SPRU
Science and Technology Policy Research

SEWPS

SPRU Electronic Working Paper Series

Paper No. 151

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June 2006

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Positive Developments and Challenges before Indigenous Software Industries: Looking at Bulgaria, Thinking about CEE

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Abstract

Little is known about the potential of indigenous software activities in CEE countries. The paper outlines positive developments and challenges before indigenous software activities and disentangles the variety of factors influencing development of indigenous software industries in Bulgaria and with a reference to CEE. Based on a survey data about capabilities accumulation in the Bulgarian software companies and further analysis of the external factors influencing development of indigenous software industries, the study identifies a new phase of development in the indigenous software industries in CEE and highlights areas for policy considerations.

1. Introduction

Technological development in the EU reveals a multiple-tier structure with Central and Eastern Europe (CEE) occupying the middle and lower ends (Radosevic, 2004). Thus enhancing technological development in CEE remains a major challenge before the region. So far technological development in CEE has been driven by technological transfer from MNEs, and it has been accepted that indigenous development in CEE was and still is totally dependent on foreign technological transfer and does not possess a potential to generate technologies on its own. However, some low capital but high skill and knowledge intensive industries may present opportunities for indigenous developments.

The case of the software industry has often being cited as an industry offering a 'window of opportunities' for latecomer countries (Soete, 1985; Steinmueller, 2001). It has been stressed that the availability of skilful human capital creates a solid base for development of an IT industry by the latecomers. The software industry is, in

principle, low-capital but knowledge and skill-intensive industry, and the international market for software is big and growing (OECD, 2004; Steinmueller, 2004). Further, the software industry possesses a potential to generate high rates of growth and spur economic development in the latecomers (Kuznets, 1957). For these reasons, the discussion about developing indigenous software industries in the latecomer context has gained particular attention both in academic and policy literature for more than a decade (Schware, 1989, 1992; Soete, 1985; Steinmueller, 2001; UNIDO, 1988).

Development of ITs in CEE has been identified as a priority by the EU (Clements, 2003; IPTS Report, 2003). Statistics shows that the enrolment ratio in science and engineering in CEE was and remains higher than the EU average[2]. In the early 1990es it has been often stated that high potential exists for development of indigenous software industries in CEE, due to outstanding skills in fundamental research and mathematics (Katkalo and Mowery, 1996). But development of the indigenous software industries in CEE in 1990es remained modest and did not generate internationally recognised industry, as the fundamental technological changes in the global software industry in 1990es found the CEE software engineers unprepared (Bitzer, 2000). According to Bitzer (2000) the catching up process in the CEE software industry was and still is based on foreign technology transfer.

Little is known about the potential of indigenous software activities in CEE countries. Studies exploring the development of the software industries in the CEE have been scarce and predominantly focussing on the restructuring of the industry and the emergence of new private enterprises. Very few of the studies, however, have been exploring the issue of technological development of these industries. The most elaborate amongst them are Bitzer (2000) and Dyker (1996), and (Katkalo, 1996). Investigating the development of the software industry in CEE, Dyker (1996) and

Bitzer (2000) give similar assessment and yet share slightly different views about potential for further development. Although Dyker does not rule out indigenous-led development completely, he outlines that its chances to flourish are low, due to relatively poor accumulation of ICT skills during the command economy period and the chance of inherited concentrations of human capability to be quickly dissipated in the absence of appropriate social and commercial structures (Dyker, p. 3). The author emphasises that the software industries in CEE can grow and develop further only if they manage to plug themselves in the global networks, and the examples provided by the author refer mostly to foreign-led software companies in the region or indigenous companies that have managed to plug themselves in the global production networks.

Bitzer (2000) provides a comprehensive and in-depth assessment of the development of the software industry in CEE. In the course of the analysis he stresses that the indigenous software companies prevail in some segments in the domestic markets in CEE (segments of low standartisation, adapted software, small-scale custom software projects, and installation, implementation and training), due to their advantage in cost, knowledge of the language and personal contacts. Nevertheless, the author stresses that the share of the indigenous companies is to shrink in time, as customers' preferences will shift towards standardised software solutions and in these segments the foreign MNEs are likely to prevail. Likewise it is unlikely that the CEE software products will gain share in the international markets, according to the author. The study emphasises that the CEE software companies are confronted by a number of obstacles (e.g. the small size of indigenous CEE companies and the limited resources they possess, small domestic markets which does not provide a platform for development of complex and costly products and large scale custom projects, domination of Western MNEs in the segment of standardised products, etc.), which

will prevent them to successfully develop standardised products both for domestic and international markets.

Both authors point (although to a different extent) that the indigenous software industries in CEE will be challenged by the international competition. In this sense, it is worthwhile to assess in quantitative and comparative way the capabilities, which the indigenous software companies possess to compete in domestic and international markets, which has not been done to the moment and is the focus of this study. This paper explores the development of capabilities for software production in the domestic and international markets in an indigenous CEE software industry by taking the case of the Bulgarian software industry.

Although the results of the analysis are valid only for Bulgaria, they will allow us to point some issues, which are likely to hold for the CEE and are worthwhile to be verified by further studies. Following the analysis of capabilities accumulation the paper disentangles external factors that influence the development of indigenous software industries. The aim of the paper is to raise the issue of capability building in the indigenous software companies in CEE, outline positive developments and challenges before it (based on the Bulgarian case) and disentangle the variety of factors influencing development of indigenous software industries in CEE. This enquiry is positioned in the broader topic and continuing debate about the possibilities for developing indigenous software industries in a less-advanced context.

The paper is structured as follows: the following section lays down the theoretical framework of the research, by discussing the concept of capabilities building and the specifics in applying it to the case of the software industry. Section three makes an overview of the development of the Bulgarian software industry. Section four presents the methodology and the results of the research about

capabilities accumulation in the Bulgarian software industry. Section five disentangles external factors that influence development of latecomer indigenous software industries in CEE. The final section draws conclusions and policy implications, and directions for further research.

2. Theoretical framework

The recent spectacular outbursts of software development activities undertaken by indigenous software industries in a number of developing countries, like India, China and Brazil, have attracted particular attention for research (see for example among many others, for all latecomer countries (Arora, 2005; Carmel, 2003; Heeks, 2002; Minevich, 2005), for India (Arora, 2001; Athreye, 2005; Tschang, 2001), for China (Tschang, 2005), for China vs. India (Contractor, 2004; Tschang, 2003), for Brazil (Botelho, 2005). Although very few latecomer companies have managed to enter the international markets for software and related services, the relative success of India, China and Brazil (Arora, 2001; Athreye, 2005; Botelho, 2005; Tschang, 2005) has amplified the need to examine the contribution of capabilities as well as other factors to entry and development[3].

In its seminal work Schware (1989) analyses the development of the world software industry at the time and potential niches, which could be exploited by the latecomers. He argues that development of the world software industry offers viable opportunities for the latecomers to harness the potential of software development activities, and identifies areas of software development activities, which can be entered on the basis of good basic if not highly sophisticated software expertise. Thus, the availability of skills and capabilities adequate to the requirements of the world

industry is the major challenge, which the latecomers face in developing software industries with indigenous resources.

Later works of Correa (1996), Steinmueller (2001) and Heeks (2002) had picked up the argument and elaborated it further. Steinmueller (2001) and Heeks (2002) had undertaken a detailed analysis of the factors influencing the process of capabilities building in the latecomers. Steinmueller (2001) emphasises that modern IT infrastructures allow latecomers to access information and knowledge and subsequently develop absorptive capacities and capabilities for software developments on their own. According to the author these create viable possibilities before the latecomers to enter the world software industry based on indigenous resources.

On the basis of detailed analysis of the enabling forces underlying the successful development of the software industries in the latecomer context, Heeks (2002) constructs a model of software export success for developing and transition countries. In it he outlines the elements, which the latecomers need to develop and mobilise in order to successfully develop export-oriented latecomer software industries. According to the model the fundament for developing a latecomer software industry is the establishment of National Software-Related Infrastructure, comprising of skilful human resources, technological base, finance, R&D, etc. The author asserts, however, that the latecomers' efforts need to go beyond these, and to involve development of a common *national* base. This involve development of a National Software Industry on the base of clusters, competition and collaboration among companies, which is based and backed up by National Software Vision, shared and supported both by the government and the industry. Once the national base is established on the strength of these three national elements, the success of the industry

depends on its links with the international markets and trust. The salient feature of the model is its explicit emphasis on the *interrelatedness* of multiple factors and the critical importance of establishment of a solid national base supported by government and industry and active collaboration and trust among companies.

The examples of successful development of a latecomer software export industry had revealed that public policies had a critical role to play in creating a favourable environment. Heeks (2002) emphasises that governments in all three successful Is (i.e. India, Ireland and Israel) have acted to stimulate the supply of working and venture capital to software firms, and have used tax breaks, marketing subsidies, grants, loans, legislative updates, and to remove red tape by a combination of both liberalisation (less government) and promotional intervention (more government). Establishment of high-tech incubators (Israel) and high-tech parks (India) have helped to boost industry development.

It should be underlined, however, that the role of public policies does not exhaust only with the provision of abovementioned direct initiatives for the industry. As Heeks asserts, a sense of a 'national project' is to be established to spur collaboration and development of the industry, and to signal commitment. Creating a sense of a national project and embarking the whole economy on a learning trajectory is critical for the latecomers (Storper, 1998), and public policies have a critical role to play. This has been also confirmed by the successful development of the electronics industries and rapid technological catch up in East Asia (Amsden, 1989, 2001; Ernst, 1998; Evans, 1995; Kim, 1992; Lall, 1994, 1996; Wade, 1990). Public support in these cases was coupled with tight performance requirements: companies have been supported only if they meet certain performance requirements like export intensity at

the time of receiving the funding and they have been expected to increase their export share and turnover over time.

If we are to summarise, the literature emphasises that building capabilities is the cornerstone in developing a latecomer software industry, and in addition identifies other factors, like public policies and cooperation among companies, as important drivers in the process.

Capabilities for software development are difficult to accumulate in a latecomer context for two main reasons. First, accumulating technological knowledge is a complex process, which requires not only acquisition of codified knowledge but also, and more so, development of tacit expertise, i.e. deeper understanding about technologies. Second, in order to build capabilities to compete in international markets, the latecomers need to develop mastery over an array of highly complex skills and abilities, while the knowledge and expertise, which they possess, may be rather limited, and thus make the shift challenging, if not impossible. Thus, the success in building capabilities depends entirely on the latecomer companies' deliberate efforts to upgrade, although the outcome is not certain.

The question of what types of capabilities the indigenous software companies need to develop and how to assess them remains open in the literature (for critical literature review and developing an approach of how to analyse capabilities see Rousseva, 2006). For the purposes of this paper the focus will be placed on the main capabilities associated with software production, which reveal the technical expertise accumulated in the companies. These represent the core capabilities, which latecomer companies need to muster, if they are to develop software activities with own resources. These are capabilities for: 1) software design, 2) software programming, 3) high quality assurance, 4) prompt delivery, 5) capabilities to develop specialised

expertise in a particular domain and 6) capabilities to diversify the products and services offered.

3. Overview of the development of the Bulgarian software industry

Bulgarian software industry offers a fruitful base for analysis of the identified issues. The Bulgarian software industry is predominantly domestic-owned (although in the last few years the industry sees an increase in foreign-owned companies, the share of indigenous companies prevails and is around 85% (Rousseva, 2003; 2005)[4] and Bulgaria has been developing ICT industries in the past.

Bulgaria was among the former command countries selected (appointed) to develop an ICT industry within the COMECON, along with Russia, Hungary and former East Germany. The enrolment ratio in science and engineering is above the EU and CEE average[5] and Bulgaria ranked significantly higher than the international average in the International Mathematics and Science Study. Bulgaria's secondary education is among the best in the world: 5th in the world in sciences, 11th in mathematics (World Bank and The Economist rankings). Further, Bulgarian pupils regularly win Olympiads in Mathematics and Bulgarians are among the top university students worldwide (2nd in the world in SAT scores). These education potentials have been channelled into IT professional certificates. The Global IT IQ Report in 2002 by Brainbench Inc. ranks Bulgaria (with 8,844 Certified Professionals) eighth in a ranking of the top 10 countries based on number of certified IT professionals. Bulgaria ranks third worldwide for the number of certified professionals as a percentage of the population.

Despite skills recognition of the Bulgarian computer engineers the country has not been able to develop big and internationally renowned IT industry. The Bulgarian

software industry remains predominantly domestically oriented and only a small percentage of the companies operate in international markets. The industry reveals a clear 'bifurcation' pattern with respect to its export intensity: around 80% operates only in the domestic market, while the rest of the companies work predominantly in the international markets, and very few companies position in the middle of the scale. Furthermore, most of the companies that are involved actively in exporting had entered the international markets straight from the very beginning, without serving the domestic market beforehand, as previous studies based on a survey and interviews revealed (Rousseva, 2001, 2005).

In the domestic market the indigenous software companies provide the whole range of software activities, like system integration, computer system software, networking software and web-design, CAD/CAM/CAE software, intermediate telecommunications and wireless development software, application software, firmware. The high segment of domestic-oriented software activities involves creation of ERP systems, B2B and B2C solutions, document flow and project management solutions, CAD/CAM/CAE software, intermediate telecommunications and wireless development software, customized services, etc. For example, the human resource and payroll system HeRMeS developed by Technologica; B2C retail application and development of billing and customer support solution for telecoms EyeBill Interactive by Sirma; human resource and payroll systems and project management solutions by Fadata, ERP system of LKlass, etc. The domestic-oriented companies dominate in the segment of accounting software packages. Further, Technologica, a leading domestic-oriented company, has developed a military information system for National Codification Instrument for the Bulgarian Ministry of Defence, which was highly recognised and certified by NATO. Some of the domestic-oriented companies had

already attempted entering the international markets but these remain with no or moderate success. Very few domestic-oriented companies succeeded to enter the international markets and these are usually markets in neighbouring countries in South Eastern Europe and their export intensity remains around 5%. The low segment of domestic-oriented activities entails customization and localization, data migration, system integration, etc.

In the international markets the Bulgarian companies undertake significantly narrower range of software activities: some companies are outsourcing and few companies succeeded to enter the international arena by offering their own products and customised services. The inception of software outsourcing activities in Bulgaria begun in late 1990es and although the years of 2000 and 2001 saw some upsurge, their presence drastically dropped after 2002. The remaining outsourcing activities executed by indigenous Bulgarian software companies at the moment remain little and appear to be undertaken by companies with well-established contacts with big multinational companies. The activities of the rest of the exporters deserve particular attention. Despite their small number, a group of Bulgarian companies have managed to develop products or customised services and to introduce them successfully in the international markets. Their revenue and market share is rapidly growing and signals that these indigenous companies possess significant technological potential. Examples for these are Sirma, which had developed a CAD/CAM software package for automatisation of the paper and pulp industry called EngView, project management solution WorkLogic, linguistic tools Ontotext and development of billing and customer support solution for telecoms EyeBill Interactive Solutions; Fadata with its software insurance package INSIS and ERP systems, Efficient Systems with its

project and document management packages, Antipodes with its workflow package, Bianor with its e-learning solutions, etc.

The revenue of the software industry in Bulgaria[6] reveals a stable increase throughout the 1990es and 2000 with 10-30% annual growth[7] but nevertheless remains modest. According to IDG Bulgaria in 2004 the industry had yield nearly 34 million EURO, which is less than the peak year of 2002 generating 36.3 million but nevertheless a recovery after the drop in 2003 (table 1). Industry officials concur with these figures and outline that the official figures provided by the National Statistic Office are overestimated due to statistical inaccuracy in data compiling.

Revenue from software development (million EURO)				
year	2001	2002	2003	2004
revenue	25.6	36.3	32.7	33.9

Table 1. Revenue from software development in Bulgaria (million EURO)

The issue, which emerges out of this general overview, is what capabilities the companies have been able to muster and how these relate to the requirements of the international markets?

Studies exploring the development of the ICT industry in the Bulgaria have been scarce and predominantly focussing on the restructuring of the industry and the emergence of new private enterprises (ARC Fund, 2002; CED, 2001; ETCO, 1990; TACTICS, 2000). Very few studies have been exploring the issues of technological development of the industry (Rousseva, 2001, 2003). It is exactly technological development and capabilities building that need to become the focal point, if the

analyses are to tackle the problems of competitiveness and sustainable growth of the indigenous industry.

4. Analysis of the capabilities in the indigenous software industry in Bulgaria

4.1. Methodological note

The analysis of accumulation of capabilities is directed at comparisons at two levels. First, the analysis explores the development of capabilities in the indigenous companies, by comparing the level of capabilities accumulation for the domestic and international markets. This analysis provides a snapshot of the level of accumulation of capabilities in the indigenous companies as compared to the requirements in the international markets. Second, to capture differences, which may occur among the indigenous companies, the study investigates possible differences between domestically-oriented versus export-driven companies. This allows for the analysis to reveal the capabilities, which the indigenous companies have managed to muster and to unveil possible differences in the accumulation pattern between domestic-oriented and exporters, which again can be used as an indicator for capabilities development as compared to the requirements in the international markets.

The analysis is based on a survey conducted in the period September-November 2004 among 38 leading indigenous software companies. Out of them 78% operate only in the domestic market. The rest 22% of the companies have 50% and above export intensity (i.e. sales abroad account to 50% and above of the total turnover). The group of exporters comprises a diverse set of companies. The biggest group, representing 16% of the whole sample are companies having 90% and above

export intensity. The rest of the exporters are single or few companies to position in the scale between 50-89% export intensity.

The analysis is based on descriptive statistics and t-test for individual capabilities for the level of accumulation of individual capabilities, and ANOVA test measuring differences in capabilities accumulation between domestic and exporters for every of the identified capabilities for software production in their deployment in domestic and international markets. All companies included in the sample are companies considering themselves as innovative, i.e. offering new products or services [8] . The analysis directed at comparing and contrasting between the performance of the domestic-oriented vs. the export-driven companies is undertaken in a comparative manner, but the percentages reported refer to the share in the sample as a whole, not within the sub-groups.

4.2. Analysis of the capabilities accumulated in domestic-oriented vs. export-driven companies

The assessment of capabilities follows the classification of capabilities for software production, in particular, software programming, software design, quality of products and services, prompt delivery, specialised expertise in a particular domain, and diversified expertise.

Most of the surveyed companies feel confident that their ***capabilities for software design*** meet adequately the requirements of the local market, as the mean of 4.86 reveals. All exporters consider that they have excellent capabilities for software design for the needs of the domestic market. The predominant part of the domestic-oriented companies, representing 64% of the companies in the sample, shares the same opinion. While the rest of domestic-oriented companies, comprising 14% of the

sample, assess their software design capabilities as very good as compared to the needs of the domestic market.

The difference in the capabilities of the domestic-oriented vs. the export-driven companies becomes more obvious when assessing the extent to which the capabilities for software design allows the companies to compete in the international markets. The mean of 3.07 and the mode of 3 reveal that the prevailing number of companies considers their capabilities for software design as average as compared to the requirements of the international markets. Moreover, this is the only variable within the set of the narrow technical capabilities (e.g. capabilities for software programming and software design), which appears with a mode lower than 5. Only 21.6% of the companies assess their capabilities for software design as excellent and adequate to respond to challenges in the international markets. These are all exporters, while among the domestic-oriented companies only two companies reveal the same confidence. Among the exporters the confidence in the excellence in their own capabilities prevails, and only two companies find their capabilities as good rather then excellent.

The overall assessment of the software design capabilities of the domestic-oriented companies is far less optimistic than the exporters. The assessment of the capabilities for software design in the international markets for the sub-group of the domestic-oriented companies drops down to a mean of 2.4 and a mode of 3, which when compared to the mean of 4.75 and mode of 5 for the exporters, provides compelling evidence about the divergence in the capabilities for software design between the exporters and the domestic-oriented companies. Apart from the two companies, which assess their capabilities as excellent, the rest of the domestic-oriented companies are far less confident and consider that their capabilities for

software design are average and below the average, when compared to the performance requirements in the international markets. Nearly 30% of the domestic-oriented companies find that their capabilities for software design are average, when compared to the needs of the international markets. Another 29.7% find their capabilities as modest, while 13.5% of the companies access their capabilities as poor. The fact that only 7.3% of the domestic-oriented companies feel confident that their capabilities for software design allow them to compete in international markets, while all the rest of the domestic-oriented companies assess their capabilities as average and below is revealing and worrying. At this point the gap between the capabilities of domestic-oriented companies vs. the exporters begins to unravel.

Next we focus on the ***capabilities for software programming***. All companies are confident that they possess capabilities for software programming, which adequately meet the needs of the local market (the mean is 4.92). Only 5.4% of the companies consider their capabilities as very good, and these are domestic-oriented companies, while all the rest of the companies, both domestic-oriented and exporters consider their capabilities for software programming as excellent. Similarly to the previous results, most of all Bulgarian software companies feel confident that their capabilities reflect adequately the requirements in domestic market. Nevertheless, the percentage of companies, which are more confident, is slightly higher, when assessing the capabilities for software programming rather then capabilities for software design.

However, companies' assessment of whether their software programming capabilities are adequate to the requirements in the international markets appears less favourable. Although the mode remains 5, the mean of 3.25 reveals that a large number of companies possess limited capabilities for software programming to match the needs of international clients. Only 22.2% of the companies in the sample consider

their capabilities for software programming as excellent for executing international projects. All exporters but one believe that their capabilities for software programming match perfectly the requirements in the international markets. Among domestic-oriented companies there is a single company, which considers itself of possessing excellent capabilities for software programming in international projects, and the rest of the companies position down the scale: 13.9% very good, 27.8% good, and two groups of equal size of 16.7% modest and poor, respectively. Overall, 64% of the companies evaluate their capabilities for software programming as average and below the average as compared to the needs of international clients, and these are all domestic-oriented companies, except one. The domestic-oriented companies appear to possess significantly lower capabilities for software programming as compared to the requirements in the international markets, which is also indicated by the mean of 2.6 for this sub-group. These results suggest that a substantial part of the domestic-oriented companies fail to develop capabilities for software programming, respective to the frontier technological development.

The results provide us with a clear picture of an indigenous software industry, in which a limited number of companies possess capabilities for software design, which allow them to compete in international markets, while the predominant part of the companies (above 70 percent) possess average and below average capabilities for software design, which prohibit them from entering the international markets. This reveals that the Bulgarian companies face limitations even in the basic technical skills and raises concerns about the potential, which the domestic-oriented companies have to enter the international markets. Most of the Bulgarian companies appear to have limited technical capabilities for competing in the international markets, and the capabilities for software design appear to be more problematic than the capabilities

for software programming. These results also confirm the existence of a difference in the capabilities for software programming between exporters and domestic-oriented companies, which we also see with respect to the capabilities for software design.

The results also raise an interesting point. There has been a wide held belief that due to the very good education in mathematics and sciences the East European computer engineers possess excellent software programming skills. This belief was confronted by studies about development of the software industry in CEE, which called for reconsideration of the myth about strong capabilities for software programming, which CEE programmers have (Dyker, 1996; Katkalo, 1993). The results of our survey show that a significant number of companies (around 64 percent) consider themselves of having average and below the average skills in software programming, when compared to the international standards. These results evoke concerns about the level of education in computer engineering in Bulgaria and the extent to which it provides knowledge about the latest technological developments, and corroborate with the results of previous studies (Rousseva, 2001; 2005).

The level of expertise in software engineering and design reflects upon the quality of the products and services, designed by the companies. Next we assess the confidence, which companies have in the ***quality of products and services*** they offer. Most of the Bulgarian software companies feel certain about the quality of the products and services, which they offer in the domestic market, which reflects in the mean of 4.70. The predominant number of the companies feel confident in the excellence of the products they offer, except few domestic-oriented companies, representing 19.4% of the sample, and only two exporters, comprising 5.6% of the whole, which assess the quality of their products and services as very good.

Companies' assessment about the quality of the products and services they offer in the international markets reveals greater heterogeneity. Although the mode remains 5, the mean drops down to 3.44. All export-driven companies but one are confident in the excellence of the quality of their products and services. While the answers of the domestic-oriented companies spread in all categories, from poor to excellent quality. Of interest, 19.4% of the companies find that they have a potential to offer products and services in the international market with an excellent quality, and yet these are companies, which operate only in the domestic market. The question, which arises, is whether these companies overstated the confidence in their products and services. We need to bear in mind that the assessment is based on respondents' subjective assessment and this may have an impact on the results. Respondents may speculate and provide results which put them in a more favourable position than the real situation, or they may provide answers, which reflect their subjective perception about the situation. Apparently, this holds for this part of the assessment, which can be considered as overrated. This group of companies may assume that it is capable of producing high quality products and services for the international markets. However, as these companies do not actually work in international markets, this assessment is more likely to reflect their perception rather than the reality.

Companies themselves assess that they do not possess excellence in software programming and design capabilities respective to the requirements in the international markets, and therefore it is very unlikely that they have the potential to offer high-quality products and services in the international markets. Otherwise, being capable of offering high-quality products and services in international markets and bidding on their low labour costs advantage, these Bulgarian companies must have at

least some level of export intensity. A more realistic treatment of these results would be to say that 19.4% of the companies in the sample, which are companies operating only in the domestic market, hold high esteem about the products and services they offer and perceive their quality to be comparable to similar products in the international markets. Another 19.4% of the companies share a completely opposite view, assessing the quality of their products as poor compared to the international markets' standards. The rest 33% of the companies position in the middle of the scale.

These results reveal that domestic-oriented companies form three distinct groups, somehow polarised in their assessment about their ability to generate products and services with a quality respective to the quality standards in the international markets. While some of the companies are highly confident, another group of equal number of companies is far negative and a third group position in the middle. Nevertheless, the predominant part of the domestic-oriented companies, representing 55.6% of the companies, consider that the quality of the products and services they can offer in international markets is average and below the average. Correcting the answers by downgrading the potentially unrealistic high answers will add up extra numbers. These results are another indication about the extent to which the domestic-oriented companies have been successful in building capabilities. The interesting point they reveal is that a significant part of the domestic-oriented companies are aware of the moderate quality of their products and services and the limitations of their own capabilities.

Promptness in delivery is the next capability to be investigated. The predominant part of the companies makes prompt deliveries in the domestic market (a mean of 4.53). The exporters appear to perform better than the domestic-oriented companies. 75% of the exporters, representing 15.6% of the companies in the sample,

point out that meeting deadlines is an integral part of their excellence, while 25% of the exporters outline that the promptness of delivery in the domestic market is very good rather than excellent. 75% of the domestic-oriented companies, representing 58.3% of the sample, also reveal excellence in meeting deadlines in the domestic market, but the rest of them, representing 11.1% of the sample, are failing to deliver on time and consider that they have modest capabilities for prompt delivery in the domestic market.

With respect to deliveries in the international markets companies diverge completely. All exporters but one achieve promptness in delivery in the international markets. Interestingly enough, some of the exporters allow themselves to be more lenient in meeting deadlines while working on projects for the domestic market, while they appear to be prompt in the international markets deliveries. This is an interesting fact by itself and it has its cultural grounds, as tolerance towards small delays is still an inherent part of the Bulgarian business culture. The difference in business cultures, and particularly the detrimental effect of lenient towards delays Bulgarian culture, becomes more apparent, when analysing the extent to which the domestic-oriented companies manage (or would be able to manage) to meet the deadlines in international projects. 40% of domestic-oriented companies, comprising 31.4% of the whole sample, consider themselves as having excellence in meeting deadlines in international projects, while two equal-size groups of domestic-oriented companies, each representing 17% of the whole sample, cluster around the two ends of the scale, having respectively very good and poor delivery in the international markets, and a limited number of companies position in the middle of the scale.

These results are provoking, as companies currently operating only in the domestic market provide answers about their performance in the international

markets. The grounds for these are twofold. Some domestic-oriented companies had already made attempts to enter the international markets, which obviously were with no success, but on these grounds they are able to provide an assessment of their capabilities to perform in the international markets. Second, as discussed above, these results reflect companies' subjective perception, and this may differ to an extent from the real situation. Further, the lowest score for domestic market is 2, while for international is 1. In other words, some of the domestic-oriented companies have outlined that they do not possess capabilities for prompt delivery both in domestic and international projects, with their skills for meeting the deadlines in international projects being lower than in domestic projects.

This raises serious concerns. It brings back the point about the prevailing business culture in Bulgaria. Apparently, those companies, which had adopted a more lenient approach towards meeting deadlines in the domestic projects, subsequently find it extremely difficult to cope with requirements in the international projects. Transition from domestic to export orientation appears to be a cumbersome task, with project management skills emerging as one of the hurdles on the way. This comes to suggest that even building capabilities for prompt delivery appears to be a problem, which the latecomer companies need to tackle.

Next we look at how companies develop their knowledge base. Companies are asked to assess their specialised expertise in a particular domain in the domestic and international markets, and the diversification of their expertise.

Bulgarian companies reveal confidence that they possess ***specialised knowledge and expertise*** about the local market, which is reflected by the mean of 4.41. 63.9% of the companies consider their knowledge as excellent, and the rest of the companies are equally distributed among answers very good and good. All

exporters except two claim that they possess specialised expertise in a particular domain in the local market. The other two, however, present an interesting case. One of the companies considers itself as having very good expertise, but the other one claims that it possesses poor specialised expertise in a particular domain in the local market. This represents the only company having no specialised expertise in a particular domain in the local market within the whole sample. The reason for this perhaps lay in the fact that this company has 90% export intensity and it does not put special efforts in developing specialised expertise for the local market.

The domestic-oriented companies also appear to have developed specialised expertise about a particular domain in the domestic markets. 47.2% of them consider themselves as having excellent specialised expertise about a particular domain in the domestic market, 13.9% very good and 16.7% good respectively. Overall, most of the companies had developed specialised expertise about a particular domain in the domestic market. When compared to the rest of the variables in the set, there are very few answers in the lower end of the scale. Apparently companies perceive it mandatory to develop specialised expertise for a particular domain for to be able to compete.

The situation seems rather different when companies evaluate their specialised expertise in a particular domain in the international markets. Although the mode remains 5, the mean drops down to 3.44. Interestingly enough, the mean, which the indigenous software industry attains, for having specialised expertise in a particular domain in international markets, is higher than the mean, which the industry obtains for its capabilities for software programming and software design in international markets. This again, raises concerns about the basic technical capabilities, which the indigenous software companies possess.

Coming back to the results about the expertise in a particular domain in the international markets, the analysis confirms the previous patterns. All exporters have managed to develop specialised expertise about a particular domain in international markets, whereas the domestic-oriented companies reveal greater divergence. 16.2% of the companies, which operate in the domestic market, outline that they possess specialised expertise about a particular domain in the international markets. The rest of the companies but one are clustered around the average and below average points of the scale. 16.2% of the companies consider themselves of having poor specialised expertise for a particular domain in the international markets, the rest of companies form two groups of 21.6% each by assessing their expertise as good and modest. Further, all exporters come up with a mean of 5, while the domestic-oriented companies attain a mean of 2.8, which again reflects the difference in the specialised expertise in a particular domain in the international markets, which the companies of these two major groups have been able to develop.

The number of companies having specialised expertise in a particular domain in the domestic market is 80%, which is considerably greater than the number of companies having specialised expertise in a particular domain in the international markets, which account to 50%. Perhaps the latter number needs correction downwards, as 16% of the companies consider themselves to have specialised expertise in a particular domain in the international markets but these are companies operating only in the domestic market and therefore, it is not realistic that they have adequate expertise to deploy in the international markets. Further, the number of companies, which have not been able to accumulate specialised expertise in a particular domain, is greater for the international markets than for the domestic one (nearly 40% of the indigenous companies consider themselves as having below the

average specialised expertise for a particular domain in the international markets). All these follow the domestically oriented profile of the industry, and suggest that a transition from the domestic to the international markets will be a challenging, if not impossible, task for the majority of the companies.

Finally, we focus on the extent to which the companies have been able to ***diversify the products and services***, which they offer in the domestic and international markets. This appears to be the least developed capability among all, as both means are the lowest within the set. Companies diversify their products and services in the domestic market to a great deal, as the mean of 4.11 reveals, whereas they have not been successful in diversifying their products and services in the international markets, as the mean of 2.64 suggests. 49% of the companies in the sample reveal excellent diversification of their products and services in the domestic market, another 30% - very good and 14% - good diversification. Only 8% of the companies appear to have poor diversification of their products and services in the domestic market.

Unlike the previous variables, this one does not suggest a strong distinction between the performance of the domestic-oriented vs. the exporters. The exporters occupy the two ends of the scale - 70% of them perform a high level of diversification in the domestic market, while the rest reveal poor diversification. Parallel to this, there is no clear relation between the export intensity and the level of diversification. Nevertheless, a pattern emerges among the exporters. Exporters seem to reveal similar levels of diversification in the domestic and international markets, i.e. if an exporter has diversified its products and services in the international markets, it applies the same level of diversification of its products and services also in the domestic market. Respectively, low level of diversification in the international markets is coupled with low level of diversification in the domestic market.

In contrast, the domestic-oriented companies reveal better diversification in the domestic market than in the international markets. 41.7% reveal excellent diversification in the domestic market, 22.2% very good and the rest 13.9% good diversification. The diversification in the international market differs completely. Only 2.7% outline that they have diversified products and services in the international markets, while 32.4% have good, 24.3% modest and 16.2% poor diversification. These results suggest that companies do attempt to diversify. But they achieve good diversification only in markets in which they have the capacity to compete, i.e. they have respective capabilities for software programming and software engineering, to develop specialised expertise in a particular domain, ability to deliver on time, etc. Second, we again face the problem of having answers about performance in the international markets by companies, which operate only in the domestic market. In this case, we need to consider the answers as reflecting potentials. Some Bulgarian companies have made attempts of entering the international markets and these results may be considered to reflect the strategy of entering the international markets. Overall, the results reveal that Bulgarian companies have rather limited ability to diversify products and services, which they eventually would offer in the international markets.

A final point in the analysis of the individual capabilities of the exporters vs. the domestic-oriented companies is to be raised with respect to the group of exporters. All the exporters reveal excellence in their performance in all the above studied capabilities, with a mean of 5. There is only one sub-group of exporters, the companies with 90% export intensity, which reveal lower level of performance, with a mean ranging from 3.7 for capabilities in software programming, mean of 4.3 for capabilities in software design, mean of 4.7 for abilities to produce high quality

products and services, and mean of 4.7 for capabilities for prompt delivery. The performance of this sub-group affects the assessment of the overall performance of the exporters, and therefore, it should be noted that the low performance is due to only that group and is not spread among all the exporters. At this point we are not in a position to outline the reasons for the lower performance of that particular group, and further investigation of the possible reasons on the basis of case studies is to be undertaken.

4.3. Further comparisons and concluding remarks about capabilities

The analysis of the individual capabilities reveals that Bulgarian software companies appear confident in all of the outlined abilities, when deployed in the domestic market. Nevertheless, not all companies reveal the same levels of accumulation of capabilities, as the standard deviation reveals (table 1). For some capabilities the companies reveal similar levels of accumulation, like the capabilities for software design and software programming. However, in the rest of the capabilities in the set companies' performance deviates significantly. Standard deviation of (.520) emerges in the capabilities for producing high quality products and services, followed by high levels of deviation of (.971) and (.956) in the capabilities for prompt delivery and building expertise in a specialised domain respectively, and the highest deviation appears in the capabilities to diversify products and services (standard deviation of (1.173). Even greater deviation occurs with respect to companies' abilities to perform in the international markets (table 1). Companies appear to deviate significantly in their capabilities to perform in international markets and this hold for all capabilities (all standard deviation coefficients range from (1.257) to (1.532).

If we are to summarise the results of the analysis a clear distinction emerges between companies' abilities to perform in the domestic and international markets. Both the domestic-oriented companies and the exporters have managed to build capabilities to compete in the domestic market, and they appear confident in the whole array of skills and capabilities. Nevertheless, despite the strong performance of both groups in the domestic market, a slight distinction between the capabilities of the domestic-oriented companies and the exporters emerges, as the domestic-oriented companies reveal slightly lower coefficients for all capabilities than the exporters.

This difference becomes far more noticeable when we compare the capabilities of the domestic-oriented companies vs. the exporters to compete in the international markets. While all exporters reveal strong capabilities and expertise to perform in the international markets, the domestic-oriented companies appear far less successful in developing the necessary skills, expertise and capabilities to execute international projects. Thus, for example, when comparing the capabilities of the Bulgarian companies for software engineering (e.g. software design and programming) and specialised expertise in the international markets, the exporters come up with coefficients, which are nearly twice higher the coefficients, which the domestic-oriented companies get. Further, for these capabilities the domestic-oriented companies position below the average point of the evaluation scale, i.e. by obtaining means below 3.

Overall, the results of the analysis about capabilities accumulation by domestic-oriented vs. the exporter-driven companies reveal sharp inter-group differences in the level of accumulated capabilities and the abilities to compete in the domestic and international markets.

These results have been also supported by the results of the ANOVA test, comparing the accumulation of capabilities in domestic-oriented companies vs. exporters. The ANOVA analysis confirms that significant differences exist between the exporters and the domestic-oriented companies with respect to their capabilities for software programming for the international markets (coefficient (.000), capabilities for software design for the international markets (coefficient (.000), abilities to offer high quality products and services in the international markets (coefficient (.001), and also with respect to the capability to develop specialised expertise in a particular domain in the international markets (coefficient (.000) (table 3). Significant differences between the capabilities of domestic-oriented vs. exporters appear in the whole array of skills and abilities necessary to compete in the international markets and higher level of accumulation appears in all capabilities in the group of the exporters. In this sense, the bifurcation pattern, which the industry performs in its export intensity, is underpinned by a bifurcation pattern in its capabilities.

5. External factors affecting development of indigenous software industries in CEE

The results of the study reveal that a small percentage of the indigenous companies had managed to build capabilities to compete in international markets. These are companies that have managed to build cutting-edge capabilities, despite being embedded in a less advanced context, and this suggests that indigenous software development in Bulgaria has certain potential. Further, a number of domestic-oriented companies have managed to accumulate capabilities and develop packages for the domestic market.

At the same time, the results of the study reveal indisputably that the predominant part of the indigenous software companies are not capable of competing in international markets. These have two implications. First, it reveals that the chances of the predominant part of the indigenous companies to enter the international markets are meagre, if any at all. Second, it suggests that a significant part of the indigenous companies are very likely to be seriously challenged in medium run by foreign competitors entering the market.

These results come to reveal that software development based on indigenous resources is a challenging task in Bulgaria, and the predominant number of the companies is failing to develop capabilities adequate to the requirements of the international markets. To be able to identify the grounds for this failure and to draw possible policy implications, further research needs to be undertaken to explore in detail the learning activities at company level and to identify impediments before capability accumulation. Nevertheless, the above results point out an area for policy consideration.

So far the policies supporting development of the ICTs, which have been adopted in Bulgaria, have been predominantly directed at developing the Information Society, after a decade in 1990es when the positive impact of public policies have been discarded and neo-liberal policy environment was established. In spite of their relevance, further and more focused policies are needed, directed at development of the indigenous software activities. Since 2001 some government initiatives have been designed to support the industry. For example, it has been outlined that the quality of education is to be improved, high-tech incubators have been established, and the government has been promoting the industry in major international expositions in Germany and the USA. However, some of these initiatives have been suffering major

pitfalls and failed to reap significant benefits for the industry. For example, the vision of the ICT development agency portrayed the industry as a potential outsourcing destination and all initiatives and efforts in promoting and support have been channelled towards this end. The outsourcing potential of the industry proved to be low and insufficient to compete with major destinations like India, which apart from being more cost-effective had already developed good infrastructure, reputation and capabilities. A strategy placing emphasis only on the outsourcing potential had deprived the software developments based on indigenous resources and no resources and support have been allocated to these.

The next major problem concerns the education. For more than a decade after the collapse of the command block there was a widespread belief in the country that the quality of education in computer sciences is good, following the tradition in the past. It is true that Bulgaria preserved very good education in mathematics (as mentioned above Bulgarians regularly win Olympiads in Mathematics and Bulgarians are among the top university students worldwide (2nd in the world in SAT scores) and Bulgaria ranked significantly higher than the international average in the International Mathematics and Science Study).

However, the positive preconceptions about the provision of good education in computer sciences in Bulgaria fail to take into account the technological dynamism in the computer industry in the last few years and the occurring change in skills requirements. Until mid-1990es skills in mathematics were fundamental for computer engineers, but since then skills in JAVA scripts, security engineering, web design, database engineering, project management, etc. had become critical. As noted above, these fundamental technological changes in the global software industry found the CEE software engineers unprepared (Bitzer, 2000). Therefore, a fundamental shift in

the education paradigm had to be undertaken in Bulgaria and CEE. In Bulgaria it took some time for the education system to re-adjust, and as a result the quality of education dropped. In the last two or three years due to pressure from industry representatives there is a positive shift, although there is still room for improvement, according to the view of industry representatives, depicted by the current study and in recent interviews by the author. However, the problem is more complex, as already described, and it should be tackled with complex and more innovative initiatives to address the whole range of problems affecting the capabilities accumulation in companies.

The next factor hindering the development of the indigenous software industry is the low level of collaboration among companies and low level of trust. Trust in CEE societies has been dramatically undermined in 1990es (Amsden, 1994; Braguinsky, 2000; Kremeny, 1996), and this reflects in a low level of collaboration among companies. However, indigenous CEE companies are in general small and possess limited resources (be they human, financial or even expertise), which limit their opportunities to enter international arena and compete with own resources. Therefore, cooperation among companies is a critical factor in mobilising a broader pool of resources enabling the indigenous companies to compete internationally. So far, if cooperation occurs, it is driven by efforts of individual companies, and remains sporadic and does not develop in broader and more encompassing joint effort. The absence of commonly shared vision and a national base hinder the possibilities these contacts to create a broader platform for collaboration. A very recent attempt gives a base for optimism in this direction, although the initiative suffers some deficiencies. In May 2006 an IT cluster has been established in South Eastern Europe, involving Bulgaria, Romania, Macedonia, Albania, etc. A critic can point out that this regional

collaboration has not been based on cohesive national vision for development of the Bulgarian software industry at a first place and that it does not contribute significantly to increase of collaboration among Bulgarian companies. Nevertheless, this initiative is a step forward in that direction and bears potential to create a base for further developments.

Another aspect of trust is the reputation of the indigenous CEE companies and the trust from the international community. European accession has helped significantly in improving the reputation of the region and in establishing a bridge between the international business and CEE companies. Nevertheless, the painful transition in some countries, like Bulgaria for example, took its stake in retarding establishment of trust, and currently this process has been threatened by the education and capabilities gaps in software development, which appeared in the recent years. Therefore, the country needs to accelerate its attempts in developing software industry, if it is to regain its strong position.

The existing public policies in Bulgaria fail to develop complex and focussed initiatives aiding in support of indigenous software activities. As Heeks (2002) points out, development of a latecomer software industry requires focused and combined efforts at several levels. Following his model, a number of missing elements can be identified in the existing Bulgarian public policies. At the lowest level, financial, R&D and technological base schemes are absent, and in addition much needs to be done towards creation of skilful human base. At the next levels, initiatives to improve cooperation among companies have been undertaken recently but much needs to be done to further improve these and to establish a sense of national commitment. Links with international industry and establishment of trust have been incubated but these are to be accelerated. But the primary task before the industry and an area for public

concern is the issue raised by this paper – the accumulation of capabilities by the companies.

Given the identified significant capabilities gaps in the indigenous software companies, there is an unequivocal need for the policies to place their focus on these and create initiatives directed at strengthening capabilities base of the indigenous companies to ensure their competitiveness in medium and long run. Due to the complexity of the problem of capabilities accumulation, the adopted policies need to be innovative and comprehensive, if they are to be effective. Once the indigenous companies improve their capability base, they will have the capacity either to continue their indigenous development coupled with active foreign partnerships or to plug themselves into global networks. However, both alternatives will be viable only if at a first place the indigenous companies strengthen their capabilities base at this point of time, and this makes the role of public policies critical.

6. Conclusions

New positive developments in the indigenous CEE software industry have been depicted by this study. The fact that a number of indigenous CEE software companies have managed to develop standardised and customised software solutions on their own and had entered the international markets signals that the industry is entering a qualitative new phase of development. While until recently the development of the industry was based only on foreign technology transfer, the new developments reveal that alongside these a handful of indigenous CEE companies have developed sophisticated technological capabilities allowing them to create cutting-edge standardised and customised products and compete in international

markets. Further, a number of domestic-oriented companies have developed standardised software packages for the domestic market.

Despite their small number, these developments give some grounds for optimism about the potential for indigenous software developments in CEE countries. Pockets of indigenous software development in CEE have already gained pace and started to generate cutting-edge solutions on their own, which have not been depicted by studies so far. These pieces of evidence counter the predictions of the previous studies of Bitzer (2000) (and to an extent Dyker (1996)) that the indigenous CEE software companies are not likely to enter the segment of standardised software developments on the domestic and international markets.

The challenges outlined by this study are most likely to reveal similarities in the whole CEE region. It is likely that capabilities gap exists, although the proportion of companies succeeding to catch up and proportion of those failing to do so may be different. The challenge, which most of the latecomer CEE software companies face, is to develop higher level of capabilities, which would allow them, if not to enter the international market, to maintain their presence in the domestic market. It may occur that domestic-oriented indigenous software companies in the CEE countries that are already EU member states are more technologically advanced than the companies in South East Europe, due to the greater number of MNEs and more dynamic technological development in the region. But at the same time, this tendency may not hold for all CEE member states. As already emphasised, the paper aims to raise the question about capabilities building in the indigenous CEE software companies but further research is to be undertaken to explore differences that may occur among CEE.

Most of the indigenous CEE software companies are trapped not only in a capabilities trap but in a far more complex prison. The predominant number of companies possesses limited human and financial resources, and even expertise. Lack of trust and cooperation among companies weaken further the base for development of indigenous CEE companies. Absence or ineffective public support and a lack of vision and will shared by government and industry to commit to a national project exacerbate the situation, and limit the opportunities to spur and nurture development of indigenous software industries in CEE.

Adoption of general and broad public policies aiming development of export-oriented industry is difficult to justify in a context in which very few companies have managed to build capabilities respective to requirements of the international markets, while the majority fails to do so (at least in the Bulgarian case). It is unrealistic to assume that if supported by public policies CEE can produce big export-oriented software industry at present or near future based on indigenous resources. At most, CEE software industry can generate 'pockets' of export-driven enterprises. The inception of these is already a fact and if further enhanced they can consolidate in an export-oriented core.

If effective public policy is to be enforced, it should be aimed at two major segments in the indigenous CEE software industry. The first one includes the export-driven companies, which had already managed to develop capabilities to compete in international markets and proved to possess technological potential. Public support will help them enhance their competitive position and can be directed at co-financing certification of the companies under ISO, CMM, etc, financial provisions, initiatives to further enhance some aspects of capabilities development, and export promotion. The second segment, which possesses potential for further development, includes the

leading domestic companies in the higher segments in the domestic market, as they have accumulated capabilities to the extent of developing products on their own for domestic clients and making attempts to supply international clients. The public support for this particular group need to include measures enhancing capability development, financial support, certification, and promotion. To ensure effective implementation, public policies must be based on strict performance requirements.

Let us return to the argument of Steinmueller (2001) about the possibilities for developing indigenous software industry in the latecomer context. The author emphasises that to be able to embark on a leapfrogging trajectory the latecomer companies need to develop 'absorptive capacities' to acquire expertise to produce and use the ICTs and that the new ICT infrastructure enables these developments (Steinmueller, 2001, p. 197).

The results of our analysis reveal that a modest number of Bulgarian software companies have been able to build capabilities to compete in the international markets, whereas the predominant number of the companies acknowledges that the capabilities, which they have accumulated, are insufficient to allow them to compete in the global arena. Although these results need to be augmented by further research exploring the underlying learning process and development of absorptive capacities in the domestic-oriented companies, they nevertheless reveal that development of indigenous software industries is a challenge in the latecomer context. Despite their sixteen years experience and inheritance of some capabilities from the past, the domestic-oriented Bulgarian software companies are failing to develop capabilities to compete in the international markets. Development of absorptive capacities in the latecomers appears to be far more challenging task than predicted. Further, as pointed by Heeks (2002) development of an indigenous software industry requires focused

and combined efforts at several levels. If these are absent or ineffective, as the case of Bulgaria reveals, they undermine (or at least do not facilitate) capabilities accumulation.

Developing absorptive capacities for software production in a latecomer context is a daunting task, as the latecomer companies face a variety of deficiencies. These arise from the low capability base on which they begin to build capabilities and also from the external environment, like poor or inadequate education, absent or inefficient public policy support, limited finance and R&D, lack of cooperation and trust, etc. In this sense, the optimistic forecasts about the possibilities for leapfrogging by the latecomer countries by developing indigenous software industries have been overestimated. This is not to contest the optimism about the potential of the latecomer companies to develop mastery over new technologies and eventually to generate new technologies, but rather to suggest that it is most likely that a limited number of latecomer companies will be able to develop leading-edge capabilities. Perhaps latecomer countries like India, China and Brazil, which have been able to mobilise their potential in harnessing the benefits from the ICTs, present optimistic examples (despite the fact that the software industries in China and Brazil remain predominantly domestic-market oriented, the domestic demand is sophisticated, as it is represented by MNEs). Whether other cases would provide grounds for optimism or rather the experience of the rest of the latecomers would provide evidence for a counter argument, is still to be seen. The case of the Bulgarian software industry itself presents a case for moderate optimism. It is optimistic that a group of companies, although representing a relatively small share in the industry, has managed to enter and compete in the international markets. Nevertheless, the questions remain whether some of the domestic-oriented companies will be able to make a shift to the

international markets and how sustainable the development of the domestic-oriented companies will be in the future.

This paper needs to be complemented by further research in two directions. The analysis in this paper was focussed on the core capabilities for software production. Other capabilities, like organisational capabilities, may also exercise an impact on the capacity of organisation to develop absorptive capacities and to compete. Therefore, first direction of research is to expand the analysis of capabilities and include organisational capabilities. A framework for this comprehensive analysis taking into account the main capabilities, which the latecomer software companies need to muster, is developed in Rousseva (2006). The second direction of research is to disentangle the underlying learning processes and development of absorptive capacities, which will allow us to detect any differences, which underpin the different patterns of capabilities accumulation. By augmenting the results of this study with these two further directions of research the analysis will have a better potential to identify the difficulties in developing absorptive capacities and to contribute to the debate about possibilities for developing indigenous software industries in a latecomer context. Potential third direction of research and with respect to development of ICTs industries only in some of the CEE countries in the past, it may be appealing to explore the differences in accumulation patterns and whether these are anyhow related to previous experience or current developments appear completely independent from existence of previous experience. This further direction of research may explore not simply past experience-dependence but also the variety of factors, which enhance or hinder indigenous software developments.

This paper opens up a more general enquiry about the potential of indigenous technological development in CEE: whether ‘pockets’ of indigenous companies in

CEE have managed to accumulate capabilities and go beyond the stage of foreign technological transfer and begin to develop technologies on their own, and this represents another broad direction for further research.

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Notes:

[1] Research that forms the basis for this paper has been undertaken in cooperation with School of Slavonic and East European studies, University College London and funded through EU FP5 project *Economic change: micro-foundations of organisational and institutional changes in Europe*

[2] Eurostat, European Science and Technology Observatory and UNESCO Yearbooks

[3] Very few latecomer companies have managed to enter international markets not only in software activities but also in the whole range of activities of new technology based firms, which illustrates the difficulties in building capabilities in new technological areas, and also influence of other entry factors and developments.

[4] Author's estimations based on data from Bulgarian National Statistical Institute

[5] Eurostat, European Science and Technology Observatory and UNESCO Yearbooks

[6] The data include indigenous and multinational enterprises

[7] According to analyses of National Statistical Institute and IDG Bulgaria

[8] To be able to analyse capabilities of latecomer software companies operating only on domestic market, it is important to distinguish between companies offering innovative solutions for the domestic market and to separate them from 'garage'-type software services, which may be flourishing in latecomers.