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Microeconomics of Competitiveness

The ICT Cluster in Estonia



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Management Summary

Estonia is on the way to become a 21st century role model for digital societies. It is an open economy embracing business-friendly policies. In this environment, an information and communications technology cluster was established, bringing forth renowned companies such as Skype.

This paper will analyse the different aspects of the Estonian ICT Cluster with an additional focus on exports as one of the Cluster's cooperation activities. The methods and concepts used in this work are based on Prof. Michael Porter's works. The main elements according to Porter represented in this paper are the country diamond, cluster diamond and cluster map.

The analysis of Estonia's macroeconomic environment indicates that the essential characteristics of the Estonian economy are on the one hand a very small but sophisticated domestic market, on the other hand few regulations, a simple tax system, leadership in digital development, and a good infrastructure. This strong and sophisticated business environment forms the perfect basis for the development of competitive clusters.

The evaluation of the Estonian ICT Cluster reveals that this Cluster's contribution to the Estonian economic success is important. The rapid development into a leading digital society has been promoted by forward-thinking government policies. Estonia's digital society led to improvements and efficiency enhancements for diverse stakeholders such as the government, businesses, and private citizens. A SWOT analysis shows that the competitive edge is gained through skilled workforce, government support, and entrepreneurial programs. The main weakness is the country's remote location.

The ICT Export Cluster is a special form of cooperation between Estonian ICT companies. Its main goal is to foster the export of ICT solutions and improve the partners' competitive abilities on the global market. It shows how well established the cooperation are in the Estonian ICT Cluster.

Table of Contents

1	Introduction	8
1.1	Relevance of the Topic	8
1.2	Purpose	8
1.3	Scope and Limitation	9
1.4	Research Methods	9
1.5	Structure	9
2	Country Analysis	11
2.1	Estonia at a Glance	11
2.2	Past Economic Developments	12
2.3	Endowments	13
2.4	Analysis of the macroeconomic Competitiveness	14
2.4.1	Social Infrastructure and political Institutions	14
2.4.2	Macroeconomic policies	15
2.5	Quality of the National Business Environment	18
2.5.1	Estonia's National Diamond	19
3	State of Cluster Development	22
3.1	Maritime Cluster	22
4	The ICT Cluster	24
4.1	History	24
4.2	International Recognition	25
4.3	Digital Society Overview	26
4.3.1	Digital Society Components	26
4.3.2	Digital Society Developments	27
4.4	Cluster Map	29
4.5	ICT Cluster Diamond	33
4.5.1	Factor Conditions	34
4.5.2	Firm Strategy, Structure, and Rivalry	35
4.5.3	Related and supporting Industries	36
4.5.4	Demand Conditions	36
4.6	SWOT Analysis	38
4.7	Strengths	38
4.8	Weaknesses	39
4.9	Opportunities	40
4.10	Threats	41
5	The Estonian ICT Export Cluster	42
5.1	Role of Export for Estonian ICT Companies	43
5.2	Fundamentals of the Cluster	44
5.3	Overview of the Cluster	46
5.4	Business Model of the ICT Export Cluster	48
5.5	Financing	49
5.6	Structure of the Cluster	51
5.7	Outlook	53
6	Strategy Recommendations	54
7	Conclusion	55
8	Reference List	56

9	Appendix.....	67
9.1	Estonia and WEF's Stage of development.....	67
9.2	Estonian Information System	69

List of Abbreviations

Approx.	approximately
cf.	confer to
EUR	Euro
ICT	Information and Communications Technology
Sq km	square kilometers
VAT	value added tax

List of Figures

Figure 1: Structure of the paper	10
Figure 2: Estonia's geographic location	13
Figure 3: GDP per capita PPP \$ for Estonia and comparator economies (The World Bank, 2013b)	16
Figure 4: Estonia's National Diamond	19
Figure 5: The most problematic factors for doing business (Sala-i-Martin et al., 2013c: 180) ...	21
Figure 6: Critical success factors in cluster developments (DTI, 2004)	43
Figure 7: Share of exports in the IT sector per country (Prime Investment, 2013)	44
Figure 8: Largest exporting IT companies in the Baltic states according to their export's share (Prime Investment, 2013)	44
Figure 9: Overview of ICT Export Cluster members according to sector (ICT Demo Center, ICT Export Cluster, Company Profiles, p.6)	47
Figure 10: Estonian ICT Export Cluster's Business Model (ICT Export Cluster Strategy, 2010) ..	49
Figure 11: Financing of the ICT Export Cluster's according to activities (Estonian ICT Export Cluster Strategy, 2010: 34)	51
Figure 12: Structure of ICT Export Cluster (ICT Export Cluster Strategy, 2010)	52
Figure 13: Estonia and WEF's 10 pillars (WEF, 2013: 214)	67
Figure 14: Estonian Information System (Herlihy, 2013)	69

List of Tables

Table 1: Estonia at a glance (CIA, 2013a).....	12
Table 2: GDP growth rate 2007-2013 (The World Bank, 2013a)	15
Table 3: Estonia's performance in global rankings (Gwartney, Lawson & Hall, 2013: 8; International Institute for Management Development, 2013: ; Sala-i-Martin et al., 2013a: 15; The World Bank, 2013c: 3)	18
Table 4: Overview of developments connected to Digital Society (Tallinn, 2013: 43).....	28
Table 5: SWOT Analysis	38

1 Introduction

Estonia is a thriving economy in Eastern Europe considered to be a “Baltic Tiger”, a term highlighting its double-digit growth rates from 2000 to 2007 (Investopedia, n.d.). It is also a technologically highly developed country and evolved into one of the world’s most advanced digital societies (e-Estonia, 2013). A blend of forward-thinking governance, a proactive ICT sector, and a technically enthusiastic populace has led to the emergence of the Estonian ICT Cluster (cf. 4 The ICT Cluster).

1.1 Relevance of the Topic

According to the European Union, ICT is one of the key sectors of Estonia’s economy (European Union, n.y.). As an exporting country, Estonia’s economy heavily relies on the ability of its enterprises to constantly develop and innovate. Estonia’s rapid change from a centrally planned to an open, free-market economic approach has fostered these developments (cf. 2 Country Analysis and 4 The ICT Cluster). Thus, the analysis of the ICT Cluster in Estonia aims to deliver practical insights on how a high-tech cluster develops and how it can secure a long-term competitiveness.

1.2 Purpose

The purpose of this paper is to analyse the Estonian ICT Cluster and its sub-cluster focusing on export cooperation activities. The theoretical framework of this paper is based on Michael Porter’s concepts and methods. Building on the knowledge gained on the Estonian ICT Cluster, the following key questions will be addressed:

1. How does the Estonian ICT Cluster work and what are its determinants of competitiveness?
2. How does the cluster cooperation in regard to exports function?

The basis for answering these questions is provided by the results of a thorough analysis of Estonia’s macroeconomic and microeconomic competitiveness, the evaluation of the ICT Cluster as well as the ICT Export Cluster. Furthermore, strategy recommendations regarding the future of the cluster will be provided and conclusions will be drawn.

1.3 Scope and Limitation

The paper covers some of the most important facts about the history and present condition of Estonia's economy and its ICT Cluster as well as of its exporting function. The paper does not contain a full analysis of all determinants of competitiveness of Estonia laid out by Porter (2009: 6). An in-depth analysis of the state of cluster development taking into consideration Estonian clusters outside the ICT sector is not feasible due to time restrictions and accessibility of data. The same applies to the sophistication of company operations and strategy. Those two determinants will only be covered insofar as it is essential for the comprehension of the ICT Cluster.

The data of the OECD and the European Union have been used for the Cluster Analysis even though the original reports do not use Porter's Cluster Theory, which might limited the meaningfulness of data.

1.4 Research Methods

The analysis is relying on Porter's (2008: 171 ff.) theory of clusters and the competitiveness. Porter's theory is being placed into the context of the Estonian ICT Cluster and being analyzed in the light of that. The research is based on secondary data from publicly accessible sources such as OECD, the World Bank, Estonian government bodies etc.

1.5 Structure

The structure of the paper follows the determinants of competitiveness framework by Porter (2009: 6), which consists of endowments, macroeconomic and microeconomic competitiveness.

After the introductory chapter, Estonia will be analyzed on a country level. The country's past economic development will be outlined followed by an evaluation of the macroeconomic competitiveness and the quality of the national business environment on a micro level. Porter's diamond model will summarize the findings on a national level.

In a further step, Estonia's state of cluster development will briefly be analyzed. Then, the ICT sector in Estonia will be examined. Its development and major players will be analyzed and an overall appraisal of its cluster development will be given by drawing a cluster map,

using Porter's diamond model on a cluster level and conducting a SWOT analysis. Estonia's exceptional digital society will also form a part of this chapter.

Subsequently, the Estonian ICT Export Cluster will be covered as an example of an IT sector internal specific form of cooperation. An overview of the state of cluster development will be provided and its business model will be introduced. Finally, conclusion will be drawn and an outlook regarding the future of the ICT Export Cluster will be presented.

In a last step, strategy recommendations for the ICT Cluster will be developed and final conclusions made.

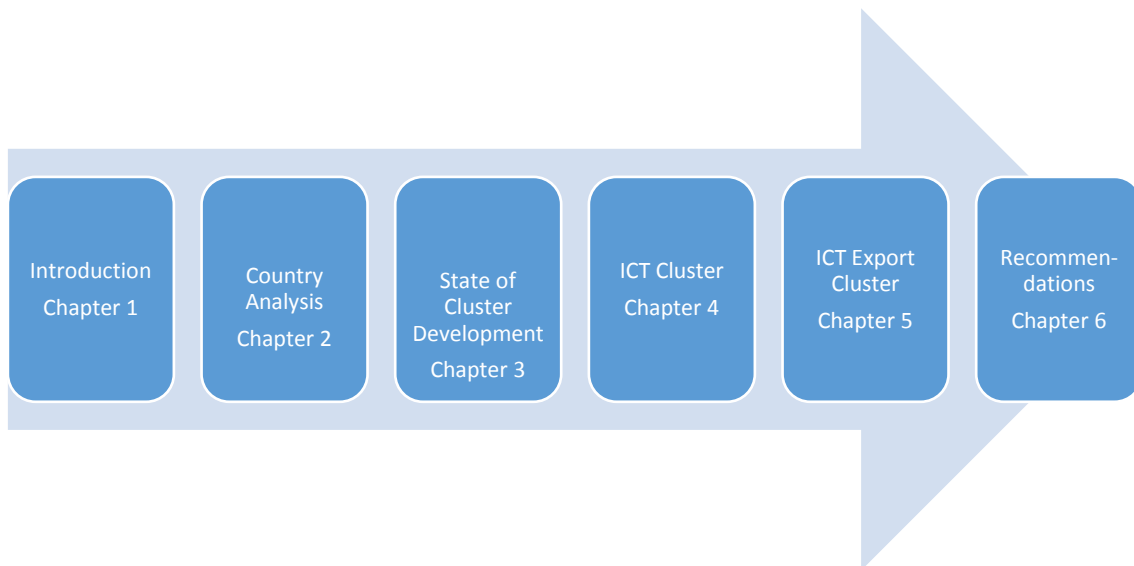


Figure 1: Structure of the paper


2 Country Analysis

Basic background information will be provided through a quick overview of Estonia's basic parameters and indicating the most important developments from a historical perspective. The contemporary condition of Estonia and its economy will be examined by analyzing the macroeconomic environment. An analysis of the quality of the national business environment will complement the findings.

Measured against the standards of history, Estonia is a fairly young country: it gained independence from Russia in 1918 (Central Intelligence Agency (CIA, 2013a). After experiencing a rough-and-tumble history during the 20th century, it has recently developed into Eastern Europe's most competitive economy (Sala-i-Martin et al., 2013a: 29).

2.1 Estonia at a Glance

Estonia is one of the smaller European countries both in terms of population (CIA, 2013b) and of area (CIA, n.d.). Table 1 gives a brief overview of the basic statistics of Estonia.

Official name	Eesti Vabariik Republic of Estonia
Flag	
Capital (population)	Tallinn (399,000)
Official language	Estonian
Population	1,266,375 (July 2013 est.)
Geographical area	45,228 sq. km
Legal system	Civil law
Administrative divisions	15 counties

GDP (PPP)	Total \$29,57 billion (2012 est.)
GDP per capita	\$22,100 (2012 est.)
Real GDP growth	3.2% (2012 est.)
Gini coefficient	31.3 (2010)

Table 1: Estonia at a glance (CIA, 2013a)

Tallinn is by far the largest city in Estonia and can be considered the major urban area (Aben et al., 2012: 3). Other larger cities all have a considerably smaller population than the capital and include Tartu (98,000) and Narva (65,000) (Aben et al., 2012: 3).

2.2 Past Economic Developments

Historical insights show the forces that shaped the way business is conducted today and determine whether a market is protectionist or open (Becker, 2004: 68).

Estonians have been living on modern-day Estonia's territory for over 2,000 years. Due to its strategic location, the country has been under foreign rule for centuries. The German influence was prevalent in terms of the economic development: in the 13th century several Estonian cities became members of the German dominated Hanseatic League (pwc, 2013: 7). This was one of the most powerful trading blocs at the time and brought many German merchant families to Estonia. After a brief phase of independence in the period between the world wars (1918-1939), Estonia was occupied by the Soviet Union (pwc, 2013: 8). The Estonian Soviet Socialist Republic was economically characterized by the communist centrally planned economy. After regaining its independence in 1991, Estonia faced enormous structural and economic problems. The post-Soviet policy makers decided on a shock therapy for Estonia's economy: the country quickly evolved into an open economy opting to attract foreign investments instead of borrowing money from international institutions. The radical shift from command economy to a free market approach is exemplified by the implementation a flat-rate personal income tax in 1994 (Laar, 2007). By embracing free-market friendly reforms, Estonia quickly joined the rest of the world in its pursuit of globalization and free trade. This development, called the Estonian Economic Miracle by former

Prime Minister Mart Laar (2007), culminated in Estonia becoming a member of the EU in 2004 and joining the Eurozone in 2011 (pwc, 2013: 8).

2.3 Endowments

Physical information: Located in Northern Europe, Estonia's territory is slightly bigger than Switzerland, 45,228 sq. km (CIA, n.d.). It shares common land borders with Latvia and Russia (CIA, 2013a). Its long coastal line along the Baltic Sea and the Gulf of Finland includes over 1,500 offshore islands and connects the country to Finland in the north and Sweden in the west (CIA, 2013a). Estonia is a lowland country with the highest elevation being only 318m above sea level (PricewaterhouseCoopers (pwc), 2013: 7). Estonia's climate pattern is temperate maritime with moderate winters and cool summers (CIA, 2013a).

Natural resources and energy

sources: The country's natural resources include oil shale, peat, rare earth elements, phosphorus, clay, limestone, sand, dolomite, and arable areas (CIA, 2013a). The accessible oil shale deposits are counted among the largest in the world and are used primarily for power production (European Environment Agency (EEA), 2011). Over 90% of the electricity is produced from oil shale,



Figure 2: Estonia's geographic location

which is a main source of pollution in the country (EEA, 2011). The agricultural production consists of grain, potatoes, vegetables, cattle, dairy products, and fish (CIA, 2013a). Forestry has a long tradition in Estonia and 50% of the area is covered by forests (Erametsakeskus, n.d.).

People: Estonia has around 1.3 million inhabitants with a negative population growth rate in 2013 (CIA, 2013a). Approximately two-thirds of the population lives in urban and one-third in rural areas (pwc, 2013: 11). The population's ethnical composition is predominantly Estonian (69%) (pwc, 2013: 11). The strongest minority is Russians (25%) and other minorities include Ukrainians (2%), Belarusians (1%), and Finns (1%) (pwc, 2013: 11). More than one

million people speak Estonian, a language that uses the Latin alphabet and is closely related to Finnish (pwc, 2013: 11). Estonian's are highly skilled in foreign languages: Estonia ranks 4th out of 60 countries assessed in the 2012 EF English Proficiency Index (EF, n.d.). Russian and Finnish are also frequently spoken (pwc, 2013: 11).

2.4 Analysis of the macroeconomic Competitiveness

The term macroeconomic environment is defined as external factors that influence all enterprises irrespective of their sector (Hungenberg, 2011: 90). In practice, every firm must select and prioritize the factors that influence its industry the most (NetMBA Business Knowledge Center, 2010). As there are countless numbers of macroeconomic factors, only the most important will be mentioned.

2.4.1 Social Infrastructure and political Institutions

Labor market: The Estonian labor force is 704,400 strong (Abe et al., 2012: 6). The average monthly salary in 2013 was EUR 916 with the minimum wage being EUR 320 (pwc, 2013: 33). At the end of 2nd quarter 2013 the unemployment rate was 8.1% (Statistics Estonia, 2013). The Estonian workforce is generally highly educated and motivated (pwc, 2013: 14). Nevertheless, employers may face difficulties hiring skilled workers in a number of sectors (United States Commercial Service (CS, 2012). The low birth rate in Estonia is expected to have a negative long-term effect on its labor supply (CS, 2012). Trade unions follow a cooperative strategy and strikes are unusual (pwc, 2013: 31).

Education: Estonia's educational system comprises compulsory basic education followed by upper-secondary education (pwc, 2013: 11). There are 28 institutions of higher education and public education establishments are most often free of charge (pwc, 2013: 11). The largest and most well-known universities are University of Tartu, Tallinn University of Technology, Tallinn University, and Estonian University of Life Sciences (Estonian Ministry of Education and Research (EMER), n.d.: 2). In 2009, 36% of all people aged 25-64 had a tertiary education (OECD average 2007: 28%) (EMER, n.d.: 7). Estonia ranks 18th in the WEF's primary education ranking, outpacing countries such as Germany (25th) (Sala-i-Martín et al., 2013b: 456). Furthermore, it has the third highest Internet access rate world wide (Sala-i-Martín et al., 2013b: 465). Overall, Estonia has an excellent educational system (Sala-i-Martín et al., 2013a: 29).

Estonian culture: Estonians have a low power distance preferring the opportunity to express their opinion over unquestioning obedience (The Hofstede Centre, n.d.). They appreciate transparency, honesty, fairness, carefulness regarding risks as well as honest and direct communication (The Hofstede Centre, n.d.). Estonia is an individualistic country and self-fulfillment is valued (The Hofstede Centre, n.d.).

System of government: Estonia is a parliamentary republic and is divided into 15 counties (CIA, 2013a). The Estonian government follows the principle of separation of powers. The governing bodies are the Parliament, the President, and the Supreme Court (pwc, 2013: 9-11). The 101 members of the unicameral legislature are elected every four years by the people, whereas the President is elected for five years by the Parliament (pwc, 2013: 9).

Political Stability: Estonia is a stable democracy with a trustworthy electoral system that gives no occasion to allegations of fraud. Estonia ranks 32nd out of 176 countries assessed in the 2012 Transparency International Corruption Perceptions Index (Transparency International, 2012: 3). Thus, Estonia fares better than many other EU countries like Portugal (33rd), Slovenia (37th), and Hungary (55th). Estonia has a Gini index of 31.3 in 2012, which puts it among the 30 countries with the lowest income disparity in the world (CIA, 2013c). Inequality has decreased significantly in the last 10 years (CIA, 2013a).

2.4.2 Macroeconomic policies

General economic policy: Estonia follows a free-market friendly policy and is considered one of the most free economies world wide (Gwartney, Lawson & Hall, 2013: 8). Generally, the regulatory and fiscal burdens are smaller than in most other European countries.

Economic growth rates: After considerable problems following the global financial crisis in 2008/09, Estonia's economy has recovered but now grows at a slower rate than before (OECD, 2012a).

Year	2007	2008	2009	2010	2011	2012	2013 est.
GDP growth	7.5%	-4.2%	-14.1%	3.3%	8.3%	3.2%	3.6%

Table 2: GDP growth rate 2007-2013 (The World Bank, 2013a)

The OECD stresses the resilience of Estonia’s economy in spite of an unfavorable European environment. According to OECD Secretary-General Angel Gurría “Estonia has achieved one of the highest medium-term growth rates in the OECD” over the past decade. However, during the crisis, Estonia has suffered from extreme volatility. In order to achieve sustainable growth over the long term, the Estonian government will have to implement reforms (cf. section 2.5.1).

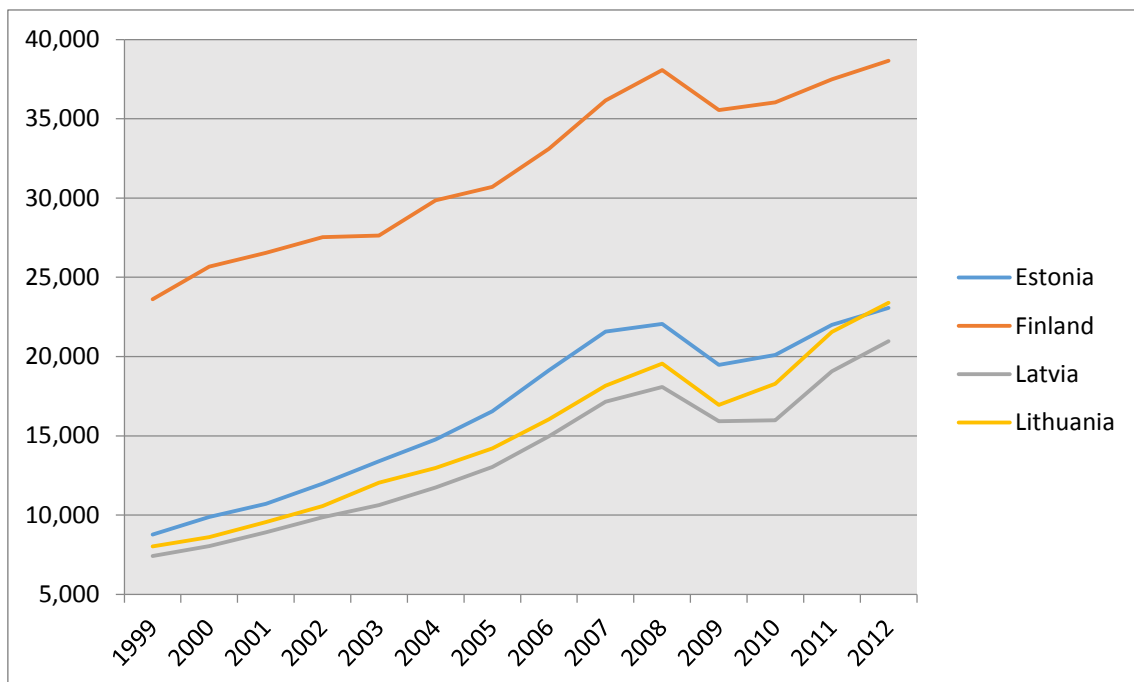


Figure 3: GDP per capita PPP \$ for Estonia and comparator economies (The World Bank, 2013b)

Monetary policy and banking system: Eesti Pank was established as Estonia’s central bank in 1919 (Eesti Pank, n.d. a). Since Estonia adopted the Euro, Eesti Pank is part of the European System of Central Banks and its primary objective is to contribute to the price stability within the Eurozone. Its Responsibilities include helping to define the Euro Area Single Monetary Policy and implementing it in Estonia. (Eesti Pank, n.d. b). The Euro secures stability, a relatively low inflation level and eases the access to foreign markets (Aben et al., 2012: 7). The banking sector is completely privatized with the major banks being from Scandinavian neighbors, mainly Sweden and Finland (pwc, 2013: 21 f.). In the WEF’s financial market development ranking, Estonia ranks 35th out of 148 (Sala-i-Martín et al., 2013c: 180).

Trading: Estonia has been a member of the World Trade Organization since 1999 (World Trade Organization, 2013). As a member of the EU, Estonia forms part of the European common market and is subject to the common trade policies of the member states (Ministry of Economic Affairs and Communications, 2013). Main export partners of Estonia are Sweden, Finland, Russia, Latvia, Lithuania, and Germany (CIA, 2013a). Estonia's economy is mainly driven by exports and thus vulnerable in times of external crises (Balticexport.com, 2013). The country's exported goods and services amounted to \$16,16 billion in 2012, slightly less than in the record-breaking year 2011 with \$16,78 billion (Balticexport.com, 2013; CIA, 2013a). Main exports are machinery and electrical equipment as well as wood, wood products, and metals (CIA, 2013a; cf. section 3 for Estonia's clusters). The 2012 Global Enabling Trade Report ranks Estonia as 23rd out of 124 countries in the overall trade index (Doherty, Drzeniek Hanouz & Philip, 2012: xvii). Global Trade Alert (n.d.) counts 118 protectionist measures for Estonia compared to 13 in Switzerland, 122 in Finland, 173 in the U.S., and 334 in Russia. All customs procedures are carried out electronically (pwc, 2013: 24). Thus, Estonia's policies as well as procedures are generally trade friendly.

Taxes: Estonia follows a pro-business tax policy. The tax system in place is simple and sticks out through low rates (CS, 2012: 33). A large majority of the tax-returns are filled in online (Aben et al., 2012: 7). Tax-returns are self-assessed (pwc, 2013: 43). The flat-rate income tax of 21% is applicable to individuals as well as companies (pwc, 2013: 43). To encourage business expansion, distributed profits (e.g. dividends) are taxed, but all reinvested profits are tax-exempt (CS, 2012: 33). The general tax strategy aims at promoting business and stimulate economic growth (CS, 2012: 33) and the government plans to shift the tax burden from labor (e.g. social taxes) to consumption (e.g. VAT) (pwc, 2013: 43).

Legal framework: Estonian legal system follows the continental European civil law tradition, making a distinction between private, public, and criminal law (Kuusik & Miil, 2008). Thus, legal issues are solved grounded on complex codifications, which are divided into private and public law (Estonian Investment Agency (EIA), n.d.). Estonia has a three-level court system consisting of county and administrative courts (first instance), superregional courts of appeal (second instance), and the Supreme Court (EIA, n.d.). Estonia achieved good results in the WEF's institutions ranking, e.g. 20th in judicial independence and 39th in the efficiency of legal framework in setting disputes (out of 148) (Sala-i-Martín et al., 2013c:

181). Regarding government regulation, Estonia even fares very good, ranking 11th out of 148 (Sala-i-Martin et al., 2013c: 180).

Infrastructure: Estonia has a good infrastructure. Transport and telecommunications are highly developed and the whole country is accessible by road (pwc, 2013: 12). The country is considered one of the leading e-societies in the world with excellent access to the internet and many web based solutions (e-Estonia, n.d. a; cf. section 3.3.1). The international airport in Tallinn connects Estonia to the international flight network and provides flights to various European cities (Tallinn City Enterprise Board, 2013: 6).

2.5 Quality of the National Business Environment

The following table indicates Estonia's performance in the most important global rankings on the competitiveness of economies.

Ranking	Score	Estonia's performance
IMD World Competitiveness Yearbook 2013	64,422	ranks 36 th out of 60
WEF Global Competitiveness Index 2013-2014	4.65	ranks 32 nd out of 148
Fraser Institute Economic Freedom Rating 2011	7.76	ranks 16 th out of 152
The World Bank Doing Business Ranking 2012	n/a	ranks 21 st out of 185

Table 3: Estonia's performance in global rankings (Gwartney, Lawson & Hall, 2013: 8; International Institute for Management Development, 2013; Sala-i-Martin et al., 2013a: 15; The World Bank, 2013c: 3)

These classifications convey a positive impression of Estonia's economic situation. The results of the World Bank and the WEF rankings are both comparatively good. Those from the IMD ranking are poorer. Estonia ranks 16th in the Fraser Institute Economic Freedom Rating. This is due to the different approach of this index: whereas the other three measure the macroeconomic environment, the Economic Freedom Rating "measures the degree to which the policies and institutions of countries are supportive of economic freedom" (Gwartney, Lawson & Hall, 2013: v). Overall the rankings of Estonia reinforce that the country is well positioned when it comes to business-friendly policies.

2.5.1 Estonia's National Diamond

Generally, Estonia's business environment is in a good condition, having enhanced its position in the Global Competitiveness Index from rank 34 to 32 in the last two years (Sala-i-Martin et al., 2013c: 180). The potential strengths and weaknesses of the national business environment can be highlighted through the Estonian national diamond. Porter's (2008: 182) diamond model illustrates the determinants of national advantage and the playing field a country establishes for its industries.



Figure 4: Estonia's National Diamond

The Estonian business environment depicted in the national diamond reiterates the findings of the global competitiveness rankings by giving a positive appraisal overall. Some of the findings of the macroeconomic analysis are included in the diamond, complemented by some microeconomic factors. Therefore, the assessment of the national diamond will focus on only a few key aspects.

In terms of **factor conditions**, Estonia stands apart in its level of workforce education. Nevertheless, the inadequately educated workforce is mentioned as the most problematic factor for doing business in Estonia (cf. figure 6). This paradox can be explained by the young people's lack of interest in natural and exact sciences and technological specialties (NET) (EMER, n.d.: 7). The Estonian government is aware of this problem and has laid out a clearly defined higher education strategy which includes the increase in number of graduates in NET (EMER, n.d.: 7). Another threat is posed by the demographic change affecting the supply of labor in the long-run (CS, 2012: 40). According to Porter (2008: 188 f.), a disadvantage in basic factors can become an advantage. In the case of Estonia, there is a strong incentive to upgrade labor efficiency (CS, 2012: 40).

In terms of **demand conditions**, the country benefits from an internal market of sophisticated, demanding buyers and the apparently insatiable appetite of the government for high technology products. This is an example of local needs that anticipate those of other nations with a resulting advantage for Estonia's future competitiveness (Porter, 2008: 191). That the economy is mainly driven by exports is another disadvantage that can be transformed in an advantage: due to their exposure to international markets, Estonian enterprises are forced to constantly innovate.

Regarding **related and supporting industries**, Estonia is home to several clusters, often within the range of innovation-driven industries (cf. section 3). Additionally, it is one of the leading e-societies attracting enterprises working in the ICT field.

In the **context for firm strategy and rivalry**, Estonia distinguishes itself through a stable and well organized political environment, which is open to new ideas and liberal in its economic policy. However, the fact that tax rates and government bureaucracy are considered problematic factors (cf. figure 6) indicates that there is still room to improve. Estonia also profits from a high degree of entrepreneurship, having the most start-up firms per capita in

Europe (Tambur, 2013). This illustrates the Estonian’s ability to take risks and launch innovative ventures. Another factor contributing positively to domestic rivalry is Estonia’s FDI friendliness.

The most problematic factors for doing business

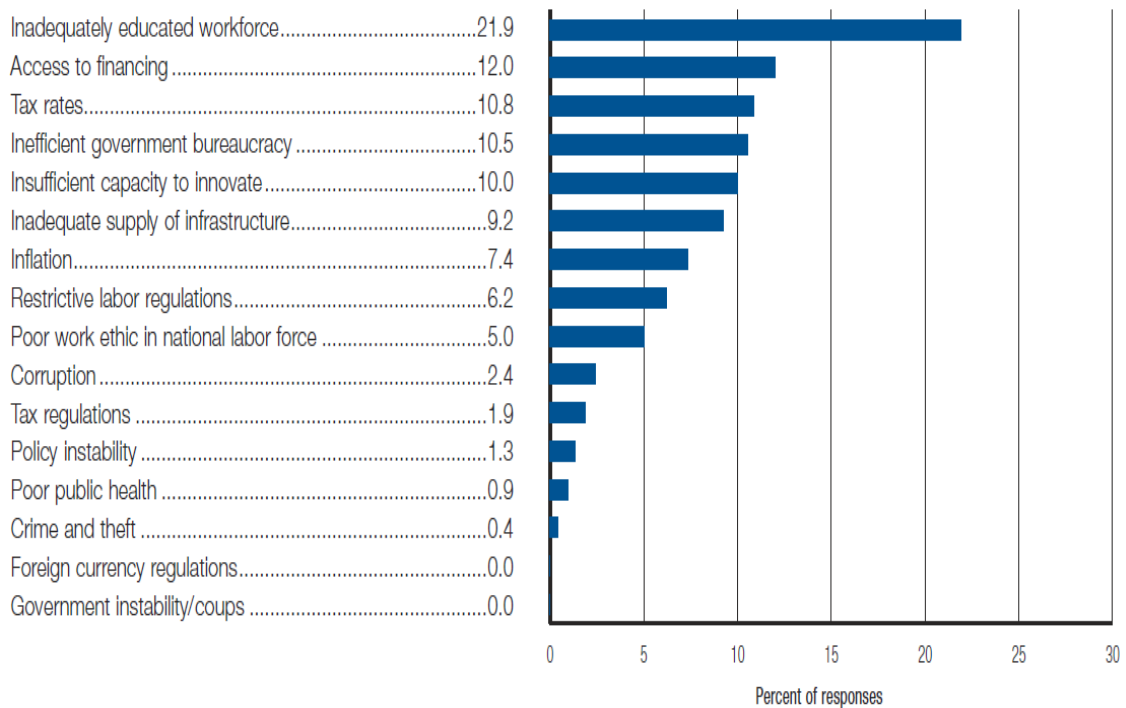


Figure 5: The most problematic factors for doing business (Sala-i-Martin et al., 2013c: 180)

3 State of Cluster Development

According to Clusnet, «an EU funded project which aims to improve the performance of European clusters» (Clusnet n.d.), there are several clusters in Estonia, such as Healthcare Tech, Cleantech, Creative/Design, Maritime/Logistics and ICT. Whether Healthcare Tech, Creative/Design or Cleantech fulfill the criteria used in this paper for cluster concept or not, cannot be specified due to time restriction and accessibility of data. It can be stated, that Healthcare Tech (incl. biotech, medical devices and pharmaceuticals) account for 1'330 employees and 127 companies (Clusterobservatory 2011a). Furthermore did healthcare and social field activities contribute 3.6 percent to the GDP in 2012 (Estonia 2013). Estonia ranked at first place for its e-health solutions (e.g. E-consultations¹, E-ward², Tele-dermatosco³p, etc.), 94 percent of all prescriptions are written digitally (Tallinn 2013). 5'000 companies are working in the field of culture and creative economy in 2013 incl. various branches such as architecture, audiovisuals, design, entertainment IT/Gaming industry, etc. (Tallinn 2013). Electricity, gas, steam and air conditioning supply have contributed to 3.8 percent of the GDP in 2012 (Estonia 2013). The Estonian Maritime Cluster will be described below in more detail as the given data allows a deeper look.

3.1 Maritime Cluster

In 2008 the Cluster accounted for 53 billion Estonian Kroons (approximately 3.39 billion euros) revenues, around five percent of the total turnover, ca. four percent of employment and ca. four percent of tax revenues (Coinmill 2011; Portsmouth et al. 2012). In 2010, 2'987 employees of around 550'000 have been working in 234 companies in the Maritime Cluster (Cluster Observatory 2011b; ECB 2013). The Maritime Cluster can be divided «into nine sub-clusters:

1. Shipping
2. Ports
3. Port operators

¹ Family doctors can ask for advice of specialists threw E-Mail. They then get an answers whereby this answers is paid automatically by the insurance company.

² A tablet application which allows docotors in a hospital to get an overview of the patients and their conidition.

³ [...].«new possibility for the prevention, early diagnosis and screening of malignant skin tumours.» (Tallinn 2013 p. 45).

4. Maritime service and intermediate commercial transactions
5. Shipbuilding and repair
6. Public sector – science and education
7. Yachting and recreation
8. Construction and maintenance of fairways and marine facilities
9. Fishing and processing. Aquaculture

Portsmouth et al. emphasize that there is an overlay between the Maritime Cluster, Logistic Cluster and Tourism Cluster which impacts the meaningfulness of data. So do 60 percent of the international travelers and five percent of domestic travelers use marine transportation and 60 percent of all exports and imports are transported over the sea (SmartComp 2012).

4 The ICT Cluster

The aim of this chapter is to show the development of the ICT Cluster, the surrounding conditions, as well as its strengths and weaknesses, which lead to the current situation. Furthermore, this chapter intends to present possible opportunities and threats for the Cluster.

As mentioned above, ICT has deep roots in the Estonian history. In 2001, only one decade after Estonia's independency, «the ICT sector had contributed to more than 500 million euros annual revenues» (WEF 2012, p 131), which lead to further investments in the sector (WEF 2012, p 131). So, in 2011 the ICT Cluster amounted only in the first quarter for 775.6 million euros revenues, which symbolizes a contribution of 8.2 percent of the total revenues earned in Estonia. Furthermore, the Cluster contained 2'207 companies and 17'287 employed people. 4.6 percent of all employees in Estonia were working in the ICT sector, which amounted in 78.9 million euro labor costs. Net profit of the sector was 93 million euros and net value-added stood at 171.9 million euros (Intellinews 2011).

4.1 History

Back in 1991, only half of the Estonian population «had a telephone line and its only independent link to the outside world was a Finnish mobile phone concealed in the foreign minister's garden.» (A.K.K., 2013). By 2012, Estonia had a broadband coverage of around 98 percent. Compared to the European Union's average (95.5 percent) and other Eastern Europe countries, with the exception of Czech Republic, this result was remarkably high (Point-Topic). (A.K.K., 2013).

The progressive thinking of Estonia's leaders was for example shown in the 1990s, when they refused Finland's offered ancient analog telephone connections. At that time Finland was upgrading its connections to digital telephone connections. So instead of accepting this offer, Estonia decided to invest itself in digital systems. Another example was the governments' strong belief in Internet, which lead to the decision to invest in computer equipment in all classrooms. By 1998 each classroom in Estonia had access to the Internet (A.K.K., 2013). Enabled was this through the government's decision in 1997 to launch the Programming Tiger initiative, which goal it was and is to manage ICT development in education. Due to this decision «all Estonian schools have: a broadband connection, constant in-service ICT methodology training for teachers at different levels, and the possibility for

teachers to use Virtual Learning Environments (VLE-s) to create electronic study materials» (E-Twinning n.d.). Furthermore does the initiative foster innovative school project (E-Twinning n.d.).

The governmental declaration of Internet access of being a human right in 2000, brought access into all areas of the country and free WI-FI developed into common property. The next step taken by the government was the introduction of “E-Government⁴”. This resulted in 95 percent of the annual tax return being filled out electronically, parking slot costs being paid by the most citizens electronically by mobile phones and online voting’s in a general election (A.K.K., 2013). The latest governmental undertaking was the initiation of a new program which aims «to teach five-year-olds the basics of coding» (A.K.K., 2013).

Currently 15 percent of the Estonian Gross Domestic Product (GDP) are accounted by high-tech industries and 9 percent by the ICT sector (A.K.K., 2013; Baltic News Service 2013a) whereby «exports make up a third of ICT sales, of which the services element is the fastest growing.» (Price, R. and Wörgötter, A. 2011). This might be based on the small size of Estonia, which has the effect that the tech companies are used to compete on a global level. . (A.K.K., 2013).

4.2 International Recognition

According to the annual World Economic Forum (WEF) “The Global Information Technology Report 2012“ which intends to measure «the degree to which economies across the world leverage ICT for enhanced competitiveness.» (WEF 2012 p xi) Estonia has ranked number 24 in 2012. Since the financial crisis started, Estonia’s score has dropped with its worst result in 2011 at 26. (WEF 2012 p xxiii). The international recognition of ICT importance in Estonia is underlined by the fact that the North Atlantic Treaty Organization (NATO) Cooperative Cyber Defense Centre of Excellence and the headquarters of the European IT Agency are both located in Estonia. Also has Tomas Hendrik Ilves, Estonia’s current president, been asked to be the chairman of the Steering Board of the European Cloud Partner-

⁴ « “E-Government” refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. » (World Bank 2011)

ship. The board's task is the development of e-services in public and private sector (Tallinn 2013).

4.3 Digital Society Overview

After regaining its independence in 1991, Estonia had to develop a new administration. The government decided to do it on the less costly way and chose to use information technology. Today Estonia has «the world's most digitized bureaucracy; even the government cabinet has said goodbye to paper.» (The Economist 2013). For being able to do so, the government laid out some crucial principles such as decentralization, interconnectivity, open platforms and open-ended processes. Decentralization means here that there is no central database and each stakeholder (government department or business) chose their system on their own and in their own time. Interconnectivity demands the smooth compatibility of all systems. The free usage of the public key infrastructure is meant by open platform. The whole process of the Estonian digital society is to be seen as an ongoing project with the aim of organically growth and improvement. This is what is meant by open-ended process (Estonia 201?).

Currently, 93 percent of the Estonians use ID cards (s. 4.3.2 Digital Society Developments) and half of them do so for preceding electronic transactions. 99.8 percent of bank transactions have been done online and so have 95 percent of income tax returns been (Tallinn 2013).

4.3.1 Digital Society Components

The digital society includes the below shown components. All the information are based on one Estonian government homepage (Estonia 201?). The graph on page XY shows all the crucial components as well.

Infrastructure: The infrastructure is based on two main components. The X-Road allows the linkage between public and private databases, whereby the platform used does not matter. The e-Identity enables the identification of a person in an online environment.

Government: E-Services gave the government the opportunity for additional transparency and efficiency.

Business: Reduced bureaucracy, simpler access to relevant information and fast interaction have been supporting the business environment.

Citizens: «Integrated e-Solutions have created an effective, convenient interface between citizens and government agencies» (Estonia 201?).

Healthcare: All stakeholders (patients, doctors, etc.) have been able to benefit from the simple access which E-Services⁵ brought.

Education: The interaction of all stakeholders has been changing and led to better educated and more tech-savvy students and pupils.

Public Safety: Higher safety is the result, as the law enforcement is now capable of carrying out their duties more efficiently and more effectively.

Cyber Security: Cyber security is crucial and different partnerships between public and private sector give Estonia the chance to be prepared for cyber threats.

Utilities: «Innovations in the utilities and intelligent home industries save energy and result in a cleaner environment.» (Estonia 201?).

4.3.2 Digital Society Developments

The below shown table gives a brief overview of the developments, which were connected to the Digital Society.

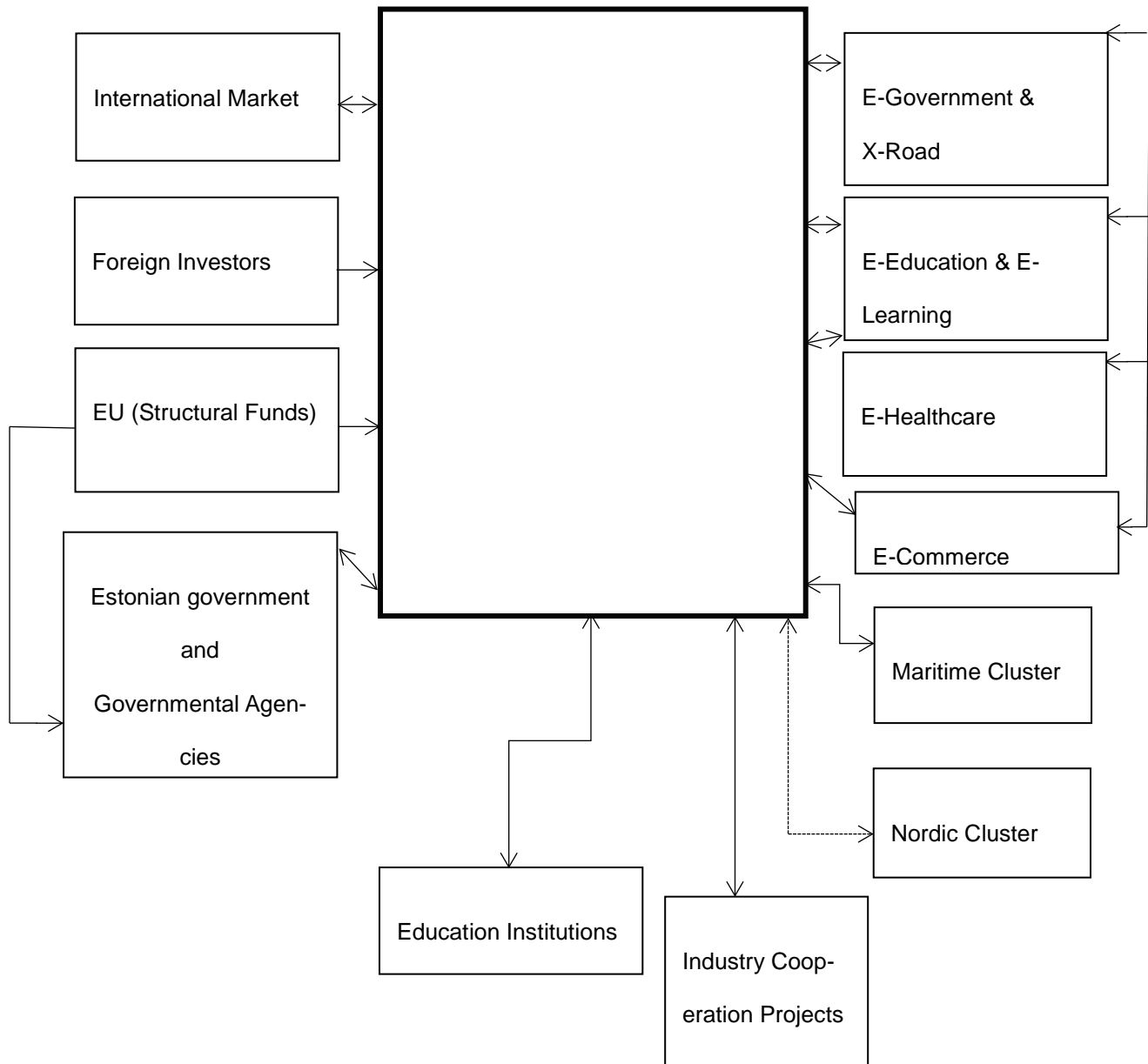
Development	Attributes/Function
X-road	<ul style="list-style-type: none"> • Technical and organizational Internet environment since 2001 • Permits secure data exchange between state's information systems
Mobile-ID service	<ul style="list-style-type: none"> • Allows secure confirmation of identity on mobile phone • Provides digital signature
ID-card software	<ul style="list-style-type: none"> • Provides digital signature • Evaluates validity of digital signature • Allows documents to be encoded

⁵ «E-services, a business concept developed by Hewlett Packard (HP), is the idea that the World Wide Web is moving beyond e-business and e-commerce (that is, completing sales on the Web) into a new phase where many business services can be provided for a business or consumer using the Web. » (Searchcio 2005)

	<ul style="list-style-type: none"> • Enables creation and signing of document on state portals
e-Commercial Register and Business Portal	<ul style="list-style-type: none"> • Enables inquiries on land ownership and annual reports of companies • Application for new company registration • Modification and erasure of companies data • Liquidation of companies
Track24	<ul style="list-style-type: none"> • Vehicle monitoring system • Allows end customer to optimize transport costs
E-State Portal	<ul style="list-style-type: none"> • Citizens can check information stored in different databanks • Permits Documents to be filled out, signed and sent
Health Information System	<ul style="list-style-type: none"> • Data can be used by doctors and patients • Gives overview of medical history • Permits payment of fees • Supports appointments with doctors • Supports communication between doctors (e.g. sending of X-rays) • Enables digital prescriptions

Table 4: Overview of developments connected to Digital Society (Tallinn, 2013: 43)

4.4 Cluster Map



The above shown graph states the core interaction within the ICT cluster. Its main components are Telecommunication Services, Computer related Services ICT Equipment and Computer Manufacturing (Price, R. and Wörgötter, A. 2011).

The **International Market** plays a role due to high exports of ICT products and services (cf. 4.1 History). International market has a high level of importance for Estonian ICT sector because there are many big international companies active on Estonian ICT landscape as employers of local specialist but foremost producing solutions for global needs. Their role of employers is crucial for enabling local talents to gain experience and create themselves an international career path. Such companies include Microsoft Estonia, Oracle Estonia, IBM Estonia etc. (Lumiste, R., Pefferly, R., Purju, A., 2007: 33). For the Estonian ICT companies, the customers have very often provided finances to work out the solutions or have established a link for funding (Purju, 2008 :43).

As Estonia is small (s. chap. XY) it can profit from **Foreign Investors** in the field of technology. In the IT sector, there are some large forge in capital or mixed capital based companies. However, this what by now has become truly international, has started in several cases as Estonian undertakings before becoming international via overtaking's or mergers. The examples include the cases of Skype and Playtech (one of the worldwide leading online gambling software producer) – both originating from Tartu, Estonia. (Lumiste, R., Pefferly, R., Purju, A., 2007: 33-34). However, also after takeovers and mergers, the big companies very often continue to prove their benefits for the country of origin on micro level. In the case of Playtech for example, the office in Tartu is today the world largest center of the corporation and also the biggest development center that keeps on yearly basis growing also in terms of new local employments.(Playtech Estonia webpage, 2013). It can be added, that in the same theme, the biggest IT exporter in the Baltic states, Nortal, is based on Estonian capital (Nortal webpage, 2013).

In 2012 18 million euros of the 21.6 million euros venture capital⁶ has been foreign money (The Economist 2013). Proportionally, it can be noted that the relevance of the foreign di-

⁶ Money provided by investors to startup firms and small businesses with perceived long-term growth potential (Investopedia 2013).

rect investments from Estonian GDP has been moderate, ranging from 1.5% (in 2011) to 6.9% (in 2012) and was 4.7% in the first half of 2013 (Swedbank Research, 2013: 8).

Through the **European Union (European Structural Funds)** invested in the period from 2007-2013 63.9 Million Euros into Estonia's Information Society. The society's goals are the creation of new information systems, improvement of existing systems, incensement of public systems and integration of all systems (Rahandusministeerium, 2011).

As Kalvet and Tiits point out the ICT manufacturing sector is a part of the **Nordic** (Finland and Sweden) **ICT Cluster**, whereby the same manufacturing branches can be found in all of the three countries (Kalvet, Tiits n.d.). The reason for this the fact that «The manufacturing of the ICT goods is dominated in Estonia by foreign investment enterprises, who have off-shored in the most case into Estonia the various manufacturing functions [...] » (Kalvet, Tiits n.d., p:8).

Enterprise Estonia, one of the major **governmental economic agencies** in Estonia, supports business and regional policy (Enterprise Estonia n.d.). In the period 2007 - 2013 Enterprise Estonia has implemented 784 Million Euro of the 3.4 Billion Euro provided by the European Structural Assistance. As this financially supporting period is going to End in December 2013, Enterprise Estonia is going to rephrase its main objectives and pay more attention to «training events, promoting entrepreneurship awareness and other activities to develop human resources. » (Enterprise Estonia n.d.). However, the new financial period is beginning in 2014. The essence of EAS is not expected to change substantially beyond this time in foreseeable future. (Majandus-ja Kommunikatsiooniministeerium, 2013: 6-7)

The main **Educational Institutions** are the University of Tartu, Tallinn University of Technology and Tallinn University (s. P. XY 2.4.1 Social Infrastructure and political Institutions, Education). There is enough reason to assume a strong link between the universities and the emerging of the world-class companies like Playtech and Skype which both originate from the university city Tartu.

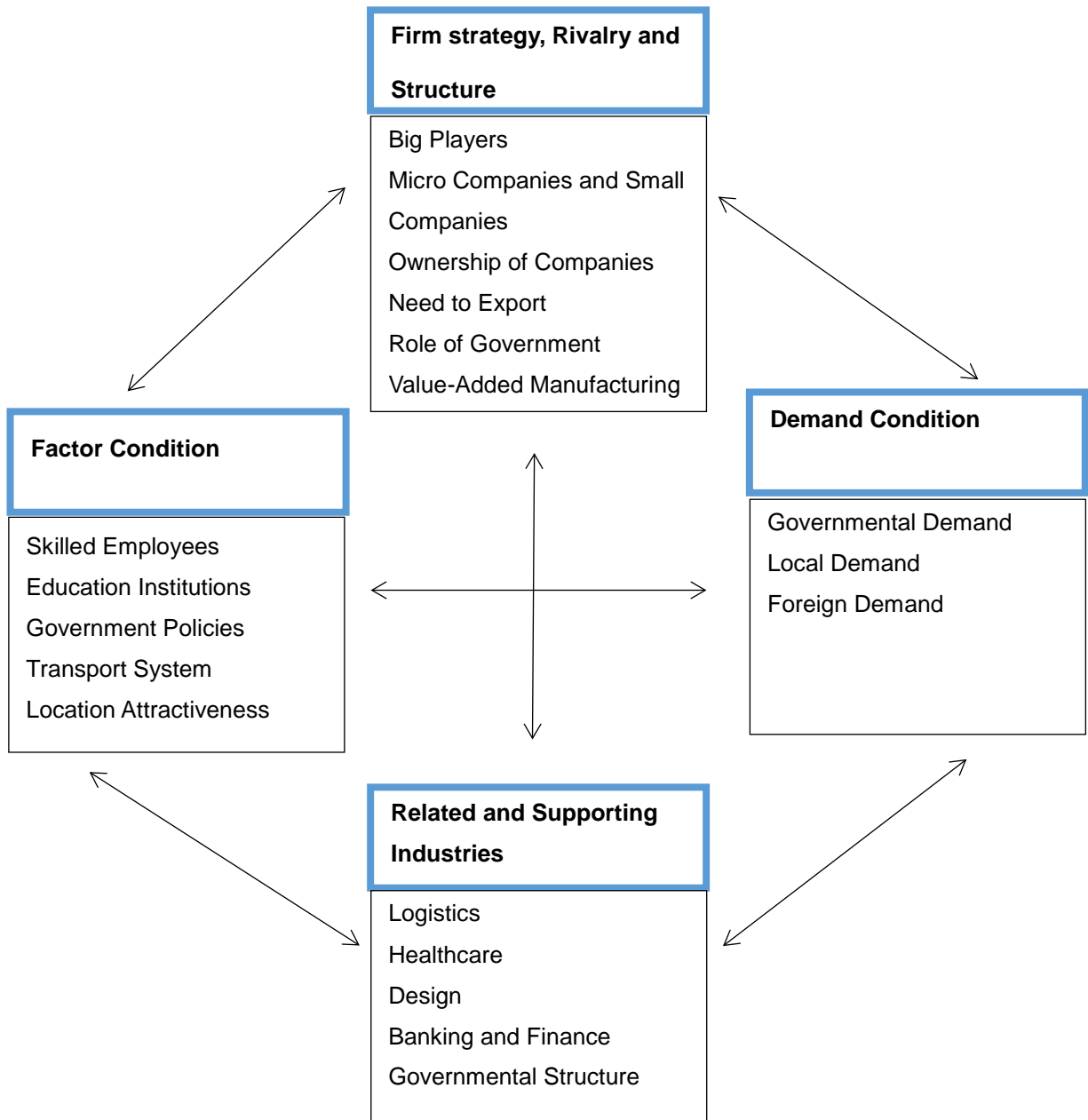
ICT Demo Center, ICT Export Cluster, ICT Cluster, Baltic Cooperation and ICT Lighthouse are some of the **Industry Cooperation Projects** (s. 5.3 Cluster Overview).

As already mentioned **E-Government, E-Education and E-Healthcare** play an important role in Estonia (s. State of Cluster Development and The ICT Cluster). Only **E-Commerce**

plays compared to the other European Union's states a less important role as it is only accounting for 1.5 percent of the total retail trade turnover (Baltic Times 2013).

The Maritime Cluster is one of Estonia's most important clusters and has therefore also an impact on the ICT cluster (s. p. 3.1 Maritime Cluster).

4.5 ICT Cluster Diamond



4.5.1 Factor Conditions

Skilled Employees: Even though Estonia has skilled employees in the ICT sector, there remains an imbalance between the supply and demand (Baltic Studies Estonia 2012). According to the Institute of Baltic Studies, Estonia will need up to three times more ICT specialist to ensure the development of the industry (Baltic Studies Estonia 2012).

Educational Institution: 35 percent of the 25 to 64 year olds had a tertiary education which is higher than the OECD average of 31 percent in 2010. Also had 43 percent (32 percent OECD average) of all Estonian women and 25 percent (30 percent OECD average) of all man a tertiary attainment (OECD 2012b). 4.4 percent of all tertiary graduates have been computing graduates in 2009 (Eurostat 2012). So far only the telecommunication sector has developed a strong link towards education institutions for fostering research activities. Other parts of the ICT Cluster see the education institutions rather as a supplier of highly qualified labor than a co-operation partner. (Kalvet, Tiits n.d.).

Cooperation between educational institutions and ICT companies: There are several cooperation initiatives and project that have been emerged between ICT companies and universities. The form of this cooperation varies. It can for example be a cooperation form like Mectomy by the Technical University of Tallinn (TTU) is offering – enabling companies to let the students under supervision of *professors* of TTU to find solutions for their business problems and develop prototypes (TTU webpage, 2013). Additionally, there are also other form of cooperation between companies and universities, like the companies offering student's specialized practice oriented IT summer and winter universities (Nortal webpage, 2013).

Government Policies: Since Estonia`s regained its independency, it`s government has introduced several policies and initiatives to foster ICT (cf. 4The ICT Cluster).

Transport System: Estonia possess a good transportation system due to its transportation infrastructure and geographical location (s. 2.3 Endowments and 3.1Maritime Cluster), which enables and fosters the export of ICT products and services. Unfavorable is the low frequency of direct flights towards other international tech clusters (The Economist 2013).

Location Attractiveness: As Estonia is out of the way and the weather conditions, especially in winter are hard, the location attractiveness might be low e.g. for attracting job talents (The Economist 2013).

4.5.2 Firm Strategy, Structure, and Rivalry

Big Players: In 2007 nine of 1'969 ICT companies (approx. 04.5 percent) amounted for 41 percent of the employees in the Cluster. 45 of 1'969 companies (approx.. 2.29 percent) generated 75 percent of the clusters turnover. Which shows the importance of a few, but big companies (Kalvet, Tiits n.d.).

Micro and Small Companies: 33 percent of all registered ICT companies had no employees and 41 percent had one to nine employees (micro companies). In total 74 percent of the companies were small and micro companies which amounted for 11 percent of employees in the sector (Kalvet, Tiits n.d.).

Ownership of Companies: 84 percent of the companies were owned by Estonians. Only 1.5 percent were owned by foreigners and Estonians with a share of 51 percent. 80 percent of the ICT exports is generated by manufacturing of electrical and optical devices, whereby 0.91 percent of the companies contribute to 67 percent of the exports. Over 70 percent of those companies are totally owned by foreigners (Kalvet, Tiits n.d.).

Need to Export: Due to the limited domestic market, Estonian ICT companies need to sell their products and services abroad (s. 4.1 History of ICT Sector).

Role of Government: As the government sets out specific rules regarding ICT and fostering ICT education, it creates a unique environment for the whole Cluster with the potential of innovation (s. 4 The ICT Cluster).

Value Added Manufacturing: The Cluster consists of different parts regarding its value-added. One part are low value-adding original equipment manufacturer, which are supplier-driven and have focused on process-innovation. Then, there is another part which focuses on software and is closely connected to the national innovation system. There is also a part consisting of internationally active specialized suppliers. Those suppliers are rather small but highly specialized. The fourth part includes companies such as Skype, which are successfully selling their own products (Kalvet, Tiits n.d). Kalvet (2004) emphasizes that «Em-

pirical evidence does not support the widely held view that Estonian ICT manufacturing has been gradually moving from low value-added manufacturing towards higher value-added production.» However, this argument shall be regarded with reservations. Firstly, the data used by Kalvet is outdated, representing the realities approximately ten years ago. Secondly, there has been considerable post-crisis value added growth per ICT employee taken place (from 29`000 EUR in 2010 to 34`000 in 2012) (Prime Investment, 2013: 2). Thirdly, the OECD Cluster Scoreboard Ranking⁷ for high-tech manufacturing places Estonian Cluster of Information and Technology on high places, i.e. for example regarding the turnover growth, proportion of young firms, liquidity ratio and employment growth (Timour, 2012).

4.5.3 Related and supporting Industries

Logistics: As transportation plays an important role in Estonia and a Maritime Cluster is existing, there might be a positive interference between this industry and the ICT Cluster.

Healthcare: ICT is important in the Estonian Healthcare industry, as above described.(s. 3 State of Cluster Development).

Design: Due to the contribution of the design industry to the entertainment IT/Gaming industry, a relation between ICT Cluster and Design industry can be assumed, especially regarding graphic design. (s. 3 State of Cluster Development).

Banking and Finance: As the most payments are done electronically, a link between the ICT Cluster and the Banking and Finance industry is to be assumed (s. 3 State of Cluster Development).

Governmental Structure: Governments imposes specific ICT standards (s. 4 The ICT Cluster).

Supporting industries: A distinguishing between the ICT Cluster and Supporting Industries could not be done due to limited accessibility of data.

4.5.4 Demand Conditions

⁷ The indicators used by the OECD for composing the ranking include economic data such as turnover and profitability growth.

Governmental Demand, government demands specific infrastructure, databases, systems, software etc.

Local Demand: Local demand is strong, whereby the shares vary depending on the used literature (Price, R. and Wörgötter, A. 2011). Local demand can be described with open-mindedness of domestic users. Proximity to advanced Scandinavian technology leaders will benefit the domestic developments. (Kalvet, T., Pihl, T., Tiits, M., 2002: 15)

Foreign Demand: Sweden, Finland, Russia and the neighboring countries Latvia and Lithuania are the major demanders for Estonian goods and services, whereby low and low-medium technology goods are mainly exported. (Baltic Export n.d.; OECD 2012b). Due to limited accessibility of data a comment on the quality of exported services cannot be made. As stated before, services are the fastest growing part of the ICT exports (s. 4.1History of ICT Sector). Furthermore, have been they less volatile to the global economic slowdown (Price, R. and Wörgötter, A. 2011).

4.6 SWOT Analysis

For analyzing the ICT sector in Estonia Albert Humphreys' SWOT analysis will be used. «Strength (S) and weaknesses (W) are defined as internal factors and opportunities (O) and threats (T) are external factors.» (Volberda et al.).

<p>Strength</p> <ul style="list-style-type: none"> • Government support • Entrepreneur programs • Labor (Knowledge) • Education Institutions • Transport System • Governmental Agencies • Industry Cooperation Projects • E*- 	<p>Opportunities</p> <ul style="list-style-type: none"> • Government support • Imported labor • Nordic Cluster • Collaboration with other countries
<p>Weaknesses</p> <ul style="list-style-type: none"> • Closeness to customer • Labor (limitation and import) • Location Attractiveness • Micro and Small Companies • Value Added Manufacturing 	<p>Threats</p> <ul style="list-style-type: none"> • Government Policy • Big players moving • Foreign investments • Labor (limitation and import)

Table 5: SWOT Analysis

4.7 Strengths

Government support: According to the WEF's "The Global Information Technology Report 2012", Estonia «has widely recognized the role that ICT can play to transform its economy and society. [...] Government`s vision to develop the sector and spread its effects to all areas of the economy has been significantly important» (WEF 2012 p 19). For instance, the government has developed several programs to support the ICT industry "E-Government",

“e-Commercial Register and business portal”, “Digital Signature Act”⁸, etc. are just some of them (s. p. YX) (Close-Up Media 2011).

Entrepreneur programs: According to the Economist, the main reason for Estonia’s success have not only been *the* government subsidiaries but its ability to be creative institutionally. Besides supporting the ICT industry financially, the government has offered several specific entrepreneur programs which provided initial trainings, legal advice and education (The Economist 2013). This ended up in Estonia holding the record for start-ups per person (A.K.K., 2013).

Labor (knowledge) and Education Institutions: The ICT skills of the Estonians are in general at the same level as the ones of the high income group (s. WEF graph), which is related to the governments *strong* support of education in ICT (s. p. History) (WEF 2012). In 2013, 17’000 of the ca. 25’000 people working in the ICT sector have been specialists (Baltic News Service 2013b).

Transport Systems: Estonia possess a well-established transport system (s. Diamond).

Governmental Agencies: Estonian government agencies have clear and well defined strategy to foster business *development* (s. Diamond).

Industry Cooperation Projects: There are several Industry Cooperation Projects existing which aim to develop the cooperation within the cluster as well as between it and other industries (s. Overview of the Cluster).

*E-**: There are *several* e-services (e.g. E-Government, E-Healthcare, etc.) existing in Estonia which are extremely well developed (s. Mapping).

4.8 Weaknesses

Closeness to customer. Most of the customers of the ICT companies are outside of Estonia, so the companies cannot test their products or services at home. To overcome this issue, some of the companies have chosen to move their management boards outside of Estonia. For example, Grab CAD, an online *collaboration* platform for mechanical engineers, moved

⁸ Digital Signatures Act: Gives the digital signature equal legal value as the handwritten one.

its headquarters to Cambridge, Massachusetts. Other examples are Transferwise and Realeyes, who relocated their headquarters to London (The Economist 2013).

Labor (limitation and import) and Location Attractiveness: At the moment Estonia is lacking specialized ICT *employees*. According to the Institute of Baltic Studies, Estonia will need up to three times more ICT specialist to ensure the development of the industry. Therefore domestic and foreign employees are needed. (Baltic Studies Estonia 2012). Employees from abroad are hard to attract due to the challenging weather conditions and complicated immigration rules (The Economist 2013).

Micro and Small Companies: As the Cluster consists mostly of micro and small companies, the potential for innovation is rather low due to the lacking of financial and human capital (s. Diamond).

Value Added Manufacturing: Estonia is manufacturing low value-added ICT products (s. Diamond).

4.9 Opportunities

Governmental support: The in 2013 elected chief ICT official from the Ministry of Economic Affairs and Communications, Taavi Kotka, aims to increase the number of employees in the ICT sector to 50'000 by 2020. In 2013 ca. 25'000 people have been linked to this sector. Taavi Kotka targets to achieve this goal by constant moving of the resources from other industries rather than by employing «fresh ICT graduates or imported labor» (Baltic News Service 2013b). Such kind of government support may be a chance to tie the ICT companies as the access to knowledgeable employees would be eased.

Imported labor. Due to the lack of specialized employees, the regulations for highly skilled foreign workers have been eased in June 2013. This steps aims to attract more employees from abroad and filling the gap between supply and demand of specialized employees (Ocilla, L.; Rebate, K. 2013).

Nordic Cluster: The Estonian ICT Cluster might increase its products and services through stronger interaction with the Nordic Cluster.

Collaboration with other countries: As Estonia has developed a unique E-Government, it could increase cooperation with other countries and thereby gain new insights and potential for innovation (s. 4.3 Digital Society Overview).

4.10 Threats

Governmental Policy and Labor (limitation and import : Doubling the number of employees in one sector from 25'000 to 50'000 in seven years (s. XY) is an ambitious that might not be completely fulfilled. Additionally, there might be a chance that the level of wages will not continue to grow on the same level as they have been growing so far. Should the proportion of foreign labor increase dramatically, the social and economic situation might become more tense.

Big Players moving: When the need for specialists is not increasing enough and the customer-closeness not given (s. p. Weaknesses), the risk of big players such as Skype and Playtech⁹ moving their development centers out of Estonia can be real (Baltic News Service 2013b).

Foreign investments: Foreign investors are important for Estonia, especially in the field of IT, they can have a positive impact on already established companies but also for start-ups. 2012, 18 million euros of the 21.6 million euros venture capital¹⁰ have been invested from abroad into the Estonian start-ups (The Economist 2013). Changes in the economic situation of the investing countries might have strong impact on Estonia's ICT sector.

⁹ One of the most important players in gambling software industry

¹⁰ Money provided by investors to startup firms and small businesses with perceived long-term growth potential (Investopedia 2013).

5 The Estonian ICT Export Cluster

The cluster definitions differ significantly, depending on the source and methodology used to describe them. There is no cluster definition being universally understood and commonly used by the various authors/ institutions. Therefore, it is necessary to distinguish between the cluster definition reflecting strategic approach of M. Porter (Porter 1998) and other existing cluster defining approaches. According to Porter`s classical definition, “Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, and associated institutions in a particular field that are present in a nation or region” (Harvard Business School webpage 2013). A little bit more refined definition of clusters on the same subject by Porter (Porter 1998) is explaining: “A geographical concentration of firms interconnected by being part of the same industry or the same supply chain, by a common resource or market, by a similar philosophy, by facing similar opportunities and challenges or by collaboration with the same university or research institution”.

Porter mentions key elements of cluster systems accordingly: “A cluster, then, is an alternative way of organizing the value chain. Compared with market transactions among dispersed and random buyers and sellers, the proximity of companies and institutions in one location and the repeated exchanges among them - fosters better coordination and trust. (...) A cluster of independent and informally linked companies and institutions represents a robust organizational form that offers advantages in efficiency, effectiveness and flexibility.” (Porter 1998: 79)

In this chapter, Estonian ICT Export Cluster is going to be explored more in detail the, it`s activities, potential, developments, role on the Estonian IT landscape. As stated earlier, the Estonian ICT Cluster is here considered in a broader sense, consisting of most of the relevant IT companies in the country. The term ICT Export Cluster however, is reflecting the usage of the original term standing for cooperation activities between certain actors on the Estonian ICT landscape. Therefore, the Estonian ICT Export Cluster is constituting a unit of Estonian ICT companies but is in the context of this paper to be understood as a special form of cooperation rather than a cluster in the sense of Porter`s theoretical framework. There is a host of research on clusters and cluster development. Some clusters have prov-

en to be more progressive than others, some might evolve for a while and then lose their vitality, similarly as regular businesses do.

DTI (2004, p.6) has carried out research summing up the success criteria for clusters based on global literature reviews (see the table below). For that purpose, different clusters worldwide over a different period of time have been observed. As a result, top success criteria were detected according to the percentage stated most often. The top criteria were determined as effective networking partnerships, followed by innovation, R&D and knowledge base and thirdly by human capital. The report refers those top three criteria as critical success factors. Top 4-7 are referred to as contributing success factors, including: physical infrastructure, presence of large firms, enterprise entrepreneurialism and access to finance. In this paper most of these factors are tried to be covered up throughout different sections of the chapter.

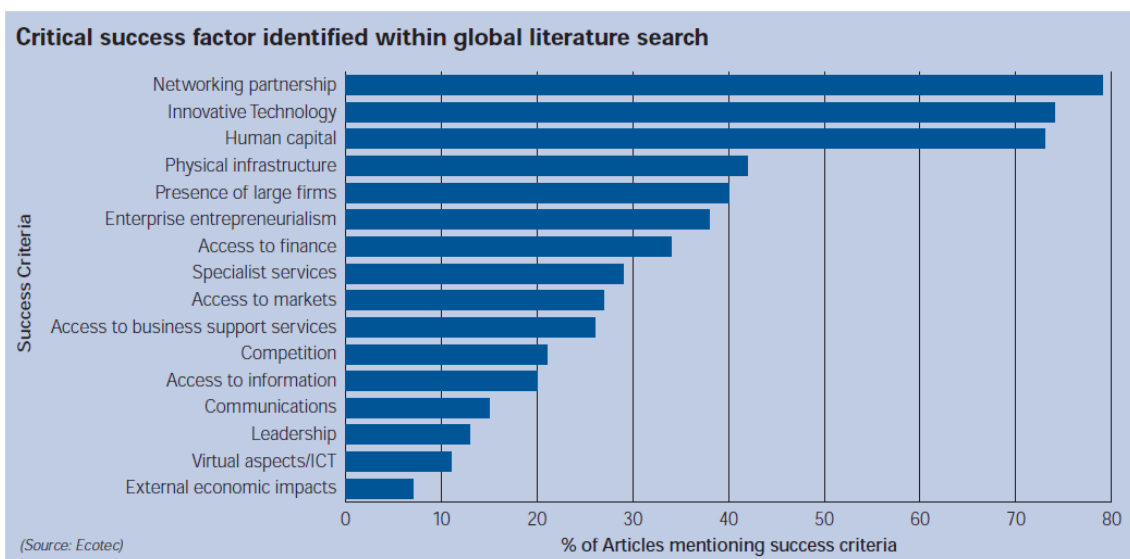


Figure 6: Critical success factors in cluster developments (DTI, 2004)

5.1 Role of Export for Estonian ICT Companies

Considering the small size of the home-market in Estonia, the role of export for IT companies is essential. In order to grow, companies are strongly relying on the ability to export outside the country. Although internal growth potential is existent, it is at the same time highly limited. In Estonia, the share of IT exports is making up more than half of the company revenues. In 2012 the share of exports is reported to be 60% of overall revenues (see

graph below). Estonian companies Nortal and Santa Monica Networks Group are both sharing strong positions on the Baltic IT companies' export comparison over the past years. (Prime Investment 2013: 3-4)

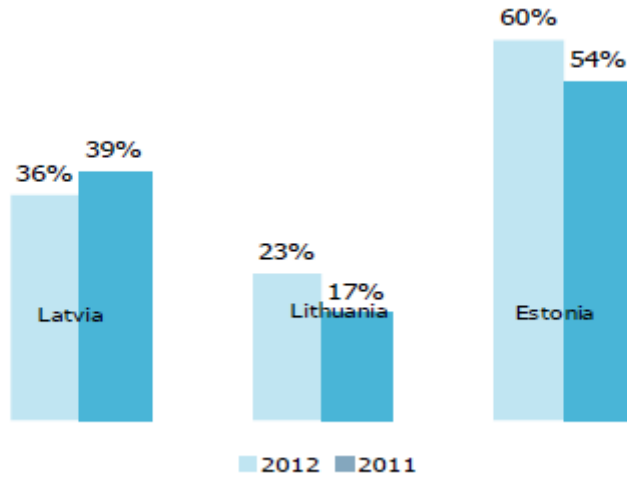


Figure 7: Share of exports in the IT sector per country (Prime Investment, 2013)

Country	Company	2012		2011		Growth, % 2012/2011
		Export value	% of total	Export value	% of total	
Estonia	Nortal	25.808	65%	19.326	58%	34%
Latvia	Exigen Services	10.172	58%	10.105	64%	1%
Estonia	Santa Monica Networks Group	9.563	61%	6.597	57%	45%
Lithuania	BDC (fmr. Baltic Data Center)	7.734	46%	5.030	0%	54%
Lithuania	NFQ	3.132	74%	1.568	68%	100%

Figure 8: Largest exporting IT companies in the Baltic states according to their export's share (Prime Investment, 2013)

5.2 Fundamentals of the Cluster

Being aware of the high importance of exports for Estonian IT companies, the export angle of the business deserves special attention. The Estonian ICT Export Cluster provides an interesting example that is being discussed subsequently.

ICT has enjoyed a good reputation in Estonia over long period of time. It is also a sector where high value-added can be created. It was acknowledged by the Estonian ICT compa-

nies that in a small home market export potential must be used. In order to support that, it was found that it would be useful to take common actions. (Laane, Vimberg, 2011: 2)

A bigger clustering activity, also regarding export activities, has taken place in Estonia already earlier - under the Estonian ICT Cluster. The formal foundation for export cooperation of the Estonian ICT companies as a cluster was initially created by establishing the Estonian ICT Cluster in 2009. Informally, the cooperation between the Estonian ICT companies has started already before the institutionalized cooperation began in 2009. (ITL, 2011: 17).

The Estonian ICT Export Cluster was officially established in 2010. At that time it was initiated as a three-year-project. During this period of time, it has proven to be a successful project and motivated the cluster partners to continue the cooperation. Although it is evident now, that cluster activities are going to continue beyond the projected three year limitation, the second period has officially not been launched yet. For this reason, we are concentrating primarily on the essentials of the first phase.

Since the beginning, the primary goal of the ICT Export Cluster has been to foster the exports of ICT solutions developed and implemented in Estonia. Private companies, different governments and societies worldwide were seen as a target group for solutions making up the e-Estonia concept mentioned before. (e-Estonia, n.d. b: 18)

“The main goal of the Estonian ICT Cluster is to promote cooperation among ICT companies and other economic branches. Through this, we aim to foster the development of new solutions and the creation of new products, and to improve the companies’ competitive ability in the international market.” (e-Estonia, n.d. c).

One of the main four areas of activity for reaching the above mentioned goal is export development. Since the ICT Cluster first operating period started in 2009, export’s role has been continuously mentioned and kept in agenda also for the 2nd operating period until 2015. (ITL, 2011: 19)

However, the main body behind the Estonian ICT Cluster, Association of Information Technology and Telecommunications, carries out somewhat different activities and has set a different focus compared to the Estonian ICT Demo Center – the main body behind the Estonian ICT Export Cluster. According to the Estonian ICT Export Cluster strategy, Demo Center is more straightforward in export development and is acting in a more network ori-

ented manner in order to create and carry out its export business. This means a remarkable difference between the ICT Cluster and ICT Export Cluster. This approach is confirmed by looking in detail at the different goals and objective targets set by the ICT Cluster and ICT Export Cluster for their according organizations. (Estonian ICT Export Cluster Strategy, 2010: 12)

It may seem that there might be some overlapping of the ICT Cluster activities and the ICT Export Cluster as such. However, the similarities are in the praxis rather small and overweighed by the different nature of the two organizations.

5.3 Overview of the Cluster

The ICT Export Cluster is composed of 24 different actors, the cluster partners. The partners involved in the cluster include a majority of private companies, two Estonian universities based in Tallinn, a business campus¹¹, and the Estonian Certification Center (providing certificates for authentication and digital signing to Estonian ID Cards)¹².

Cluster partners offer first and foremost services and products on the field of IT solution development, IT equipment production and R&D. The exact sectorial positioning of the companies is illustrated in detail in the graph below. There are 15 different sectors listed where the Cluster partners are active in. So even when the size of the Cluster is limited to 24 partners, it has a very diversified composition.

¹¹ Technopolis Ülemiste AS, <http://technopolis.ee/en/smart-business-center-tallinn>

¹² AS Sertifitseerimiskeskus, <https://www.sk.ee/en>

	3D TECHNOLOGIES R&D	AKTORS	ARSTILIK PERENOUDANDLA	COLUMBUS IT	CYBERNETICA	DATEL AS	ELION	EMT	HELMES	IT COLLEGE	KOOLITÖÖDE	MOBI SOLUTIONS	NETGROUP	NORTAL	NOW! INNOVATIONS	NUTITEQ	POSITIUM	REALSYSTEMS	REGIO	SERTIFITSEERIMISKESKUS	TALLINN TECHNICAL UNIVERSITY	TECHNOPOLIS ÜLEMISTE	UPTIME	YOGA
SECTORS																								
Interoperability																								
e-Identity & digital signature																								
CleanTech / Energy and resources																								
e-Governance																								
Education																								
Finance																								
Healthcare																								
Human Resources																								
Law enforcement																								
LBS, GIS																								
Logistics																								
Manufacturing																								
Mobile solutions																								
Real estate / facilities																								
Telecommunications																								

Figure 9: Overview of ICT Export Cluster members according to sector (ICT Demo Center, ICT Export Cluster, Company Profiles, p.6)

The ICT Export Cluster`s approach can be seen as pretty much as a rational one. It has been called into life to create real value for its partners. Thereby, it was stated already in the beginning of the Cluster`s activities, that the basis for the value creation shall result from innovation. Therefore, the role of universities and other knowledge generating bodies participating in the cluster is crucial. As one major measurable goal for the first period of Cluster activities, the export growth rate of 50% for Cluster partners was targeted. Other additional goals are listed below. (ICT Export Cluster strategy, 2010: 25).

Estonian ICT Export Cluster`s goals (ICT Export Cluster Strategy, 2010: 25):

- Inclusion of universities and other research institutions in order to create a functioning innovation growth engine and a network for developing ICT solutions.

- Through cooperation with global corporations, establishment of a network of lobbyist/ sales teams in target countries that are informing the ICT Export Cluster about upcoming procurements and their conditions.
- Development of Cluster homepage introducing Cluster members and a common database. Usage of commonly coordinated branding and marketing measures.
- Cooperation between Estonian public and private sector that enables further support for ICT solutions export.
- Cluster`s activities have raised the exports of cluster member at least by 50%.

Three years after the establishment, by the autumn 2013, it has become clear that the ICT Export Cluster has managed to fulfill its initial goal to achieve growth in export revenues of participating companies and to profit from the cooperation synergies. Export revenues of ICT Export Cluster companies increased three times in the period of 2010 until 2013. This means substantial 300%, instead of planned 50%, increase in export revenues as targeted in the beginning of Cluster`s existence in 2010 (Äripäev, 2013).

The ICT Export Cluster creation was a consequence of the initiation of the ICT Demo Center in Tallinn. The ICT Demo Center itself has been officially set up in 2009- only one year before the establishment of the ICT Export Cluster. Now and then, the ICT Demo Center has been serving as a showroom to demonstrate the state of the art IT solutions created by the Estonian IT companies. It`s a place where visitors (e.g. foreign business delegation, investors or policy representatives) can easily get an overview of the sector and the its latest developments in physical products and electronic simulations of the available solutions.

Next to the ICT Export Cluster, Demo Center operates further projects. For example, in 2011 the Baltic Cooperation Project was set up to foster ICT related cooperation between the Baltic states. (ICT Demo Center, Baltic Cooperation). However, in the course of this paper, we only address the ICT Export Cluster and no further activities related to the Demo Center – this is due to the scope and concept of this work.

5.4 Business Model of the ICT Export Cluster

The ICT Export Cluster`s main common activities are respectively divided into three groups: marketing, sales and innovation. Those three main categories of activities each contain further activities explained closer in the graphic below. Additionally, the following supporting

activities are carried out: representation of common interest in the formation of public sector legislation, policies and programs, organizing common events and networking, analysis of the cluster's development needs, adjustment of cluster according to the external environment trends. (ICT Export Cluster Strategy, 2010: 29)

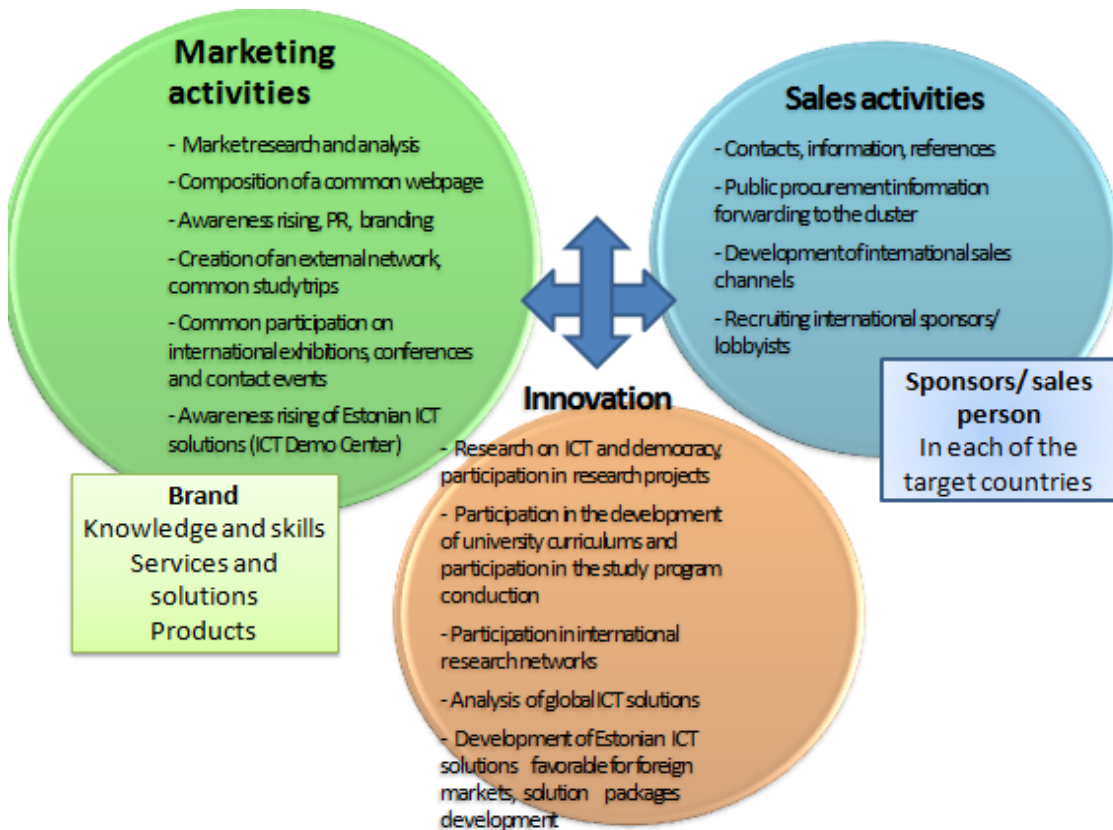


Figure 10: Estonian ICT Export Cluster's Business Model (ICT Export Cluster Strategy, 2010)

5.5 Financing

The government of Estonian has recognized the importance of cluster formations and cluster development activities. There are different cluster support measures offered since 2008. The total amount of financing for cluster development programs until 2013 was EUR 6.391 million. (Tartu linnavalitsus webpage 2010)

The ICT Export Cluster has been financed by using different sources available for cluster funding. Altogether, there are eight types of different activities distinguished by the Cluster

(Estonian ICT Export Cluster, 2010: 34). For carrying out those activities the Cluster is using different sources of financing.

There are three main sources of financing (ICT Demo Center):

1. European Structural Funds
2. Tallinn Enterprise Board
3. Export Cluster participants self-financing

Financing via European Structural Funds (Regional cooperation section) is providing the main source of finances for the Export Cluster. The financial means of the European Structural Funds are administered by Enterprise Estonia (EAS), which is a governmental economic development implementation body. Companies can apply via Enterprise Estonia for funding according to the ongoing available application rounds if their financing needs are fitting into the given support measure categories. In the case of ICT Export Cluster this has been the case with several support measures. For different activities, the Export Cluster has received funding from EAS, most commonly from the cluster support measure (see table below).

The city of Tallinn, where most of the Cluster's companies are based, has also supported the Cluster financially. This has been done via Tallinn Enterprise Board. Thirdly, Cluster partners that are the Cluster's main profiteers also contribute to the Cluster's budget.

The following table shows how the different cluster activities are financed and which financing measures are therefore used.

Sources of financing	Cluster`s support measures	International exhibition support measures	Common marketing support measures	Conference support measures	Partner`s self- financing
Activities					
Market re- search	x				x
Study trips	x				x

Conferences	x				x
Exhibitions		x			x
Homepage and data base creation and maintenance	x				
Common visual appearance			x		x
Marketing strategy	x				x
UN Conference				x	x

Figure 11: Financing of the ICT Export Cluster`s according to activities (Estonian ICT Export Cluster Strategy, 2010: 34)

5.6 Structure of the Cluster

The Cluster is organized in a relatively simple way. It`s structure is designed according to the functions different parties exercise in it. The leading role of Cluster management is taken by the company representatives themselves. In this way, direct involvement of the insiders is enabled.

Structure and functioning of the ICT Export Cluster (ICT Export Cluster strategy, 2010: 30):

- The fundamentals of Estonian ICT Export Cluster are stated in the consortium contract signed by the Cluster partners. Cluster partners are responsible for giving inputs for organizing Cluster`s goals, activities and other aspects relevant for organizing Cluster`s work.

- Supervisory board is composed by the representatives of the Cluster partner companies, universities and ICT Demo Center. The head of supervisory board and the vice head are elected – their task is to manage the work of the supervisory board.
- The Head of Development is responsible for Cluster development, realization of projects and is managing and representing the Cluster. The Project Manager post is created to make sure that the daily administrative tasks of the Cluster are fulfilled.
- Experts and specialists are engaged on a contractual basis when needed for concrete projects and services (e.g. consulting).

Nevertheless, the beginning of the cooperation was not without risks and challenges. It was not clear in the beginning how the freshly formed cooperation is going to function and which forms it can take. One issue that concerns such undertakings is the establishment of mutual satisfactory trust basis underlying the cooperation among the companies. (ICT Export Cluster Strategy, 2010: 9). This is especially concerning the exchange of company's specific know-how.

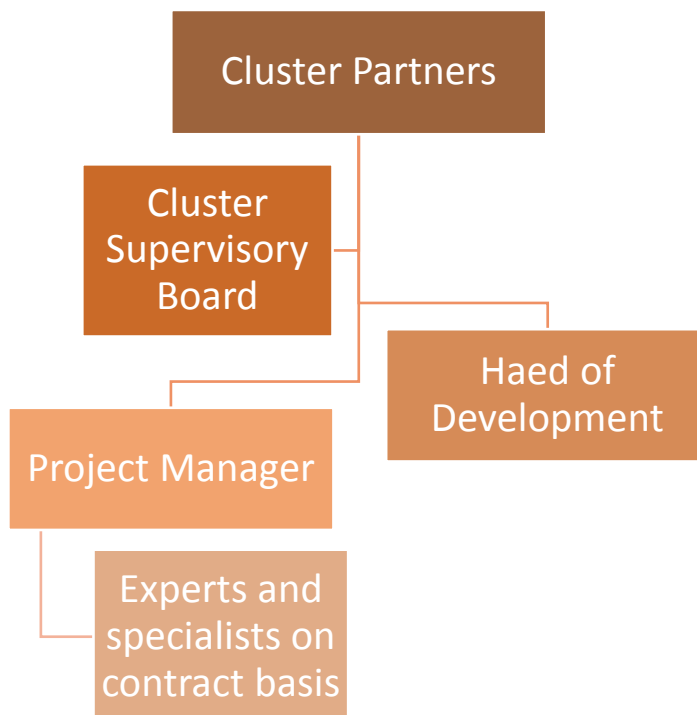


Figure 12: Structure of ICT Export Cluster (ICT Export Cluster Strategy, 2010)

5.7 Outlook

At the moment, the first phase of the Export Cluster activities has just ended and the second phase for the Cluster is under planning (Estonian Ministry of Finance, 2013). The previous success of the companies within Cluster seems to motivate participants to continue this cooperation also in the future and move on with the Export Cluster activities beyond 2013.

It is to be expected that the new activity period for the Export Cluster will include larger collection of displayed solutions, further developed focus on innovation. (IKT Demokeskus & Ekspordiklaster, Laane, Vimberg, 2011: 11)

Besides fulfilling the major goal of export growth, the Cluster has also received positive attention on the public arena. In 2012, the ICT Export Cluster won the first place of the Tallinn Entrepreneurship Day 2012 in the category of best cooperation projects (Tallinn Entrepreneurship Day, 2012), being a possible indicator for the good cooperation not only internally but also externally.

6 Strategy Recommendations

Firstly, Estonia shall improve its value-added manufacturing and therefore it has to redefine its position in the global value chain. In order to do so, it shall even stronger focus on production of specific parts of ICT goods and services. Low-cost production will provide no competitive advantage and competition shall be based foremost on quality and innovation. For doing so, innovation must be fostered by increasing research and investing in design. The cooperation between the micro and small companies must be improved (through the Industry Cooperation Projects) and also between the big players and education institutions. Additional governmental investments into R&D will provide a good framework for that.

As there is a lack of specialists in Estonia, it has even more actively attract skilled employees from abroad by making living and working in the country more attractive for them.

Being part of a bigger Cluster, such as the Nordic Cluster, gives Estonia the opportunity to benefit from exchanging labor and knowledge there, which should be used for supporting its own Cluster. Collaboration with other countries might help to create better innovation potential and should therefore be more encouraged.

Estonia should also attract even more IT related investments from abroad as the creation of innovation and the necessary research and design are cost intense and therefore additional financial means would be appreciated.

7 Conclusion

Estonia's government plays an important role for the Estonian ICT Cluster. It has been able to create a unique business environment by using several methods. Government is also cooperating with the IT companies in order to create sophisticated IT solutions that are going to be put into practice once they have been created. In this way, companies get the chances to produce ICT solutions for the governmental use and can get new insights and ideas for new innovations which they are later on able to further develop and sell also in other countries. This model has been working so far well and companies have been in several cases able to further develop their products and services and match them with the target markets where they have also been sold.

On the other hand, Estonia needs further acknowledge that it has constantly move higher in the value-added manufacturing, so that it could gain a bigger competitive advantage and produce its IT services and products for higher processes.

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9 Appendix

9.1 Estonia and WEF's Stage of development

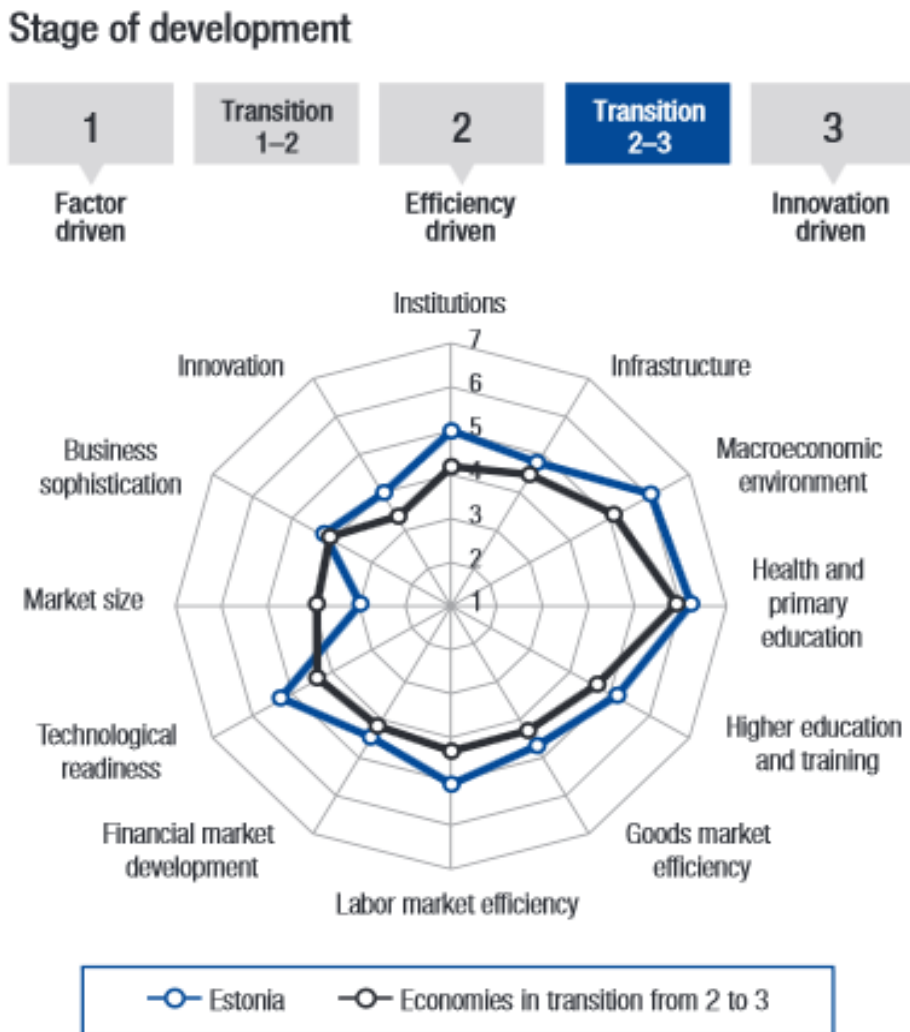


Figure 13: Estonia and WEF's 10 pillars (WEF, 2013: 214)

The above shown graph compares Estonia's result in the WEF's Travel & Tourism Competitiveness Report to the average of the high income group. The high income group is defined by the OECD whereby in this graph no distinction is made between OECD-countries (e.g.

Austria, Czech Republic, United States, etc.) and non-OECD-countries (e.g. Singapore, Kuwait, Croatia, etc.). The graph emphasizes how similar Estonia has scored to the average of the high income group. The main difference lies in “Social impact” which analyses «the level of quality of life in a society and the equality of access to basic services that a society requires » (WEF 2013, p. 127)

9.2 Estonian Information System

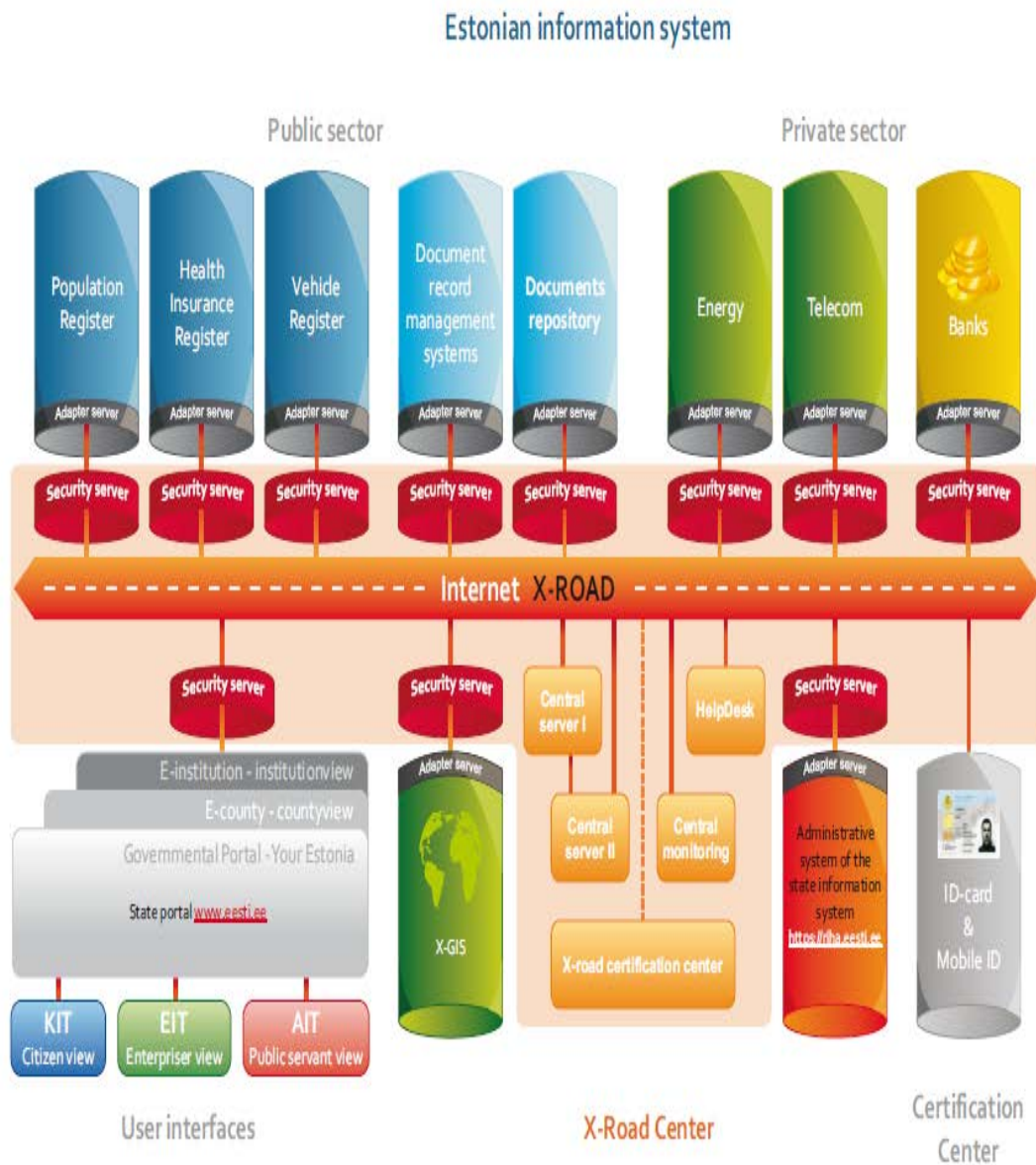


Figure 14: Estonian Information System (Herlihy, 2013)

This graph shows the different stakeholders in the digital society and the way they interact with each other and the affected systems, databases, etc.