705	64.778	48.808
Electronic scales	5.850	4.200	1.255	1.035	11.294	11.184
TOTAL	1.480.025	1.083.085	873.116	904.307	523.691	401.348

The largest firms in the domestic market as mentioned above, are namely Vestel, Beko and Arçelik. Beko and Arçelik, part of the same holding company (Koç Holding), are the brand names of two different durable goods. The Beko brand is widely known in foreign markets. Vestel and Beko compete in both domestic and European markets. Currently, Vestel has a 20% market share in color TVs in Europe. Additionally, the product portfolio of these firms is not limited to matured CRT television sets. They have their own technology and products using plasma, LCD and MEMS technologies.

In 2002, Arçelik[23] acquired Blomberg, a Brandt company located in Germany. Following this acquisition, Arçelik purchased Elektra Bregenz, a Brandt owned company in Austria, and its brand Tirolia. Subsequently, Arçelik acquired two UK cooker brands, namely Leisure and Flavel, as well as Romania's largest white goods manufacturer, Arctic. Beko acquired “Home Intermedia System Division” of the well known German electronics company Grundig AG in January, 2004. Through these acquisitions, Turkish Koç Holding companies became the owner of production plants and seven new brands in Europe. In 2002, Arçelik sold to more than 80 countries, increasing its international sales, which have reached 725 million €, by 146%.

In July 2000, along with world leaders such as Cisco Systems and Dell Computer Corp., Arcelik has established a partnership with Ubicom, an American company based in the Silicon Valley. Ubicom, formerly known as Scenix, is a provider of Internet-edge processor and software platforms for ubiquitous communications. Through this partnership, Arcelik plans to integrate the Ubicom microcontroller solution into its projects where new technologies unique in their field have been used. Thus "smart appliances" controlled remotely from anywhere in the world will be available to consumers. Ubicom’s representative in Turkey is Artesis, a subsidiary of Arcelik dedicated to R&D into "state of the art" systems for quality assurance and condition monitoring.

Beko Elektronik[24] is Europe’s third largest television manufacturer and provides quality products under its own name, as well as to major, well-known brands. Beko Elektronik

[22] Source: TESID
[23] http://www.arcelikas.com/
[24] http://www.beko.com.tr

exports to more than 60 countries. 85% of its exports go to the European community.It is increasing the number of countries and continents in its export drive and also exports production technologies. Beko Elektronik's 2002 television volume exceeds 4 million units and projected sales for 2003 are more than 5 million units. Due to the economic crisis that Turkey faced in 2001 and the Iraq War in 2003, the domestic market shrank though Beko Elektronik managed to retain its leadership of the market with a share of 48%.

VESTEL[25] is another important Turkish OEM/ODM (original equipment and original design manufacturer) consumer electronics manufacturer. It was acquired by its current owner, the Zorlu Group, in 1995 when the total production of the company was only 500,000 color TVs. However, by 2002 Vestel produced 6.4 million color TVs, 2.4 million digital products including digital satellite receivers, DVD players, Internet access devices and interactive digital-to-analog TV converter boxes. The Vestel Group consists of Vestel Electronics (a colour TV manufacturer), Vestelkom (a digital products manufacturer), Vestel Foreign Trade (exporter), and Vestel Pazarlama (a domestic marketing company). Vestel Electronics, the parent company, directly or indirectly owns all the group companies. Vestel Electronics trades on both the Istanbul Stock Exchange and the London Stock Exchange (49% of its shares are publicly owned). The group's consolidated revenue for the fiscal year 2002 is 1.4 billion US D. The company currently has a 20% market share in color TVs in Europe and a similar market share is targeted for digital products by the end of 2004. The company has also made a successful entry into the next generation colour TV market, which includes plasma, LCD and MEMS technologies. The company has been shipping plasma TVs for three years. It started shipping LCD TVs simultaneously with the major brand names in 2002 and is ready to produce DLP TVs (with MEMS technology by Texas Instruments).

Vestel expects to produce more than 11 million consumer electronic product units in 2003, and will thus rank among the top three European companies on the international market. It exports 93% of its products to 110 countries in the world and 70% of these exports are to the EU. On the consumer side, Vestel's customers include JVC, Toshiba, Hitachi, Mitsubishi, Sanyo. The company offers design, manufacturing, point deliveries and facilitation services. Every year the company designs more than 1000 different models for its OEM customers, to be sold exclusively by them in their own market segments.

Consumer electronic sector development, supported by the highly developed broadcasting sector, the large area of the country and its corresponding domestic market have allowed the emergence of very strong industrial players in the TV/Video sub-segment. These players have, in turn, been able to develop beyond the domestic market, serving retailers and major global companies.

3.2 The Telecommunication Sub Sector

The telecommunications sub-sector is the second most important ICT sector in Turkey in terms of economic figures. Telecommunications equipment production started in 1960s. During 1960-1980, analog multiplexers, transmission systems and analog switches were produced by the industry. Production, however, was limited in volume. In the 1980s the structure radically changed and digital technology based production

[25] Source: http://www.vestel.com.tr and Mr.Cengiv ULTAV (Member of Executive Committee of VESTEL).

facilities were established in Turkey. The following table indicates the distribution of production in the telecommunication sub-sectors.

Telecommunication Sub Sectors, Production, Import and Export

TELECOMMUNICATIONS SUBSECTOR PRODUCTION IMPORT and EXPORT BY YEARS						
PRODUCTS	PRODUCTION (000 $)		EXPORT (000 $)		IMPORT (000 $)	
	2000	2001	2000	2001	2000	2001
Automatic Telephone Exchanges	208,265	115.250	10,847	13,212	336,033	83,382
User-End Equipments	55,560	30.500	9,503	6,462	87,807	53,207
Transmission Equipments	108,750	76.035	31,936	37,591	359,777	205,957
Wireless Telp./Telgrph. Equipments	55,045	50.850	38,535	35,944	1,611,118	550,397
Receiver/Transmitter antennas	11,500	12.600	7,386	10,687	55,561	55,809
Telecommunication Cables	185,000	218,000	93,556	191,380	13,055	23,379
TOTAL	624,120	503,235	191,763	296,276	2,463,351	972,131

The telecommunications equipment sector was highly regulated and driven by the national PTT until the early 90s, during which time Turkey made big telecommunications investments. During this period, major international telecommunications equipment suppliers were forced by the Turkish PTT, and later Turk Co, to set up national production and R&D capability. They were requested to supply proof of national added value, if they wished to take part in PTT infrastructure tenders. As a result of this policy, Siemens, Alcatel, Northern Telecom and Eriksson either installed local manufacturing facilities or enlarged existing ones in Turkey.

PTT also requested the international producers to devise a new and cheaper solution to cover the large rural population of the country, through R&D carried out in Turkey. In response to this policy, Siemens and Alcatel developed and produced new rural exchanges for Turkey. Siemens developed a rural exchange called “Anadolu” and the software for this product was also developed by local engineers.[26]

As a result of this policy, Turk Telecom also created an important software development capability in Turkey. This has created some spillover in the sense that some of the software for other Siemens products and for other countries, such as HiPath (PBX product of Siemens), lawful interception solutions and products, and Web Frame Work for enterprise companies, have also been developed by local Siemens subsidiaries.[27]

Besides the major international firms, some domestic firms such as TELESIS and KAREL, which originated from the PBX/PABX industry, also increased their production capabilities during the 1990s.

TELESİS

Established in 1983, Telesis has grown rapidly as a manufacturer of leading-edge telephone exchange systems. Today, it has a workforce of more than 120, 25 of whom are engineers. Marketing, sales and after-sales services are handled by Ankara headquarters as well as Telesis's branch offices in Istanbul and Izmir. Fully one third of Telesis's staff is assigned to these services.

[26] There is a 1,366,000 line unit installed capacity of Anadolu exchanges
[27] Interview with E. Alptekin, Siemens AS, PSE TR

Over the years, Telesis has succeeded in designing, producing and delivering to its customers over 2 million telephone lines. These lines make up four generations of telephone exchanges, two of which are based on digital systems.

In 2001, TELESIS delivered 150,000 telephone lines, half of them going to public and private sector entities in Spain, United Kingdom, Greece, Portugal, Poland, Albania, Pakistan, Hungary, Czech Republic, Russia, Romania, Bulgaria and various Middle Eastern and African countries. In each of these markets, Telesis has won the approval of the national telecommunications authorities.

Telesis now accounts for 25% of the PBX domestic market.

Telesis also produces rural telephone exchanges, which are currently used in Poland and Turkey. Telesis won the rural exchange tender in Pakistan in July 2003. Its share in the Pakistani telecommunications sector rose to 50% in two years.[28]

KAREL

Karel was founded in 1986, to produce fully automatic electronic telephone systems for small and medium sized enterprises and has pioneered the transition in Turkey from electro-mechanical telecommunications systems to electronic systems.

KAREL is a leading supplier, offering advanced telecommunications solutions to the fast growing and dynamic telecommunications industry in Turkey. It delivers products and services to more than 20 countries in Europe, Africa and Asia. It is also the leader of the Turkish PABX market, with a total of 3.6 million PABX lines installed, an average of 450.000 PABX lines/30.000 PABX unit sales per year, 75% market share of the small systems and a 50% market share in the total PABX market.

As a result of global policy changes, Türk Telekom also changed its policy of creating domestic production and R&D. In parallel to this policy shift, the Turkish market was saturated with telecommunications infrastructure equipment. Today, there are digital exchanges even in Turkey's rural residential units. The multinational companies have either radically downsized or closed their manufacturing and R&D activities in Turkey.

The privatization of the R&D capacity of both PTT and Alcatel is also an important milestone in the history of the Turkish ICT industry.

In 1984, despite the highly regulated telecommunications equipment sector, the publicly owned PTT-R&D Laboratories was reorganized as a commercial firm – TELETAŞ. A licensing agreement was signed with ITT/BTM, a subsidiary of the American ITT in Belgium. The licensing agreement stipulated that 39% of TELETAŞ shares should be sold to BTM, on the intervention of Turgut Özal, Prime Minister at the time. In 1987, BTM was in turn sold to the French company ALCATEL. ALCATEL increased its shares in TELETAŞ continuously and, in 1993, TELETAŞ became a full subsidiary of ALCATEL. The change in ownership also gave rise to some crucial changes in the firm's technology policy. ALCATEL took the decision to decrease domestic production in Turkey and fulfill Turkey's market needs by exporting from other ALCATEL groups. The workforce decreased from 1,600 to 600.[29]

[28] BT Haber, 7-13 July 2003 (Interview with Hüsnü Tokmen)

[29] Source: Abay, T.E. (2003) "New Global Governance Regime on ICTs and It's Effects on Turkish Telecommunications Industry: A Case Study on Alcatel-Teletaş" Msc. Thesis of Middle East Technical University

As regards export strategy, ALCATEL has not given permission to TELETAŞ to export its own products to countries where other ALCATEL companies have markets.[30]
ALCATEL initially employed Turkish engineers for R&D projects in Belgium and the software produced by these engineers was sold to TELETAŞ. In 2002, the whole production department of ALCATEL TELETAŞ was outsourced to a domestic company, Anel Electronic Co. This firm now concentrates on marketing, rather than development and production.

During 1980-2000, Turkey faced a series of changes in the telecommunications sector. The policy of forcing multinationals to carry out production locally obviously created an important human capital for domestic industry. However, recent changes have underlined the fact that the multinationals have their own global strategies, which rarely coincide with national priorities. Therefore, this domestic production creation policy has not been enough to make lasting structural change in the Turkish ICT industry. As a consequence, the telecommunications industry in Turkey has a limited technological capability in the state of the art core of the sector (GSM base stations, handsets, large exchanges). However, the policy has created a favorable environment for small domestic firms, Karel and Telesis being two good examples. These firms have a good reputation in the Black Sea region, the Middle East and Eastern Europe.

TOP 14 Software Firms in income

Rank	Firm	USD	Share (%)
1	MICROSOFT	80.026.000	25,99
2	HAVELSAN	39.387.581	12,79
3	IBM TÜRK	37.392.823	12,14
4	ORACLE	17.167.000	5,58
5	SAP TÜRKİYE	10.000.000	3,25
6	LİKOM YAZILIM	8.297.617	2,69
7	KOÇSİSTEM	7.497.434	2,43
8	LOGO BUSINESS SOLUTIONS	5.997.817	1,95
9	NORTEL NETWORKS NETAŞ	5.740.974	1,86
10	COMPUTER ASSOCIATES	5.000.000	1,62
11	CYPRESS	3.623.650	1,18
12	OKSİJEN TEKNOLOJİ	3.623.650	1,18
13	INFONET	3.513.095	1,14
14	SAYISAL GRAFİK	3.198.803	1,04
15	SYS SESLİ YANIT SİSTEMLERİ		1,01
	DİĞER		25,33
	TOPLAM		101,18

According to software revenue ranking, Microsoft comes first, with 26% of the total software market in Turkey.[31] Havelsan, which produces software mainly for the defense

[30] For example, when the former Soviet Union wanted to purchase PSTN switch called System 12 from TELETAŞ, the headquarters of ALCATEL did not give permission for this sale
[31] Source: İnterpro, Top 500 ICT Firms

industry and government projects, is the second largest software company. The total revenue of the first three companies constitutes 51% of the software market in Turkey.

Local software companies, with the exception of the above three, are small firms in terms of budget and workforce. It is hard to find statistics that evaluate the software production capability of Turkey. The latest detailed analysis of the Turkish software industry was done by TURSOFT in 1995 and supported by the Turkish Technology Development Foundation (TTGV).[32.] In 1998, a detailed analysis of the Turkish software sector was done in the National Information Infrastructure Masterplan (TUENA), but this also used old TTGV data.[33]

The TUENA report makes some important provisional observations about the Turkish software industry:

- Turkish software companies are small, both in terms of revenue and numbers of employees,
- Though Turkish software firms have been unable to sign any big international software projects, they have won important awards in the international arena in recent years.[34]
- Computer engineering departments of Turkish Universities have been in demand with students for several years, and these departments accept only the most intelligent students, capable of obtaining the highest qualifications.
- Staff quality and education pose no problems for Turkish software firms. Most of their staff are university graduates. (88% according to the TUENA report)
- The share of the Turkish ICT industry's software sector in the total computer sector production value (205,000,000 USD in 2001) is very small.[35]

It also important to note the effect of the following recent developments on the Turkish software industry:

- E-Government projects are expected to be the biggest market for national and international software firms. Security technologies are essential for the development of value added services over communication networks and are important for e-government projects. The Turkish parliament passed an electronic signature law at the beginning of 2004 and it is believed that the existence of this law will foster the use of on-line services in both government and the private sector. Digital certificate providers expect to find a market in Turkey. Governmental research institutes are developing information security software products and applications. One of these institutes, TÜBİTAK BİLTEN,36 produces PKI software. Its products and capabilities were utilized in Turkey's first Public Key Infrastructure (PKI) applications.
- A tax holiday incentive for firms based in techno-parks was recently established to boost their R&D activities and innovation capabilities. This 5 year tax holiday covers both corporate and income taxes and is granted on project basis to firms located in university campuses in designated areas. There are significant numbers of

[32] TURSOFT, Turkish ICT ındustry, Software and Service SubSectors.
[33] Turkish Software Sector, TUENA, 1998 http://www.tuena.tubitak.gov.tr/rapor/pdf/1402-M-T-A-02.pdf
[34] For example, CyberSoft received the coveted 21st-Century Achievement Award from the Computerworld Honors Program for visionary use of information technology in the category of Government and Non-Profit Organizations on June 3, 2003. CyberSoft is the leading software house in the development of Public Sector IT projects, now expanding to Financial projects.
[35] Source TESİD
[36] http://www.bilten.metu.edu.tr

software firms in these techno-parks and software production capacity is expected to increase.

4 FINAL ASSESSMENT

In the above sections, case studies on two important sub-sectors of the Turkish ICT industry were investigated. In the telecommunications equipment production sub-sector, strong national policy initially obliged foreign international companies that gained control of local national firms to carry out production and R&D locally. However, the neo-liberal policy climate that followed created some hesitation in the implementation of this policy. Foreign multinationals have downsized, relocated or closed their production and R&D facilities in accordance with their global strategies. Today, with the exception of some domestic firms owned by domestic capital, such as Telesis and Karel, Turkey does not have any significant production and export capacity in the telecommunications equipment sub sector.

On the other hand, national firms in the consumer electronics sub-sector have established important production and technological capabilities as a result of the large domestic market in the absence of a harmonized policy. Today, this sub-sector constitutes an important area of economic activity in Turkey. These national companies also invest in other countries and their export figures continually increase. The consumer electronics sub-sector also has a strong technological base to cope with the impending technological change in the sector.

Electronic export and import figures were around 5% and 10% of the total export and import figures respectively from 1999-2001. The share of ICT exports in total exports increased from an average 3% during 1995-1997 to 5% during 1999-2001.

5 SOME PROVISIONAL CONCLUSIONS

The above preliminary analysis led us to draw the following provisional conclusions about the Turkish ICT manufacturing and software sectors.

Turkey has a strong consumer electronics sub-sector with a very strong export orientation. Two out of three major TV set production companies in the European market are Turkish.

Hence, ICT manufacturing plays an important role in the Turkish economy. Electronic export and import figures were around 5% and 10% of the total export and import figures respectively from 1999-2001. The share of ICT exports in total exports increased from an average 3% during 1995-1997 to 5% during 1999-2001.

Despite the very tough environment created by the global competition and the resulting policies of the multinationals, some small and medium sized domestic telecommunication firms have the capacity to compete in global markets.

The software industry mainly depends on Ministry of Defense and other Government Agency projects. With the exception of a few firms concentrated in that market, other software firms are small both in terms of number of employees and turnover.

The most recently available rankings of ICT companies by turnover show that foreign manufacturing and software companies do not have a strong position in the domestic market.

Turnover figures for the telecommunications service industry are much higher than those of the manufacturing industries. Domestic telecommunications service providers have a major influence and considerable investments in the Balkans, the Middle East and in Turkey. Though the effects have yet to be seen, it is strongly anticipated that this situation will create a favorable environment for both domestic telecommunication manufacturing and software industries.

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