The emergence of creative styles of innovation in Central and Eastern Europe: the challenge from Estonia

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Innovation continues to suffer from a peculiar neglect in the broad field of Central and East European (CEE) studies. In particular, surprisingly little is still known about the ways in which real-world systems of innovation function in post-socialist Central and Eastern Europe and the actual processes through which they have emerged during the past 10-15 years. The present chapter seeks to contribute to a better understanding of the dynamics of innovation in CEE by historically explaining the emergence of post-socialist ‘styles of innovation’. As an example of the emergence of ‘creative’ innovation styles, the chapter discusses the Estonian telecommunications sector. Rather than trying to measure ‘how innovative’ CEE is, the focus is on the qualitative characteristics of the innovations that do occur, who the innovators are, how innovation is organised, and what role institutional change has played at different stages of development. It is argued that in order to explain the characteristics of systems of innovation in CEE, a deep historical dimension is needed in the analysis. In the case of Estonia, the combined effect of an unusually close and historically rooted cooperation with Sweden and Finland and the emergence of new technological paradigms in the telecommunications sector has paved the way for post-socialist innovative activities that in several cases have been surprisingly creative and aggressive.

1. Introduction

The generation and exploitation of new technologies, processes and products – i.e. innovations – is today widely regarded as the principal driving force in all long-term socio-economic development. The future of
The knowledge-based economy in transition countries, industries and firms is therefore likely to be largely determined by their capability to generate and exploit technological change and other innovations. This is true also for the post-socialist countries of Central and Eastern Europe (CEE). However, research on economic transformation in the CEE countries and their integration with Western Europe has so far mostly focused on issues such as the role of the former socialist countries as emerging markets for Western products and as new production sites of Western companies, based on the availability of low-wage labour. The deeper, more long-term interest in the dynamics of sectors and firms in CEE and their innovative performance has so far been much less emphasised.

To a certain extent this may be motivated by the fact that, for example, aggregate R&D expenditures and patenting in CEE have been and continue to be almost negligible in comparison to Western countries (e.g. OECD, 2002) and that innovation thus in general hardly can be seen as a driving force in current CEE developments. Similarly, in technologically dynamic sectors CEE firms have mostly had international success only as subcontractors, whose difficulties to innovate are dramatically demonstrated by the almost complete lack of CEE firms in international patent statistics (US Patent Office, 2003; cf. Lankhuizen, 2000).

On the other hand, economic and industrial policies in many CEE countries do contain a strong commitment to the establishment of knowledge-based economies, with education, science and technology as the main drivers of socio-economic change. Drawing as far as possible on their problematic but advanced industrialised and technified Soviet-era pasts and taking advantage of the recent establishment of open capitalist economic systems, CEE economies have set out to establish themselves among the most advanced European countries. In CEE, there is often a strong belief that this can be achieved within a foreseeable future.

Indeed, despite the negative overall trend, innovation is far from non-existent in today’s CEE economies. The problem, both from a research and from a policy perspective, is that we know only very little about how these innovative activities have actually come about; in what areas CEE firms have been successful; how successful innovation has been organised; how the institutional environment has co-evolved with the development of the innovation system; etc. The present chapter seeks to contribute to a better understanding of the dynamics of innovation in CEE countries by exploring their ‘styles of innovation’ and historically explaining the emergence of these styles. As an encouraging example of
the emergence of more ‘creative’ styles of innovation, the chapter discusses innovation in the Estonian telecommunications sector. Rather than trying to measure ‘how innovative’ CEE is, the focus is on the qualitative characteristics of the innovative activities and how they have come about. The chapter thus moves beyond purely quantitative indicators and aims, instead, at capturing the actual development of new products and processes in CEE as it takes place in and between organisations in the post-socialist environment.

2. Systems of innovation and innovation styles

2.1. Modern perspectives on innovation: some stylised facts

The commonly-held view today that science, technology and innovation constitute fundamental forces in socio-economic development is, of course, not new. Classical authors such as Smith, Ricardo, Marx or Marshall all recognised the phenomenon of innovation as playing a key role in shaping any modern economy, although the extent varies to which they actually set out to study the process of innovation itself. Schumpeter explicitly suggested placing the innovator at the centre of all economic analysis, but the study of innovation in its own right and of its role in the modern economy remained largely in the shadow of ‘equilibrium’-based theorising during most of the 20th century. It is thus only in the last couple of decades that a deeper understanding of the phenomenon of innovation has begun to emerge.

Above all, it has thereby been recognised that individuals, firms and other organisations who are involved in the innovative process in society are not passive automata that mechanically transform inputs into outputs and that can easily be ‘reprogrammed’ to perform new tasks. This might seem self-evident, but recognising it means opposing a number of traditional expectations, for example, that the creation of a suitable institutional environment in a less developed country (e.g. the establishment of market economies in post-socialist countries) sooner or later forces catch-up with advanced economies. The innovative economy is in more modern views seen as constituted by creative agents who actively shape the process of innovation and who react to a changing environment not necessarily by adjusting their rational choices in accordance with the new conditions, but also by engaging in difficult
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search and learning processes with highly uncertain outcomes (e.g. Schumpeter, 1947). In doing so, actors are seen to be only ‘boundedly’ rational, and they interpret their environment and their possibilities strongly in terms of their own experiences and of the worlds that they know. History is therefore strongly present in the behaviour of actors and not least in their generation and exploitation of innovation.

Furthermore, it is today no secret that firms almost never innovate in isolation (Edquist, 1997). In the evolutionary language, this is to say that innovation is a ‘collective learning and selection process’ (McKelvey, 1997). The ways in which innovation is generated and exploited in an economy are therefore unlikely to be satisfactorily understood without addressing the relationships and connections between actors. Actors are dependent upon a variety of relationships to customers, suppliers, competitors, research institutes, universities, government agencies, branch organisations, etc. Among innovating firms, such relationships may take the form of technology licensing, user-producer relationships, strategic alliances, research consortia, networks of innovators, etc. (see e.g. Tidd et al., 2001, ch. 8). Recent research has stressed the importance of relationships with non-firm organisations such as universities and government agencies. Direct access to academic research is growing in importance, and the need for advanced regulation in industries such as pharmaceuticals and telecommunications means that government bodies have come to play increasingly crucial roles for innovation. In addition, non-firm organisations often play decisive roles as demanding customers of new (or still non-existent) products (Edquist et al., 2000).

The focus on inter-organisational relationships has grown stronger in recent years, so that today there hardly exists any innovating firms that can afford to generate and exploit innovation solely through in-house efforts. This also means that the innovative process may spread over a larger number of organisations in a larger part of the world than earlier. For example, traditionally relatively non-innovative firms such as subcontractors may in many cases be seen to play more important roles in the development of innovation (e.g. Carlsson & Braunerhjelm, 1994). With respect to the related issue of internationalisation of innovative activities, it has been observed that firms are increasingly part of transnational or even global networks, although it is clear that international relationships involving innovative activities are in general much less strongly developed than networks related to the exploitation of international markets and of production capacities (for example, outsourcing of production to low-wage countries) (Archibugi & Michie,
When it comes to internationalisation of innovation, it has been observed that cultural affinities matter a lot for the choice of partner. For example, international collaboration in innovation is much more common among firms from different European countries as compared to partnerships between European and Japanese firms. Linkages and networks for innovation are therefore likely to look very different from linkages and networks in trade and manufacturing. This relates to Schumpeter's (1934) thinking, for whom understanding the dynamics of innovation was something completely different from understanding the ‘circular flow’ of production.

The observed dependence upon and interactions with other organisations (and individuals) involved in innovation has led to an increased focus on the *systemness* of the innovative process. This relates to the failure of traditional approaches to fully grasp the ability of firms, industries and economies to generate and exploit innovation. In particular, firms’ differential performance across national and regional settings led from the late 1980s to the study of *national systems of innovation* as a broad explanatory framework for understanding how the evolutionary and interactive characteristics of innovation manifest themselves at the level of national economies. It was thereby observed that the evolution of technologies, organisations and institutions in close relation to each other has created quite distinct and different environments and cultures of innovation in different countries. Even countries which traditionally interact strongly with each other, such as Sweden and Denmark, turned out to have developed very different national systems of innovation (Edquist and Lundvall, 1993; Virén and Malkamäki, 2002). Such differences in national systems (and in later studies also regional and local systems) may also be expected to emerge in post-socialist Central and Eastern Europe. A similar argument has later been developed for innovation in different *industries*, giving rise to the notion of ‘sectoral’ systems of innovation, whose dynamics is thus often seen to differ radically from one sector or industry to another (Malerba, 2002; cf. Pavitt, 1984).

In summary, innovation had better be analysed as taking place in *systems*, while at the same time the evolutionary characteristics of the innovative process mean that the *time dimension* should be emphasised, i.e. *history* is of critical importance in explaining how and why innovation takes place in the ways it does.
2.2. Styles of innovation

The above modern view of the innovative process highlights the need to understand the qualitative characteristics of innovation as it takes place in its systemic and evolutionary setting. With respect to CEE, such a qualitative understanding should be regarded as a valuable complement to the important quantitative findings that have so far constituted our main sources of evidence on innovation under post-socialism. To describe and explain how innovation takes place, I will here develop the notion of ‘innovation style’, a concept that may be seen as inspired by two different research traditions.

On the one hand, the idea of specific styles of innovation draws on research on national and sectoral systems of innovation, where innovation, as pointed out above, has been seen to take place in very different ways in different national and sectoral settings. However, one of the major shortcomings of the systems of innovation approach has been that it is static and overly descriptive, rather than explanatory (see e.g. Balzat, 2003). The idea of ‘styles’ may provide a solution to this problem, having been used explicitly in the history of technology, where, for example, Hughes (1983) studied the ‘style of evolving systems’ in connection to the historical emergence of the electricity industry in different Western countries. Combining these approaches, a ‘style of innovation’ is in this chapter seen as a sector-specific and more dynamic extension of the idea of national systems of innovation. An ‘innovation style’ can thereby be seen as a combination of the technological, organisational and institutional factors that through their co-evolution shape the system of innovation in a concrete national or sectoral environment. The style should thus be understood in a highly dynamic sense, as it is seen to evolve over time.

The notion of innovation styles can also be linked to some well-known theorising in economics, economic history and technology management. In particular, we may draw on the distinction between creative and adaptive styles of innovation. Already Schumpeter (1947) distinguished in this way between ‘creative’ and ‘adaptive’ response to a change in the economic environment. In Schumpeter’s view, only the ‘creative’ response was to be regarded as a genuine innovation, representing ‘something that is outside the range of existing practice’ and thus forming a ‘new combination’. Accordingly, a creative innovation may be defined as the first application of a new combination and an adaptive innovation as its subsequent application. Schumpeter stressed
that the new combination (first application) ‘need not be spectacular or of historic importance’, though it has to be something genuinely novel, i.e. must not exist anywhere else in the world. The only exception would be two innovations that are identical but are made independently of each other. Creative innovation, which will be of particular interest in the following, is thus equivalent to a (radical or incremental) innovation which is new to the world.

In the field of technology management, a similar distinction is usually made in terms of ‘offensive’ and ‘imitative’ innovation strategies (Freeman and Soete, 1997). An offensive firm is seen to build its competitiveness on the continuous creation of world-leading innovations, thus seeking first-mover advantages and temporary monopolies that compensate for the enormous costs and risks of offensive innovation. Imitative firms, in contrast, seek to compete on price rather than on novelty and quality. However, between these two strategies there is also the ‘defensive’ innovation strategy, referring to firms (typically in oligopolistic markets) that do not necessarily wish to introduce any revolutionary changes, but which prepare to react quickly to the innovations developed by offensive firms and which then seek to improve these. In addition, a fourth alternative is the ‘dependent’ strategy, which is typical for traditional subcontractors whose innovations are the result of customers’ detailed specifications.

At the firm level, we may in this way speak of a spectrum of innovation styles from dependent and imitative up to increasingly creative and offensive styles. On the other hand, Bell and Pavitt (1997) and others have argued convincingly that there is no reason to treat creative and adaptive innovation as completely separate phenomena. Adaptive and imitative activities are clearly an invaluable form of knowledge diffusion in any economy, and they typically involve a great deal of creative effort despite the fact that it does not result in world-leading innovation. The exception, it seems, would be a change that is imposed from outside, i.e. without actual involvement by the firm itself in the innovative process. This lies close to ‘dependent’ innovation and has often been identified as a problem in connection to foreign direct investment and other technology transfer projects in catch-up countries, where new technologies are often implemented through ‘turnkey projects’ and other activities where domestic actors play only a minimal role in the process of change. In Sanjaya Lall’s (1992) words, the result is often a situation where a catch-up country ‘receives the results of innovation, not the innovation process itself.’
In other cases, notably in East Asia, adaptive styles of innovation can be seen to have functioned as a preparation for building more creative innovative strength. But nothing can guarantee that countries will climb the ladder from pure imitation to genuine novelty creation in Schumpeter’s sense. The crucial question here is in what ways catch-up countries may move towards increasingly innovative economies. For the case of East and South-East Asia, an interesting body of literature has during the past couple of decades made important contributions to understanding this problem. In contrast, fifteen years after the collapse of Central and East European communism, there is more or less a vacuum with respect to similar qualitatively deep studies for the CEE countries. This gap will definitely have to be filled.

The literature on innovation in successful catch-up countries elsewhere in the world also point to the need to look beyond the *firm-level*. As should be clear from the definition of ‘styles’ above, this chapter focuses on characterising and explaining innovation at the level of *systems*. Following the importance of a systemic understanding of innovation, the chapter thereby focuses on the role of both *firm* and non-*firm* organisations in the innovative process; the character of inter-*organisational linkages* that shape and enable (or hinder) innovation in a certain context; what the role of *institutions* are (i.e. ‘the rules of the game’); what the technological focus of innovative activities are, etc.

### 3. Central and East European styles of innovation

#### 3.1. Socialist innovation styles

After 1945, technologies, organisations, and institutions in East and West evolved according to radically different logics, and the interactions among these elements across the East-West interface were almost negligible in comparison to the interactions within the Eastern and Western worlds themselves. Although the Iron Curtain and institutions such as COCOM did not fully prevent ideas and artefacts from being transferred – in both directions – across the East-West divide, their principal impact was undeniably to reinforce a separation and differentiation in terms of innovation, and environments for innovation, in the socialist and capitalist worlds. This meant that socialist and capitalist

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1 See e.g. Michael Hobday’s (1995) research on innovation in the Asian ‘tiger’ economies. Freeman (2002) gives further examples of interesting studies.
systems of innovation cannot be seen simply as variations on a common theme. Rather, they worked according to fundamentally different logics, and their styles of innovation thus came to differ dramatically from each other.

Most authors have agreed, in general, that the East European systems of innovation, including those which were undergoing ‘market socialist’ reform in the 1980s, showed a very weak performance, and that this weakness was closely linked to the central planning of innovative activities. For example, Hanson and Pavitt (1987), applying a systems perspective, pointed above all at a problematic fragmentation of the innovation system as inhibiting vital learning processes, especially inter-organisational learning. They also identified problematically linear characteristics of socialist innovation styles, which in the 1980s still persisted despite a strong consciousness about the problems associated with the linear model and numerous attempts to reform the innovation systems in this respect. Further, referring to evolutionary insights into the economics of innovation, several authors have pointed at the critical lack of variety and redundancy and of appropriate selection environments.

These problematic characteristics are well-known and should not be discussed here in further depth. In accordance with the argument above on the importance of history, however, it is crucial to be aware of the historical origins of today’s innovation styles in CEE, several features of which, as will be discussed below, continue to persist today and have sometimes even been reinforced.

3.2. The erosion of the socialist style

In general, the collapse of the centrally-planned economies resulted in a downsizing of innovative efforts in CEE. This was above all a result of liberalisation, which effectively removed the guaranteed markets of domestic enterprises. These turned out to be too weak to be able to respond to the radical environmental changes in a creative way, to use Schumpeter’s phrasing. There are only utterly rare cases where the response to transition has been seen to be creative in the early years of capitalism, while most firms that faced transition appear to have followed dependent and imitative paths.

From a firm perspective, this was in itself not a radical shift, as ‘firms’ in socialist systems had in the typical case always been imitative or dependent, their innovative activities being focused on ‘implementing’ innovations that had already been developed elsewhere in the innovation
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system. From a systems perspective, however, the changes had a severe impact – on the R&D system as well as on inter-organisational linkages in general. With respect to basic research, most CEE countries actually retained a surprisingly large share of the research carried out in Academies of Sciences and other public institutes and universities. As a matter of fact, the public research sector in the Eastern countries typically remained of a comparable size to that of Western countries, if seen in relation to GDP levels (see e.g. OECD, 2002). On the other hand, the old problem of too weak interaction between public research and production enterprises seems to have become even more alarming in the post-socialist era than it had been in the socialist period. The reason was that the part of the R&D system that was most severely affected by transition was applied R&D, whose purpose was naturally to function precisely as a link between basic research and industrial production. This is no doubt part of the explanation for the frequent observation that CEE firms are seldom involved in collaboration with academia today, and also for the fact that industrial innovation remains so rare in CEE despite the existence of a large basic research sector.

With respect to linkages between innovating actors, privatisation typically also led to the incorporation of CEE firms into the supply chains of foreign (typically multinational) companies, thereby eroding most of the (problematic) linkages that had been built up domestically and within the CMEA area in the Soviet period. Innovation in CEE was thus in the initial phase of transition seldom the result of domestic collaboration. This tendency was also strengthened by the parallel integration of on the one hand research institutes, and on the other hand production enterprises, into separate global networks (Sadowski, 2001). This seems to have reinforced the isolation between different actors that often gave rise to islands of ideas that could not diffuse efficiently throughout the innovation system. The often observed lack of spillovers from foreign investment on domestic innovation may be seen in this light (cf. e.g. Radosevic, 2003: 10).

On the other hand, however, it has been suggested that the formal or informal reintegration of socialist networks following their legal split-up might in fact play important roles in stimulating innovation in the post-socialist era. These networks may, at least in theory, be able to play a constructive role in the transformation and reorientation of the inherited systems of innovation, for example, by creating a critical threshold demand for R&D or by creating subcontracting networks (Radosevic, 1997b). However, no research has attempted to test this hypothesis by
investigating to what extent innovation as it occurs in CEE can be seen as an outcome of such reintegrated networks.

Whether or not the main innovation linkages are domestic or international, it seems clear that foreign firms have strongly influenced the emergence of post-socialist styles of innovation in CEE. In contrast to the positive impact of foreign firms on CEE economies in terms of GDP growth, however, there seems to be a negative correlation between foreign investment and domestic firms’ innovative success. At least in terms of creative innovation, the accumulation of extensive capabilities through foreign investment appears to have been extremely rare (Sandberg, 1999; Geenhuizen, 2001; Sadowski, 2001).

In general, there is still some disagreement in the literature as to how strong the socialist heritage of innovation has actually been and what role it has played in rebuilding CEE systems. With respect to inherited competencies, Pavitt (1997) suggested that the inherited socialist competencies have become obsolete with the systemic change in the East, implicitly indicating that they are replaced by diffusion into the East of Western competencies. Bitzer (2000) has gone further and suggested that the socialist knowledge-base and the socialist technological trajectories have not had any significant influence at all on post-socialist innovation. On the other hand, however, scattered evidence does point to examples of successful exploitation of Soviet-era competencies in the post-Soviet period (e.g. Dyker, 1996; 2003). The empirical evidence does so far not allow to draw any deeper conclusions about the role of inherited technologies and competencies, and even less so about the explanations of the observed patterns. In general, however, it seems that the inherited competencies that do matter in the post-socialist context tend to be embodied in individuals rather than in organisations (Radosevic, 1997a; 1997b).

At the same time, and perhaps more important, Soviet-era history is embedded not only in technological trajectories and competencies, but also in organisational forms and institutional structures. The possible reintegration of socialist networks following their legal split-up (see above) should be seen in this light. A synthesis of the findings seem to imply that a lot of the competencies accumulated in the socialist systems of innovation are becoming obsolete under post-socialism, but that, at the same time, the very ways in which knowledge is accumulated in today’s East show strong traces of the socialist innovation system. The problematic missing link between university research and industrial innovation, as already discussed, should be seen in this light. This
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The evolutionary aspect of surviving organisational and institutional characteristics is particularly evident in a systems perspective, since the process of innovation is here interpreted in terms of technology: as argued above, innovation is here rather seen as an interactive process with strong linkages between technological, organisational and institutional changes.

3.3. The emergence of new styles of innovation in CEE: looking beyond East-West ‘convergence’

Quantitative data tend to indicate that there is generally a lack of creative innovation in CEE. But somewhat surprisingly, this hint has very rarely been followed up by empirical research that could confirm this. While we do have a relatively clear picture of how the old systems functioned and how they have been destroyed, we know only very little about the new ways in which new products and processes are being created in CEE. In particular, there is an obvious lack of qualitative in-depth evidence at the firm and sectoral levels. Similarly, when it comes to national systems of innovation, CEE countries are aware of the importance of such systems and have often produced interesting views of how they are expected to function, but no deeper studies have been carried out to investigate the ways in which the national systems actually function, i.e. how real-world innovation takes place, what the key linkages are in different sectors and countries, what the driving organisations are, etc. – in short, what the styles of innovation are that are emerging in CEE.

Radosevic (1999) used secondary data to assess the extent to which CEE countries had undergone ‘convergence’ with typical capitalist systems of innovation by the mid-1990s. Not surprisingly, a number of clear convergence trends could be found. For example, innovation decisions in CEE have become much more decentralised and firms can now freely choose their suppliers and other partners. Universities have also become more Western-like by becoming involved not only in teaching, but also in research. Similarly, CEE economies have seen the emergence of inter-sectoral differences (which were more or less absent in socialism) with respect to the patterns of innovation, and in particular the emergence of ‘specialised supplier’ firms (which have been seen to play such important roles in Western systems). On the other hand, Radosevic concluded that CEE systems of innovation ‘still possess some socialist features’ as well as ‘some peculiarly post-socialist features’.

It is this latter observation, i.e. of the emergence of peculiarly post-socialist features that is the most interesting for the purpose of this
chapter. In a more long-term perspective, it may be expected that CEE systems of innovation develop styles of innovation that may very well lead to the accumulation of impressive innovative strength, though not necessarily in the same ways as in Western countries. This is an issue that goes beyond the ‘convergence’ debate. The present chapter argues that these emerging styles can, in some sectors and countries, be observed already today and that this provides a valuable clue to future developments in the region and, perhaps even more interesting, about future relationship between East and West in the enlarged European Union. For example, the above mentioned separate integration of R&D and production into the global economy may be seen as a sign of the emergence of more internationally networked styles of innovation in CEE, where the relatively strong integration between domestic R&D and business, as has been a typical feature in Western post-war systems, does not exist to the same extent. If this picture is correct, it would be more fruitful to speak of systems of innovation not in terms of national systems, but rather of sectoral systems whose major linkages span across national borders and whose styles of innovation cannot be understood in a purely domestic perspective.

Another feature of the emerging CEE styles of innovation is clearly the relative abundance of subcontractors, who are typically not balanced by any larger end-product manufacturers (as is typically the case in more advanced countries). In an interesting way, this need not necessarily be a disadvantage in itself, although a common fear has been and continues to be that CEE is being locked into a second- and third-tier supplier role. In an age of outsourcing and increasing global networking, as pointed out above, subcontractors may in fact come to play increasingly important roles in creative systems of innovation (Carlsson and Braunerhjelm, 1994). Clearly, such an increased innovative strength does not appear without considerable efforts, but it does point at the possibility of building innovative strength in quite alternative ways.

An even more interesting feature of post-socialist styles of innovation is the emergence of CEE systems of innovation as ‘test sites’ for new technologies developed by Western firms (e.g. Shah, 2002; Högselius, 2002). The latter thereby use the circumstance that CEE countries typically lack the previous generations of the technology in question, thereby making it more attractive for customers to switch to the new technology (whereas in the West its introduction is often delayed through the relative efficiency of the older technology). If these activities involve domestic actors, they may constitute an interesting step towards more
creative styles of innovation in CEE. To further illustrate how creative styles of innovation may look like and how they may emerge in CEE, the next section discusses the case of Estonian telecommunications.

4. The challenge from Estonia

4.1. The Estonian style of innovation in telecommunications

The telecommunications sector is in this chapter broadly defined as involving both equipment manufacturing and service provision, as well as both fixed and mobile telephones and the Internet.

With respect to the manufacturing of telecommunications equipment, Estonia has no large telecom manufacturers in terms of the ‘national champions’ that until recently have dominated the national equipment markets in many Western countries (Siemens in Germany, Ericsson in Sweden, etc.). With few exceptions, domestic operators as well as consumers therefore have to procure all network equipment (exchanges, routers, radio base stations, handsets, etc.) from foreign firms. Of the large international manufacturers, Ericsson has the strongest presence in Estonia, but although this Swedish-based firm has been involved in interesting activities related to innovation in telecommunications services (in cooperation with domestic operators and software firms – see further below), the company has no R&D located to Estonia related to equipment production.

On the other hand, there do exist a number of firms in Estonia that clearly belong to the telecom equipment industry. These firms, however, are mainly subcontractors, whose activities are based on their integration into the supply networks of the large global manufacturers. Most of these Estonian companies have the Nordic telecom giants Ericsson and Nokia (or their suppliers) as their most important customers. The Estonian showcase in this field is the Finnish-owned electronics subcontractor Elcoteq, whose R&D and design functions remain located almost exclusively in Finland, but whose Estonian plant in 1997 became the first in the world as a subcontractor to get the responsibility for the complete ‘box-build’ manufacture of a mobile phone (an Ericsson GSM phone). Elcoteq can therefore be regarded as an advanced first-tier supplier. However, this is an exception from the general Estonian pattern, which is rather

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characterised by second- and third-tier suppliers of components for telecom equipment who focus on labour-intensive assembly and related activities, with little or no influence on the innovation process; instead, new products and processes in these firms are usually the result of large customers’ innovative activities. The Estonian firms do get access to the results of these innovative activities, which has helped them to become exporters of national importance, but they are seldom involved in these innovative activities themselves. Examples of such companies, who themselves admit that their core competencies are much more focused on labour-intensive assembly rather than innovation, include Tarkon, Baltronic, Keila Kaabel and Nolato. Even Elcoteq, however, can largely be characterised as a firm with a ‘dependent’ style, which was painfully demonstrated by the dramatic influence of one single customer’s – Ericsson’s – problems after the year 2000 (cf. table 1 below). In conclusion, it is therefore hardly possible to speak of a creative style of innovation on the manufacturing side in Estonian telecoms.

Table 1. Estonia’s telecom-related exports, 1998-2002 (percentages of total exports)

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<th>1998</th>
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<th>2000</th>
<th>2001</th>
<th>2002</th>
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<tbody>
<tr>
<td>Office machinery and computers</td>
<td>0.9%</td>
<td>0.6%</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Electrical machinery and equipment</td>
<td>2.8%</td>
<td>3.7%</td>
<td>4.2%</td>
<td>4.5%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Radio, television and communications equipment</td>
<td>12.6%</td>
<td>13.4%</td>
<td>29.9%</td>
<td>25.2%</td>
<td>15.5%</td>
</tr>
<tr>
<td>Medical, precision and optical instruments</td>
<td>1.8%</td>
<td>1.6%</td>
<td>1.9%</td>
<td>1.6%</td>
<td>1.8%</td>
</tr>
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Comment: The dramatic variations with respect to the share of telecommunications equipment in Estonia’s exports here mainly reflects Elcoteq’s exports. The dependence upon a few important customers is here immediately reflected in the down-turn after the year 2000, following in particular the turmoil at Ericsson, Elcoteq’s most important customer.


With respect to the production of telecommunications services, however, the Estonian style of innovation is quite different from that in manufacturing. The Estonian services market is, of course, extremely small (the population of the whole country totals some 1.4 million), but qualitatively speaking it is a strikingly advanced market. Thus Estonia was the first of the Central and East European countries where mobile
telephony and the Internet took off in a massive way in the second half of
the 1990s (see tables 2 and 3 below), and in terms of Internet penetration
Estonia is today even one of the European leaders.  

Table 2. Mobile phone penetration in selected CEE countries, 1998-2002
(percentages)

<table>
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<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
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<tbody>
<tr>
<td>Estonia</td>
<td>18</td>
<td>28</td>
<td>41</td>
<td>46</td>
<td>65</td>
</tr>
<tr>
<td>Latvia</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td>28</td>
<td>39</td>
</tr>
<tr>
<td>Lithuania</td>
<td>7</td>
<td>9</td>
<td>14</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Poland</td>
<td>5</td>
<td>10</td>
<td>17</td>
<td>26</td>
<td>36</td>
</tr>
<tr>
<td>Romania</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Slovakia</td>
<td>9</td>
<td>12</td>
<td>21</td>
<td>40</td>
<td>54</td>
</tr>
<tr>
<td>Slovenia</td>
<td>10</td>
<td>31</td>
<td>55</td>
<td>74</td>
<td>84</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>9</td>
<td>19</td>
<td>41</td>
<td>68</td>
<td>85</td>
</tr>
<tr>
<td>Hungary</td>
<td>10</td>
<td>16</td>
<td>31</td>
<td>50</td>
<td>65</td>
</tr>
</tbody>
</table>

Comment: Estonia’s early lead in mobile penetration turned into a slow-down of
the growth of subscribers in 1999, a year that as a consequence of the Russian
crisis was characterised by negative economic growth in all the Baltic
countries, in contrast to the less Russia-dependent Central European countries.
Source: Statistical Yearbook of Estonia 2002; ITU World Telecommunication

This is an important prerequisite for domestic innovation in
telecommunications service products. On the other hand, the very use of a
mobile phone or the Internet has today not much to do with innovative
activities, as these basic technologies have already been available since
more than a decade in most CEE countries. Hence, high rates of
penetration do not necessarily in themselves signify any innovativeness.

Table 3. Internet users in CEE countries (per 10,000 population)

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>2721</td>
<td>4133</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1508</td>
<td>4008</td>
</tr>
<tr>
<td>Croatia</td>
<td>669</td>
<td>1629</td>
</tr>
<tr>
<td>Slovak Rep.</td>
<td>939</td>
<td>1604</td>
</tr>
</tbody>
</table>

3 ITU (2003), Internet indicators: Hosts, Users and Number of PCs 2002. The
countries with a higher penetration than Estonia were Iceland, Sweden, the
Netherlands, Finland, Norway, Denmark and Germany.
Per Högselius 241

Hungary 715 1576
Czech Rep. 973 1467
Latvia 619 1331
Poland 725 983
Romania 357 806
Bulgaria 527 746
Lithuania 609 679
Russia 197 409


More important is, instead, the development and commercialisation of new goods and services that *build upon* the mobile telephony and Internet technological paradigms. These new paradigms, reflecting dramatic technological discontinuities, have opened up a whole new universe of potential innovation in telecommunications, and the important question is how CEE has been able to innovate by exploiting parts of this potential.

Estonia has managed to do so in at least two fields. The first is with respect to innovation along the *Internet* trajectory. Here, the country has become one of the absolute world leaders in the field of ‘eGovernment’, i.e. the computerisation and Internetisation of public administration with its enormous potential for cutting public expenditures, raising efficiency and improving services. For example, in the year 2000 Estonia became the first country in the world to offer the possibility of electronic filing of income tax declarations (as a comparison, a similar service was introduced in Sweden only two years later).

Other interesting innovations have emerged in connection with the activities of the government itself, whose weekly meetings have been referred to as ‘the world’s most high-technological’, having been simplified and become surprisingly more efficient since the introduction in 2000 of a system that enables not only Internet-based government meetings, but also the beforehand preparation of discussion points, etc. Table 4 below shows the global ranking of countries in the field of eGovernment according to the Global Information Technology Report.

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Table 4. Ranking of countries with respect to achievements in ‘e-Government’

<table>
<thead>
<tr>
<th>Country</th>
<th>Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>5.43</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>5.40</td>
<td>2</td>
</tr>
<tr>
<td>Iceland</td>
<td>5.35</td>
<td>3</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.10</td>
<td>4</td>
</tr>
<tr>
<td>Estonia</td>
<td>4.95</td>
<td>5</td>
</tr>
<tr>
<td>Canada</td>
<td>4.93</td>
<td>6</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>4.90</td>
<td>7</td>
</tr>
<tr>
<td>Taiwan</td>
<td>4.90</td>
<td>7</td>
</tr>
<tr>
<td>Denmark</td>
<td>4.88</td>
<td>9</td>
</tr>
<tr>
<td>United States</td>
<td>4.88</td>
<td>9</td>
</tr>
</tbody>
</table>


These and similar ‘offensive’ innovative activities in Internet-based services have also stimulated interesting developments in other parts of the same value chain. In particular, the developments in the field of eGovernment in combination with an unusually well-developed Internet banking sector has paved the way for advanced innovation in the field of information security, where Estonian software firms have now started to market their often unique products (which were originally developed in response to a domestic market need) also abroad. For example, Privador – a spin-off from the privatised R&D institute Cybernetica – concluded its first foreign distributorship agreement for their information security products in 1999.\(^6\) Cybernetica itself has also been involved in a large number of information security projects with respect to the Estonian state demands, starting already in 1991 with the Internet-based IT system for the newly created Estonian customs authority,\(^7\) and ending up more recently with Cybernetica’s most complex project so far, ‘X-Road’, a system for the exchange of information among a large number of heterogeneous organisations.\(^8\)

The other field of creative innovation where Estonian firms have become offensive innovators is in the development of new mobile phone services. In July 2000, for example, the leading Estonian mobile operator EMT introduced its ‘mobile parking’ service, enabling drivers to pay their

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\(^6\) Information from Privador, April 2003.
\(^7\) Information from Cybernetica, April 2003.
\(^8\) Ibid.
parking fees via their mobile phones. The service quickly acquired a large portion of the parking market, and the innovation was nominated for various awards in Europe during 2001 and 2002. In 2002, the service also started to be exported, initially to Norway. 9

In the field of mobile services, highly advanced innovative activities are also taking place with regard to positioning technologies. For example, the Estonian Rescue Board was in the end of the year 2000 able to take into commercial use a system that enables a very precise tracing of emergency calls from mobile phones, thereby considerably improving the activities of the Rescue Board. 10 The Swedish Rescue Board stated that a similar system would have been very useful also in Sweden, but that it was still far from reality on the Western shores of the Baltic. 11 As in the case of mobile parking, Estonian positioning services have also recently been exported to other countries. 12

It is difficult to tell to what extent these innovative achievements have really contributed to economic growth in the Estonian telecommunications sector. As shown in table 5 below, however, the sector has grown at an extraordinary pace since the reestablishment of independence in 1991. This is true with respect both to absolute growth and in particular to the relative importance of telecommunications services in contributing to GDP: in 2001, telecommunications services accounted for 5.3% of GDP, which is an extraordinary high figure in international comparison. In Sweden, for example, usually referred to as a leading telecommunications services country, the corresponding figure was 3.3%. 13

Let me now turn to the issue of how the above innovative activities have been organised.

10 Representative of the Rescue Board, interview with the author, 23 September 2002.
12 Thus Regio’s mobile positioning technologies were chosen by the large Slovakian operator Orange Slovensko in January 2003 – see Regio, 19 January 2003, ‘Regio mobiiltehnoloogia Slovakkias’ (press-release).
Table 5. Estonia: GDP and contribution to GDP from communications services and computer and related services, 1992-2001 (million EEK, current prices)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP at basic prices</td>
<td>12,221</td>
<td>19,799</td>
<td>26,314</td>
<td>35,805</td>
<td>45,663</td>
</tr>
<tr>
<td>Telecommunications services</td>
<td>165 (1.4%)</td>
<td>385 (1.9%)</td>
<td>625 (2.4%)</td>
<td>958 (2.7%)</td>
<td>1,333 (2.9%)</td>
</tr>
<tr>
<td>Computer services</td>
<td>37 (0.3%)</td>
<td>31 (0.2%)</td>
<td>56 (0.2%)</td>
<td>110 (0.3%)</td>
<td>140 (0.3%)</td>
</tr>
<tr>
<td>GDP at basic prices</td>
<td>55,338</td>
<td>65,086</td>
<td>67,918</td>
<td>76,752</td>
<td>86,299</td>
</tr>
<tr>
<td>Telecommunications services</td>
<td>1,812 (3.3%)</td>
<td>2,507 (3.9%)</td>
<td>3,246 (4.8%)</td>
<td>3,699 (4.8%)</td>
<td>4,535 (5.3%)</td>
</tr>
<tr>
<td>Computer services</td>
<td>196 (0.4%)</td>
<td>343 (0.5%)</td>
<td>319 (0.5%)</td>
<td>567 (0.7%)</td>
<td>734 (0.9%)</td>
</tr>
</tbody>
</table>


Due to the lack of large manufacturers, the collaboration between equipment suppliers and network operators that have been so typical in Western countries is non-existent in Estonia. The only exception so far has been the subcontractor Tarkon’s assembly and testing of pay phones to be used directly by the main Estonian operator, Eesti Telefon. The lack of further links between operators and manufacturers may actually be seen as inherited from the Soviet era, as the Soviet-Estonian Ministry of Communications was never allowed to engage in innovative projects with leading Soviet manufacturers. Instead, telecommunications innovations reached the Estonian operator in the well-known linear fashion.

In contrast, with respect to the new segments of the sector, a characteristic feature of the offensive innovations above has actually been that they typically involve important collaborative activities with both foreign and domestic firms. Behind the Rescue Board’s positioning services we thus find substantial cooperative efforts between the Board on the one hand, and on the other hand the dominant domestic mobile operator EMT (which is in itself an Estonian-Swedish-Finnish joint venture) and the Swedish telecom giant Ericsson. In addition, the project

involved the Estonian software firm Regio, who contributed with its capabilities in the field of geographical information systems, and the Finnish software firm Done. From the perspective of Ericsson, the involvement in these and similar projects has been the result of Estonia emerging as a suitable site for testing new technologies that are being developed by the Swedish firm. A ‘suitable’ site here refers not merely to the broad diffusion of mobile telephony in Estonia, but above all to the availability of technologically knowledgeable collaborative partners – with respect both to Estonian operators and Estonian software firms. That the mobile operator EMT is indeed such a desired advanced partner seems to be clear from the success of both the examples of offensive mobile innovations cited above. The important competences of Regio in positioning software was confirmed by Ericsson’s inclusion of Regio into its exclusive networks of ‘world partners’. 

In the case of mobile parking, however, EMT’s partners were mostly domestic, the innovation being the result of collaboration with, in particular, the Estonian software company Voicecom and the municipal transportation department of the City of Tallinn. Voicecom is one of many Estonian IT firms that have been repeatedly involved in various innovative projects in telecommunications. In the case of the Internet-based income tax declaration the major partner was another Estonian IT firm, AboBase Systems, while the Tax Board also praises the collaboration with the two leading Estonian banks (who are themselves partly or fully owned by Swedish banking groups). In the ‘X-Road’ project, Cybernetica and the Estonian State Information Systems worked closely together with the Swedish-owned Estonian firm Cellnetwork. With respect to mobile positioning, the Tartu-based firm Regio has already been mentioned. It is not within the scope of this chapter to list the entire cluster of firms that has emerged around Eesti Telefon and EMT (both of which were once created as joint ventures with the major Swedish and Finnish operators, who still own 49% of both companies). It

16 BNS, 5 October 2000, ‘Finland's Done, Estonia's Regio to jointly develop positioning software’.
17 CEO of Regio, interview with the author, 18 September 2002.
is interesting to note, however, that many of these smaller domestic IT firms are also active on foreign markets, notably in the Baltic Sea region. Some of them were also, at the peak of the Internet boom in the years around 2000, partly or wholly bought up by Nordic IT firms. Examples include the well-known Estonian firm Assert, which after many years with Nordic customers was acquired by Cellnetwork from Sweden, and Regio, which merged with the above mentioned Finnish firm Done.²⁰

Another interesting feature of the Estonian ‘style of innovation’ in telecom services is the active participation of public authorities, who in addition to acting as demanding customers also typically have far-reaching in-house ICT competences. The Tax Board played such a role in connection to the introduction of the electronic filing of income tax declaration, combining in-house efforts with the above-mentioned cooperation with AboBase Systems, and the Rescue Board played a similar role in the case of its mobile positioning system. As for mobile parking, one of the partners was the municipal transportation department of the City of Tallinn. Often the original initiative to new innovative projects have come from important private actors such as EMT, Ericsson or Cybernetica, but in some of these cases we may also speak about ‘public technology procurement’, i.e. of demanding public customers that place orders on technologies that do not yet exist. This can be seen as an interesting form of innovation policy.²¹

On the other hand, it should be noted that the above collaborative networks have not involved any strong participation from the side of research institutes and universities as direct actors in the innovative process. The somewhat striking absence of these organisations is here in line with the results derived from the recent innovation survey in Estonia, where academy-industry collaboration is emphasised as one of the major problems in the national system of innovation.²² This is also in line with the observation above that post-socialism may be expected to worsen rather than improve the relationships between academia and industry.

However, there are some recent signs of improvement in the Estonian academy-industry relationships. For example, an interesting actor in the innovation system is the former cybernetics research institute of the Academy of Sciences, which in the 1990s was in part incorporated into

²⁰ With the bankruptcy of Done in 2002, however, Regio became once again an independent Estonian company.
²¹ See further Edquist et al. (2000).
the Tallinn Technical University (TTU), and in part transformed into a private R&D organisation. As mentioned above, Cybernetica, as the privatised part of the research institute was renamed, was early on a key partner for the Estonian government in connection to the computerisation of public administration after Soviet collapse, and it has in recent years emerged as a complementary partner of the major telecommunications operators, Eesti Telefon and EMT. This relationship has contributed to some of the Estonian innovation in information security, an area which has become increasingly important for Eesti Telefon and EMT, not least in connection to the creation of a ‘Public Key Infrastructure’ (PKI).

Another recent example of academy-industry linkages is the establishment of a test centre for GPRS and third generation mobile services at TTU. The actors behind this ‘Mobile Applications Initiative’ are (in addition to TTU) Ericsson’s Estonian subsidiary and EMT. However, this is not an innovation project in itself, but rather offers other firms an artificial environment where future services can be developed and tested. It remains to be seen if the centre will have any impact on the actual development of new products and processes.

In general, it has been a characteristic feature in Estonia that key actors such as Ericsson, Eesti Telefon, EMT and TTU work together to improve the general sectoral environment in ICT. The ‘Mobile Applications Initiative’ is one example of this. Another interesting example is the opening up of an ‘IT College’ in September 2000, which was a response to the demand for qualified personnel in the booming sector. Eesti Telefon and EMT here worked together both with TTU, Tartu University and the Estonian as well as the Swedish governments (the latter contributed heavily to the financing of the IT college through the Swedish ‘Baltic Billion’ project).

Thus the main joint activities between academia and industry in Estonian telecommunications continue to circle around issues related to the education of engineers and other relevant specialists, while collaboration around concrete innovative projects remains rare. The

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23 Information from Cybernetica, 2003.
25 Ibid.
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relevance of academic research results for industry is rather a matter of person-embodied technology transfer resulting from the movement of specialists from universities to private firms. This is, as a matter of fact, probably one of the absolute key factors in enabling creative innovation in Estonia. In general, it seems obvious that the inherited Soviet educational system has been a prerequisite for the rapid development of the Estonian telecommunications system of innovation.

Another characteristic feature of the Estonian telecommunications sector is the emergence of *competition* as a driver of innovation. It is not clear to what extent competition in the sector is really of a Schumpeterian type, but it seems unlikely that an operator such as EMT in an environment with three GSM operators would have been able to retain its impressive market position in the absence of its strong innovative services as exemplified above. The situation in Estonia is here different from, for example, neighbouring Latvia, where only two mobile operators are active (in the countryside there is even a monopoly) and where the development has been seen to be slower. The leading Latvian mobile operator LMT has not introduced any ‘new to the world’ innovations in the way that has been a characteristic of EMT.  

With respect to the Internet, it seems also clear that Estonia’s aggressive innovative activities in services have gone hand in hand with a remarkable price competition, which resulted in the ‘Internet war’ that came to characterise the Estonian Internet services market in the year 1999, i.e., in the year before many highly interesting innovations were introduced.

4.2. Explaining the emergence of the Estonian style

It may appear surprising that Estonia has seen the emergence of a style of innovation that at least in some segments is clearly creative, i.e., containing a number of world-leading innovations. Up to 1991 Estonia was a republic within the Soviet Union, whose telecommunications sector was subject to a peculiar neglect and serious underdevelopment in comparison to Western countries. Innovation was severely hindered both by the well-known general short-comings of the Soviet economic system as well as by sector-specific problems (in particular, civilian telecommunications were in accordance with Marxist reasoning identified

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28 Davids Dane, press-secretary at LMT, interview with the author, 13 June 2003.

29 For the price war that burst out on the Internet services market in the autumn 1999, see e.g. Eesti Telefon’s newspaper *Kõnetraat*, no. 7, 1999, pp. 5f.
as a ‘materially unproductive’ sector, and was therefore neglected in budget negotiations). Still, Estonia is today regarded as the most successful ICT country in the CEE region and does, as we have seen, have the capability to produce innovations that are unique also at the global level. How has this been possible?

Two explanatory factors seem to be of particular importance. First, to the extent that Estonia has actually managed to develop a ‘creative’ telecommunications system, this cannot be understood without taking into account the country’s far-reaching and historically deep affinities with Sweden and Finland. These two Nordic countries, which have themselves emerged as two of the absolute world leaders in modern telecommunications, have had an enormous influence on Estonia – an influence that has been enabled by a deep history.

Finland lies close to Estonia mentally and linguistically as well as geographically – the distance between Helsinki and Tallinn is no more than around 70 km, and some observers even speak of the emergence of a ‘Hellinn’ region linked by the Gulf of Finland. Almost every actor in the Estonian telecommunications sector, if asked to give their explanatory account of Estonia’s rapid development, mention the fact that Estonia is so close to Finland that North Estonians have been able to watch Finnish television for decades. Also, present-day managers and engineers have often been students for a year or more at Finnish universities – a trend that seems to result from a combination of geographical and linguistic proximity. The same factors have also made it natural for Western multinationals to coordinate their entrance on the Estonian markets via their Finnish subsidiaries.

Estonia’s relationship to Sweden is somewhat different but not necessarily weaker. It is not uncommon to hear references in Estonia to what is somewhat paradoxically known as the ‘golden age’ of Swedish occupation in the 16th and 17th centuries – an expression that has to be understood in relation to German and Russian rule. Above all, however, around 25,000 Estonian refugees settled in Sweden after World War II. Many of these väliseestlased (‘foreign Estonians’) and their descendants made invaluable contributions to the transformation of business from the late 1980s and onwards, and several ‘Swedish’ Estonians now hold important positions in Estonian firms (for example, the CEO of the main operator Eesti Telekom is a Swedish Estonian). In addition, Sweden’s dominant role in today’s Baltic Sea region has included aggressive

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initiatives such as the ‘Baltic Billion’ project, seeking directly to stimulate various kinds of exchange and cooperation between the Nordic and the Baltic countries. The Swedish ‘Baltic Sea IT Fund’ even directly contributed to financing the above-mentioned pioneering mobile positioning innovations.

Today, Estonians often even prefer to speak of their republic as ‘a Nordic country’, thus linking their very national identity to their Western neighbours in the Baltic Sea region. It is thus not a coincidence that one of the major ICT initiatives recently launched goes under the heading ‘Estonian eVikings’.31

It is within this broad picture that the historical emergence of the Estonian style of innovation must be seen. The traditional links to Sweden and Finland made it natural for the main Swedish and Finnish operators, Telia and Sonera (at that time known as Televerket and Tele, respectively), to play an important and above all very early role in reforming the Estonian telecommunications sector and infrastructure. Telia’s and Sonera’s activities began already around 1988 (i.e. three years before independence), leading eventually to the establishment of new independent fixed and mobile operators in 1991 and 1992 in the form of Swedish-Finnish-Estonian joint ventures. Similarly, Ericsson – through its Finnish subsidiary – began doing business in Estonia already in 1988. This very early establishment of close relationships between Estonia on the one hand, and Nordic operators and manufacturers on the other hand, enabled an efficient West-East transfer of technology and the build-up of substantial domestic competencies in modern fields of communication technologies and business, including mobile telephony and the Internet. Towards the end of the 1990s, these competencies had already developed to such an extent that the Estonian firms could themselves engage in world-leading innovation.

This development may be interpreted in terms of what Christopher Freeman (2002) has called ‘continental systems of innovation’, an idea that stems from the simple observation that successful catch-up countries have historically been almost exclusively located in geographical and/or cultural proximity to already advanced countries. The implication is that the very proximity of CEE to advanced Western innovation systems provides CEE countries with an enormous advantage compared to catch-up countries in other parts of the world. Unfortunately, however, it seems that in the typical CEE case this potential has not really been exploited in

31 See http://www.esis.ee/eVikings/
positive terms. Instead of being associated with the emergence of creative styles of innovation, the relationship between East and West in Europe has mostly concentrated to Western firms’ exploitation of new markets in the East and of low-wage labour there. In this context, Estonia seems to form an interesting and encouraging exception from the general pattern, whereby the Estonian creativeness in telecom services innovation builds heavily precisely upon the country’s relationships to and gradual integration with the telecommunications clusters of Sweden and Finland.

At the same time, a crucial aspect of Estonia’s success has been its ability to integrate its foreign relationships with domestic linkages. Whereas innovative efforts have sometimes been seen to form isolated islands in CEE – typically as an extension of multinationals’ corporate networks – almost all innovative activities in Estonia, as exemplified above, have been deeply integrated with the domestic economy, thereby typically combining foreign and domestic organisational networks. It may be argued that this is the only possible solution for a country of Estonia’s size, and it is as such an encouraging example of the far-reaching opportunities of East-West integration.

The second important factor that seems to be of crucial importance for Estonia’s creative success, is related to the fact that this creativity in telecommunications innovation has been totally based on the new segments of the telecom sector, i.e. mobile telephony and the Internet. The technological discontinuities that these segments represent appear to have opened up a ‘window of opportunity’ for CEE, whose transition to capitalism almost perfectly coincides with the Internet and mobile telephony boom in the 1990s (cf. Perez & Soete, 1988). To some extent, the Internet and mobile discontinuities have lowered the cumulativeness in telecom innovation, opening up opportunities for new actors to capture significant market shares. This is in particular so with respect to the Internet. It is hardly possible to imagine that Estonian firms would have come up with creative world-leading innovations in the absence of these discontinuities, which now even seem to give CEE countries interesting advantages in relation to the already advanced countries. These advantages are related to the difficulties that in the West arise from the widespread use of older, but still relatively efficient technologies. For example, most Western countries had a well-functioning computerised banking sector – based on mainframe computer technologies and a systems of payment by check, etc. – already long before the Internet boom. This was never the case in the CEE, where vested interests in older technologies were more or less absent and switching costs lower. Estonia
thus went more or less directly from the most primitive to the most advanced banking technologies. Internet banking has here seen a much more rapid growth than in, for example, Sweden, where the old system is still regarded as good enough to prevent many consumers from switching to Internet banking.

The observation that Estonia’s creative style of innovation is based on the new segments of the telecommunications sector is interesting, as traditional reasoning typically tends to lead to the recommendation that catch-up countries should concentrate on more mature markets and not on turbulent high-tech, high-growth industries.

A few words should also be said about the role of institutional changes in the telecommunications sector for the emergence of the Estonian style of innovation. Not surprisingly, radical changes occurred in connection to the new independence in 1991, but already in 1987, Gorbachev’s call for perestroika created the formal possibility for Estonian organisations to seek the foreign cooperation that proved to be so decisive for the development in the 1990s. In early 1991, important institutional reconfigurations followed as Estonia decided to secede officially its telecommunication functions from the rest of the USSR, a step which was at that time seen as a unique measure for a Soviet republic.\(^{32}\) Steps were also taken towards a more Western-like sectoral structure, as the Ministry of Communications handed over the network operation function to a new state-owned company, *Eesti Telekom*, which was created for this purpose.\(^{33}\) In December 1992, a concession agreement was concluded that gave Eesti Telefon an eight-year monopoly for fixed telephony, an agreement that was to form the basis for the modernisation of the physical infrastructure. The mobile telephony and Internet markets, in contrast, were fully liberalised, as was also the equipment market. These early reforms did not pass without a vivid debate, but the end result was a structure that through its clarity laid the foundation for the later innovative success.\(^{34}\)

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33 ‘Vestnik Sviazi’, no. 6, 1992, p. 33.

34 Some observers have in this connection stated that it was really Estonia’s luck that Televerket and Tele did not demand any exclusive rights for mobile telephony and data communications, but only for fixed services. Given the weakness of the Estonian state and economy in 1992, the government might very well have been forced to accept such demands if actually put forward. E.g. Linnar Viik, IT advisor to the prime minister, interview with the author, 23 September 2002.
The introduction of second generation mobile telephony (GSM), which was offered by three operators in Estonia starting in 1995, meant for the first time that further strong actors entered the sector in addition to Eesti Telefon and EMT. This seems to have resulted in a strong private lobby against the latter two towards the end of the 1990s, which was to have an interesting influence on further institutional change. Frequent complaints about what the private actors regarded as discrimination (for example concerning interconnection between the private networks and those controlled by Eesti Telefon and EMT) served as a basis for trying to influence the governance of the sector. The regulatory-institutional framework was frequently challenged and re-interpreted, sometimes even through processes in court. The government seems to have put Eesti Telefon under hard pressure in the context of its obligations to modernise the physical infrastructure, and it was clear at an early stage that the theoretical possibility of extending the operator’s fixed monopoly for another eight years would not be realised. This meant that a number of service providers prepared themselves for entering the fixed telephony market in 2001. The expected market opening was a major reason for the increasing dynamism in the overall telecommunications sector that can be observed in Estonia towards the end of the 1990s, as many service providers planning to enter the fixed market saw the opportunity to build up their brand name in the already liberalised Internet market.

But there were also other institutional changes that were to affect innovation more directly. It was hardly a coincidence, for example, that Privador, the spin-off from Cybernetica mentioned above, was founded only two days before the ‘Digital Signature Act’ was passed by the Estonian parliament in March, 2000. This and related laws seemed to open up a wide range of innovation opportunities, in particular within the field of information security. In general, Estonian observers point out that it seems to have been easier in the post-socialist environment to establish legal structures for the information society, as compared to the complex procedures that have typically been necessary in Western countries as a result of the already existing path-dependent web of formal institutions there.35 Hence the initial lack of modern legislation seems to have been an advantage, in the same way as the initial lack of Western-level technologies was.

With regard to innovation policy addressing the field of telecommunications and information technology, the Estonian

35 Kaido Saarma, former President of the Estonian Computer Firms Association, interview with the author, October 2001.
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government played quite a passive role until about 1998, although most observers acknowledge that earlier policies have also been important simply because the creation of new laws after 1991 seldom raised any serious obstacles to the development of the telecommunications sector and information technology (e.g. Vallner, 2002). From 1998 and onwards, a number of highly interesting policies and projects have been launched, starting from the ‘Principles of the Estonian Information Policy’. Most of the innovative activities discussed in this chapter, however, have their origins already prior to the launch of these new policies, and the influence of recent Estonian innovation policy on actual innovative activities in the Estonian economy thus largely remains to be seen.36

5. Conclusion

Modern innovation theory and the concept of ‘styles of innovation’ have been used in this chapter to make it possible to look beyond more quantitative perspectives on innovation in CEE as well as beyond the ‘convergence’ discussion. The chapter has argued that the most interesting problem is not how fast CEE can close the technological and economic gap with the West, but rather what the ways are in which CEE has managed to build new and creative styles of innovation. Implicit in this argument is the obvious but neglected potential for CEE countries to learn from their own success, in addition to the more common attempts to draw on Western experiences. The chapter shows that it is already today possible to speak about quite specific styles of innovation in CEE that, as in the case of Estonia, have made it possible for post-socialist economies to catch up along trajectories that do not necessarily lead them towards Western-like styles of innovation. On the contrary, there are clear cases of creative innovation where Estonia itself has been the country to show the way. This has been possible as a result of the specific history of Estonia and its cross-border relationships, which in combination with the global technological discontinuities of the 1990s have made it natural for Estonia to emerge as a highly interesting country in some important segments of

36 Thus the Estonian eTax Board, for example, which started to be developed in 1998, was more inspired by developments in Internet banking and its early popularity in Estonia, rather than by the later government Internet policies. Tax Board eTechnology director, interview with the author, 23 September 2002.
the telecommunications sector, such as eGovernment, information security, and mobile services.

Estonian telecommunications provides a striking case of an emerging style of innovation in CEE that at least partly deserves to be labelled ‘creative’. However, this does not mean that the Estonian telecommunications sector is developing in a problem-free fashion. In particular, the focus on labour-intensive production in the equipment manufacturing sub-sector implies that there is a risk for Estonia getting locked into a situation in which the strong linkages to Sweden and Finland weaken rather than strengthen the Estonian innovative performance. Moreover, the intense innovative activities of public agencies in the field of ICT have meant that there has been a lot of subcontracting work available also for Estonian software firms, much of which is not necessarily innovative in any creative sense. Ironically, there is therefore a risk that the success in the field of eGovernment might lower the innovative performance of the Estonian software sector. An even more serious problem on the long-term is perhaps that the prospects for exporting innovative Estonian service products are anything but clear.

The technological characteristics of the concrete innovations which have been discussed in this chapter, as pointed out by several Estonian ICT managers, are often such that the innovations are fairly easy to imitate. The fact that surprisingly creative innovations have been introduced in Estonia earlier than in other countries bears, again, witness not only of strong technological competences, but perhaps even more of an institutional environment in terms of laws and regulations that differ considerably from Western countries. Exactly these institutional differences have often been found to be a severe obstacle for services export.\(^3^7\)

But despite these and similar problems, the Estonian experience in the field of telecommunications represents an encouraging case of innovation in CEE that at least in some segments has been of a ‘creative’ nature. Moreover, there is no reason to believe that this is the only example of

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37 Thus EMT, for example, has had problems in connection to the export of the mobile parking service to Norway, where at least two institutional problems have occurred: on the one hand, the existence of an already well-functioning system of parking payment (ticket machines), and on the other hand, the Western habit of connecting all payment procedures to credit cards (which was never an issue in Estonia in the case of mobile parking). Holger Haljand, EMT business development manager, interview with the author, 22 September 2002.
creative styles in CEE. Indications of other potentially interesting cases are given, for example, by the fact that R&D expenditures in the Hungarian business sector are strongly concentrated to pharmaceuticals, where the former socialist country shows an innovative effort at least at the level of the EU average (see e.g. OECD, 2002). Case studies of the innovation dynamics in this and other sectors and countries would clearly be of considerable interest if we want to understand the emergence of creative innovation in post-socialism. However, sector-level studies of the dynamics of innovation and the emergence of new styles continue to be missing in CEE research. In view of the insights gained from the case of Estonia, this neglect is clearly unfortunate.

From the argument that history matters, it follows naturally that it is of key importance to be aware of today’s features of a system in order to be able to influence tomorrow’s. Being familiar with the specific styles of innovation in specific sectoral and national environments may therefore be seen as a prerequisite for policy makers to be able to formulate and implement effective innovation policies. Unfortunately, however, the lack of deeper studies in this respect seems to indicate that today’s styles of innovation remain relatively unknown – let alone historically understood.

References


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