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## **Does Croatian national innovation system (NIS) follow the path towards knowledge economy?**

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**Abstract:** Croatia invested in the last ten years significant efforts to establish the Croatian national innovation system (CNIS) which nowadays presents a complex system of various institutions and supporting programmes for science-industry cooperation.

Despite significant progress, the main thesis of the paper is that the concept of NIS in Croatia is, by words of Lundvall (2005) more 'abused' than 'used' as a model for accelerating innovation, economic growth and transition to knowledge economy.

The reasons behind are identified in the complex set of mutual interconnected factors that cause substitution of the systemic model of NIS with its fractionalised and narrow-scope version. The factors are classified in the four main groups, as follows: transitional economic deficiency, cognitive maps and mindset, public administration deficit and socio-cultural factors.

The paper outlined the present institutional set up of CNIS, provides an overview of its main characteristics and discusses the identified obstructive factors.

**Keywords:** systemic innovation system; fractionalisation of NIS; disintegrative forces; socio-political factors; Croatia.

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### **1 Introduction**

The concept of the national innovation system (NIS) first appeared in the 1980s in the framework of institutional and evolutionary economists (Lundvall, 1992; Nelson and Winter, 1982; Freeman, 1988) with the main aim to understand and put into action the processes through which scientific research and knowledge is produced and transferred into businesses and innovation. No has ever been so rapidly adopted

by national governments around the world as an analytical framework and practical tool on how to manage innovation processes in local economies (Albert and Laberge, 2007).

The two essential features of NIS make ground for its huge influence on government practices for improving national competitiveness and economic growth. First of all, contrary to the precedent neoclassical economic approaches, NIS provides certain 'recipe' to national governments on how to cope with globalised innovation-based competition. The recipe consists basically of recommendation to governments to establish an institutional set up of private and public institutions that would, by mutual interaction foster and accelerate creation, storage and transfer the knowledge and skills which produces new technologies and innovation (Freeman, 1988; Sharif, 2006). It calls for public policy induced interaction among sectors and intersectoral knowledge flow (OECD, 1997).

The second appealing feature of NIS comes from its underlying message that economic growth is not an economic spontaneous process simply driven by the 'hidden hand' of market which is beyond the reach of socio-economic agents, such as influence of strategic policy visions, management skills and governance competences. Besides, competitiveness of a nation does not depend on the scale of R&D but rather "(...) upon the way in which the available resources are managed and organised, both at the enterprise and at the national level" [OECD, (1992), p.80]. Therefore, efficient NIS is a result of governance of innovation process and management of knowledge resources through appropriate institutional set-up. The ability of society for social and related institutional change towards such an institutional set up which would facilitate productive use of knowledge points out the utmost importance of socio-cultural factors of economic growth. The guidelining principle embedded in the very essence of NIS as an institutional structure shaped by the deliberate policy action and political wisdom of national political elites is the hidden driver of NIS' widespread impact and its power over the public administration. Many national governments, faced with the challenges of knowledge driven economy, have exchanged their science and technology policies for innovation policies.

However, a wide diffusion of NIS in policy circles is, as Lundvall (2005) stressed, mixed blessing 'since the concept has been both used and abused'. The most positive outcome of NIS was a shift from the simplistic ideas of price-led and wage-reducing competitiveness, dominant in 1980s, towards recognition of firms' international competitiveness based on research exploitation and learning of new managerial and organisational practices.

On the other side, the most obvious abuse of NIS stems from the misunderstandings and crude interpretations of the interactive model of innovation (Kline and Rosenberg, 1986). This model produced a revolution in linear science-technology causal connection and made a theoretical basis of NIS as an ideological and epistemological opposition to the linear model developed within precedent neoclassical economic theories. However, the idea that innovation cycle does not necessarily involve basic science ended up in scepticism about the purposeful use of public science and put universities and scientists under the pressure to justify their *raison d'être*. In addition, the idea that firm innovates in interaction with other firms and with the knowledge infrastructure such as universities and public institutes has born a misinterpretation of relationship between university and

industry. A pure interaction between university and industry was perceived as the main source of innovation needed for transition to knowledge economy. This simplistic idea has increased the pressure on universities to commercialise research results and to be, in fact, an immediate source of innovations. This discourse was fostered in European Union since the mid 1990s upon discovery of the Europe research paradox (European Commission, 1995) and formulated in the First Action Plan for Innovation in Europe (European Commission, 1996).

This interactive model of innovation gave rise to the EU Community Programmes which sought to promote science-industry cooperation and technology transfer such as the education and training for technology (COMETT), the basic research in industrial technologies (BRITE), the specific projects action like technology parks (SPRINT), the European strategic programme for R&D on information technologies (ESPRIT), etc. It has also a huge influence on shaping innovation policy in many Europe countries, both member and non-member states. Croatia is just one of them trying to catch-up with the best practices in innovation governance. After Lisbon council in 2000 when the assessment of the Europe's innovation performance became important factor of transition of Europe towards knowledge economy EU invests series efforts in developing innovation policies and programme (Arundel et al., 2000). Nowadays, they culminated in a complex system for monitoring, benchmarking and fostering innovation systems of all European countries and other interested parties under the common roof of PRO-INO Europe project<sup>1</sup>.

### *1.1 The changing nature of NIS*

The initial interactive concept of NIS faced with failures in practical life has evolved nowadays into the systemic concept that treats all part of innovation system at the same footing (Smits and Kuhlmann, 2004). It is mainly driven by the growing critics of interactivity (Arnold and Thuriaux, 2002) supported by the slow implementation of Lisbon agenda. Relaunch of Lisbon agenda relaunch also a role of basic science as an important agent of European process of catching up with its main competitors, like USA, Japan and BRICS countries (Brazil, Russia India, China and South Africa) (Dosi et al., 2006). The underlying idea is to make a shift from pure interaction between science and industry towards strong science base as a tool for integration of science and entrepreneurship in high-technology sectors, a bottleneck of European global competitiveness. A concept of integration of science and entrepreneurship has proved very successful in the USA for knowledge capitalisation during the third industrial revolution when information technology and biotechnology have emerged. The formation of fast growing companies in the USA in the knowledge industries like bio- and information technologies are the best examples of practical implications of these ideas. The science-business integration fits completely into the systemic approach which argues that NIS is as strong as its weakest component, either being it basic science, technological capability of companies, lack of venture capital or intellectual property rights (IPR). NIS is comprehensive in character and requires harmonised development of all the components in order to be appropriately used, not abused. The stress on a single or a few components to detriment of others will produce misuse of the concept and would lead utterly to the disappointment with the concept and its discard.

### 1.2 NIS as a social process

Difference in economic growth of various countries gave rise to the emergence of the 'new innovation paradigm' (Lundvall and Borras, 1997; Mytelka and Smith, 2002) that has widened and strengthened the notion of innovation as a complex social phenomenon (OECD, 1992). The different rate of national innovativeness and dynamic in NIS implementation leads to the conclusion that the process of innovation as well as national innovation capacities are both path dependent and location-specific (Mytelka and Smith, 2002; Furman et al., 2002). The 'social capability for growth' that determines the nation's ability for institutional change, especially towards those type of institution which facilitate a high rate of technical change, e.g., innovation system (Freeman, 2002) appears to be decisive for accelerating economic growth rates. Therefore, the social ability for institutional change turned out to be a decisive factor for appropriate use of NIS for transition to knowledge economy. It specially concerns transition countries like Croatia where social ability for institutional change is seriously lessened by long curve of policy learning, inherited socialistic-type of institutions in economy and new socio-cultural values born by the transition process itself.

### 1.3 NIS in Croatia: basic dilemmas

The public administration in European countries demonstrated different dynamic and capabilities for institutional change towards NIS due to their economic, administrative and political capacities and orientations [Biegelbauer and Borras, (2003), p.290]. The three groups of countries have been identified: 'first movers' like Nordic countries which grasped the idea of science-industry-technology interaction rather early, in 1980s as a model of transition to knowledge economy. This model is nowadays recognised as a Finland model of innovation and serves for benchmark for other countries. The second group consist of 'late comers', the countries with largely centralised and inert administrations like France, Italy and Austria with slow adoption of NIS. The third group countries 'discursive reformers' consists of countries that belonged to previous socialist block like Slovenia, Hungary and Poland. These countries adopted innovation system only in fragments and through much larger political discourse context mainly shaped by integration process with EU.

Although Croatia has gained only a status of candidate country, it belongs to the third group of countries since innovation system emerged within a process of 'Europeanisation' of standard science policy through policy learning from EU neighbouring countries. It is also largely fragmented and still poorly perceived by ruling elites as a tool for structural adjustment to knowledge economy.

On the other hand, Croatia meets the basic requirements for establishing NIS as an efficient tool for transition to knowledge economy. It has inherited rather mature R&D and higher education system and has developed in the meantime a relatively complex system of institution for fostering entrepreneurship and science-industry cooperation (see Section 2). Besides, Croatia is a leading country in the region in research intensity since its investments in R&D and number of researchers surpasses not only Western Balkan countries (WBC)<sup>2</sup> where Croatia is located from the geopolitical point of view, but also many new EU member states (MS) and the states on Southeast of Europe. After all, Croatian national innovation system (CNIS) can be described as a relatively complex

system of various institutions and supporting programmes and with a track record of at least ten years.

However, the economic growth in Croatia was not as vigorous as it was expected and, above all, it is not based on knowledge and innovation. The general weaknesses of the economy, although leading in the region, and marginalised position of science and innovation in economic development provide a ground for many critical thoughts and some far-reaching dilemmas about the future of CNIS. The first dilemma is related to the appropriateness of NIS as an analytical framework and practical tool for transition of Croatia towards knowledge economy since it has not proved very successful up to now. Another dilemma does not dispute the concept of NIS itself but examines whether the concept of NIS is appropriately used or maybe, using Lundvall's words 'abused' for structural adjustment of economy? The next question concerns the obstacles to the efficient NIS and the reasons behind. Are the obstacles stemming from pure economic and administrative reasons or they are caused by the deeper layers of society such as a complex set of 'soft' socio-cultural and political reasons? Which reason is the most decisive one?

In order to resolve the presented dilemmas, the paper is structured in five main sections that follow the introduction. Section 2 gives an outline of the institutional set up of the current NIS while Section 3 provides a brief overview of the main statistical indicators of CNIS in order to present its main advantages and weaknesses comparing to other countries. Section 4 discusses the dilemmas about the appropriateness of NIS model for future development of Croatia and points out to the four main factors of NIS marginalisation and fractionalisation. Finally, Section 5 summarises the main findings of the paper and brings conclusions.

## **2 Institutional set-up of CNIS**

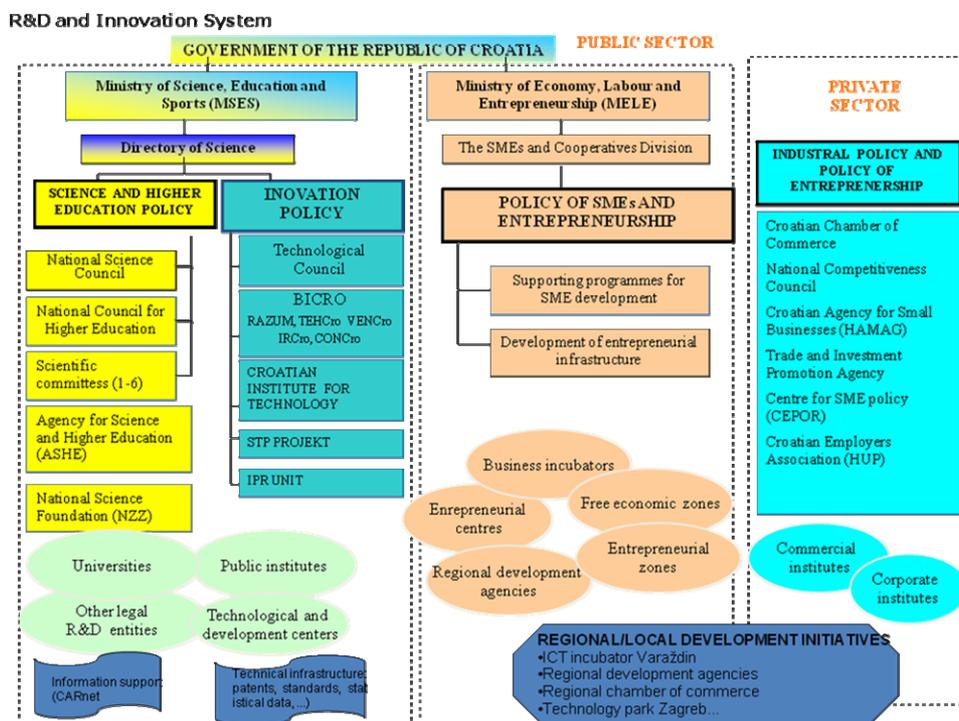
The history of innovation policy and innovation system is more than ten years long and begins in the mid 1990s, about five years after Croatia is formed as an independent state in 1991. Its development could be divided in three phases (Švarc, 2006) of which the most important was the third phase marked by the launch of the first innovation policy programme – the programme of innovative technological development – HITRA at the beginning of 2001 and lasts up to 2004, when Croatia received a status of EU candidate country. HITRA marks a turning point in science policy since it laid down the legal and administrative grounds for creation of the CNIS. This is the first attempt of public administration to connect science and economic development and thus it initiated socio-cultural changes from the values and norms of standard science policy towards a new growth paradigm inherent to innovation policy

The period after 2005 when Croatia opened accession negotiations for EU membership that brought Lisbon and Barcelona targets into the science and technology policy agendas can be classified as the fourth phase. The strategic science policy documents of the Ministry of Science, Education and Sports (MSES) (2006, 2007) incorporate the Lisbon goal of meeting '3% of GDP for research'. Although this goal can be hardly reached by 2010, yet it is important to maintain it as a motivating factor. Therefore, the annual increase of funds for R&D at the rate of at least 25% and increase of the private sector investment in R&D to match public investment according to 1:1 ratio

until 2010 are foreseen. Since 2005, the reforming process of the whole HITRA programme is in progress with a stress on expanding the activities of BICRO through the new programmes, establishing of the Croatian Institute of Technology (HIT), further upgrading of science-industry interface infrastructure and implementation of the Science and Technology Project (STP) supported by the World Bank.

Nowadays, CNIS is rather complex system that consists of private and public higher education and research institutions, transfer institutions, infrastructure for fostering innovative entrepreneurship and SMEs, private R&D sector and public administration responsible for setting up policy measures and strategic visions (Figure 1).

**Figure 1** Institutional set up of the CNIS (see online version for colours)



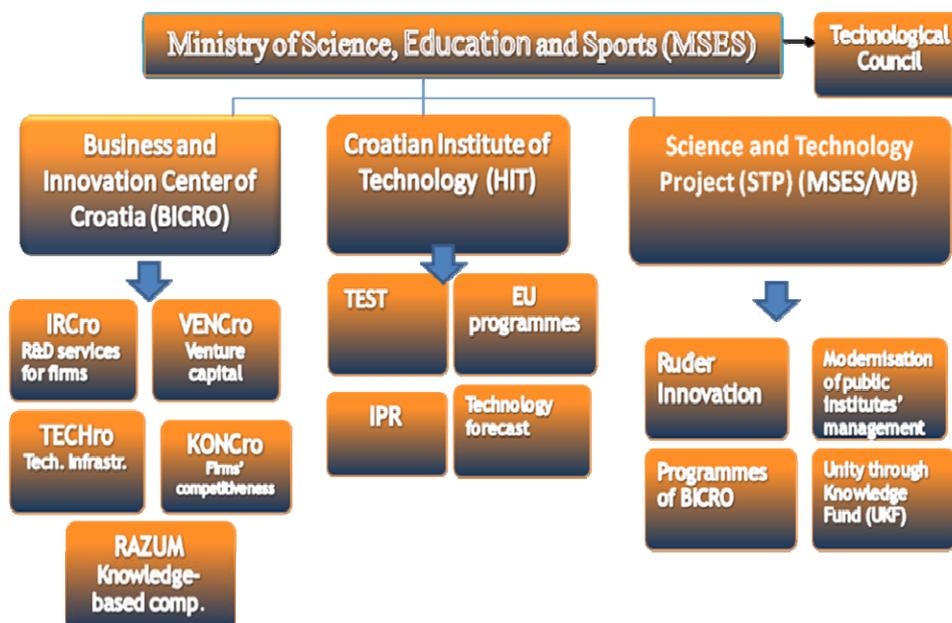
The pillar institutions of the Croatian innovation system are the MSES and the Ministry of Economy, Labour and Entrepreneurship (MELE). The MSES is responsible for the entire research and higher education system, and innovation policy in a narrow sense, in terms of science-industry cooperation and commercial exploitation of research. MELE complements national innovation policy in part of business development. It is responsible for fostering entrepreneurship and technology capabilities of companies by supporting business infrastructure and innovative culture.

The innovation policy and the institutional set-up of innovation system in a narrow sense are under the responsibility of the MSES and primarily oriented towards fostering science-industry cooperation. It consists of the three main components (Figure 2):

- 1 Business Innovation Centre of Croatia (BICRO) which runs the Programme for Support of Entrepreneurship Based on Innovation and New Technologies, with the five subcomponents, as follows: support for knowledge-based companies (RAZUM), the development of the technology infrastructure (TehCro), public-private risk capital fund (VenCro), R&D services for companies (IRCro) and business competitiveness upgrading programme (KonCro).
- 2 Croatian Institute of Technology (HIT) which task is to develop technology forecast and business intelligence activities, provide support for researchers in IPR and their participation in EU framework programmes and also to run the Technology-Related Research and Development Programme (TEST). TEST is aimed at developing of new technologies (products/processes/services) up to the stage of commercial application.
- 3 The STP supported by the World Bank which began in fall of 2005. It co-finance BICRO' subprogrammes, modernisation of science management of selected research institutes, newly established Centre for technology transfer at the 'Ruder Bošković' Institute – Ruder Innovation and the Unity for Knowledge Fund aimed at cooperation with the Croatian research Diaspora.

In addition, there are technology council of the MSES and five technology and development centres affiliated to the universities of Zagreb, Rijeka, Split, Osijek and Dubrovnik.

**Figure 2** The institutional set up of innovation system under the responsibility of MSES (see online version for colours)



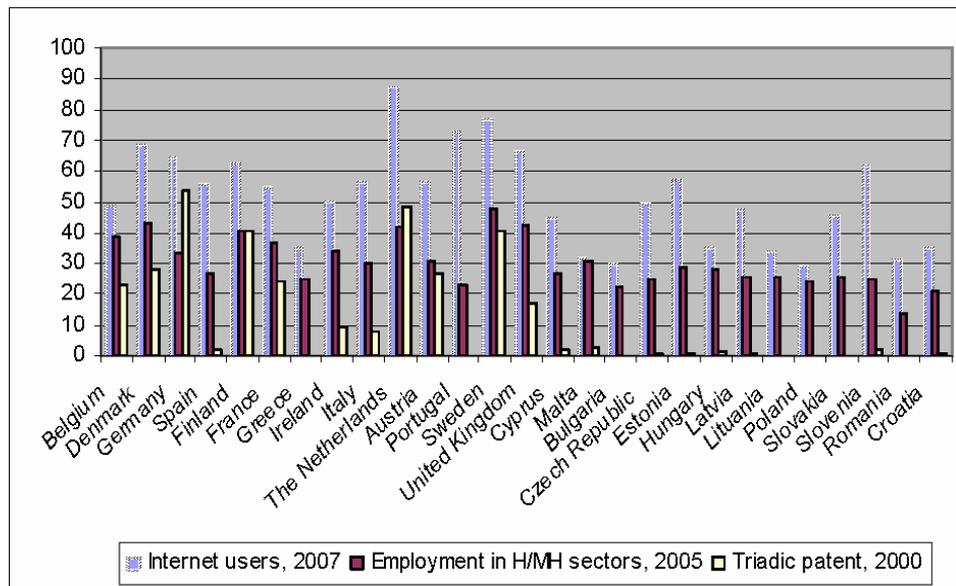
### 3 The present state of CNIS: brief overview

Although the institutional set up and various programmes provide a platform for certain satisfaction with the innovation policy, it is estimated that the overall impact of the innovation policy programmes on the structure of economy and science sector itself is rather modest.

As far as economy is concerned, the structure of industrial sectors and exports has not changed much since the period of socialism and planned economy. The low and medium-low technology industries account for almost three-fourths of the value added (74.1%) in manufacturing (Aralica, 2007) while the most important export products to the EU are labour-intensive industries and products with a relatively low value added share (tobacco, textile products, wood, furniture, ships, chemical and petrochemical industry). However, the possible niches in high technology exports are evident from the rather high 8% share of high-technology products (electrical machinery, pharmacy) in total manufacturing exports of Croatia (Eurostat, 2005).

Technological and absorptive capabilities of companies measured by the number of patents, internet hosts employment in high and medium-high sectors (Figure 3) reveal that Croatia lags behind not only developed countries, but also newly integrated European countries that are used to compare with, more favourably.

**Figure 3** Some selected indicators on technology performance (see online version for colours)



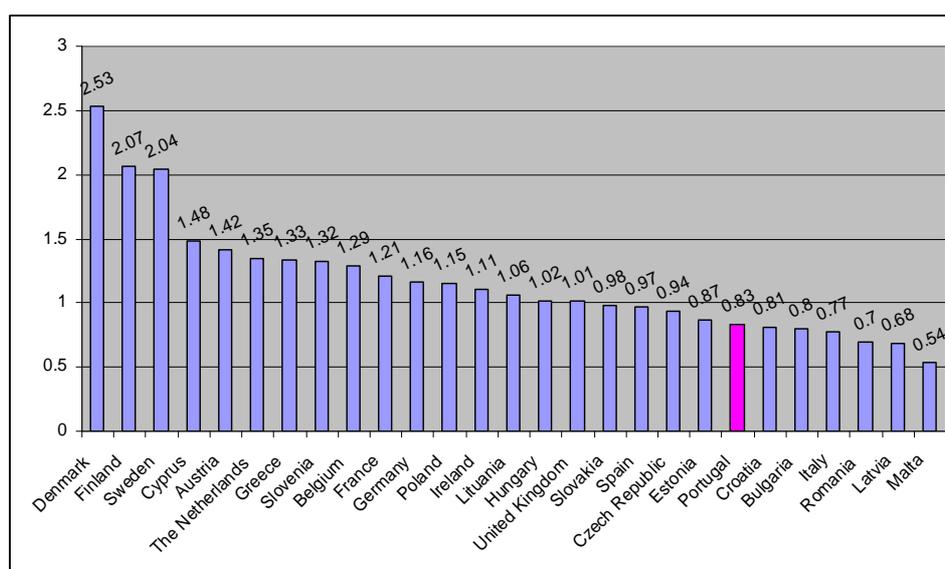
*Source:* Internet users (in % of population), 2007, Internet World Status (<http://www.internetworldstats.com/>); employment in high and medium-high technology manufacturing sectors (share of total employment), 2005, Eurostat; Triadic patent families by earliest priority year at the national level per million inhabitants, 2000, Eurostat

The most recent data on national competitiveness (NCC, 2006) shows that Croatia has recorded considerable improvements in business competitiveness in the last two years since it climbed from 70th to 55th place out of 80 countries. However, this is same position Croatia occupies in 2002 and it is still significantly behind the new EU members states.

The TEA index shows that entrepreneurial activities of Croatian companies continues to increase but Croatia is by entrepreneurial environment among the lowest graded countries. It calls for government measures for removing administrative, financial, public procurement and other barriers (Cepor, 2006).

Policy of education, life-long learning and skill-building should be radically changed in order to enable Croatia to make a shift towards more competitive economy. Nowadays, the investment in tertiary education in Croatia, less than 1% of GDP (Figure 4) is going to be insufficient to change the educational base of the working force needed for competition on European markets.

**Figure 4** Expenditure on tertiary education as % of GDP, 2004 (see online version for colours)

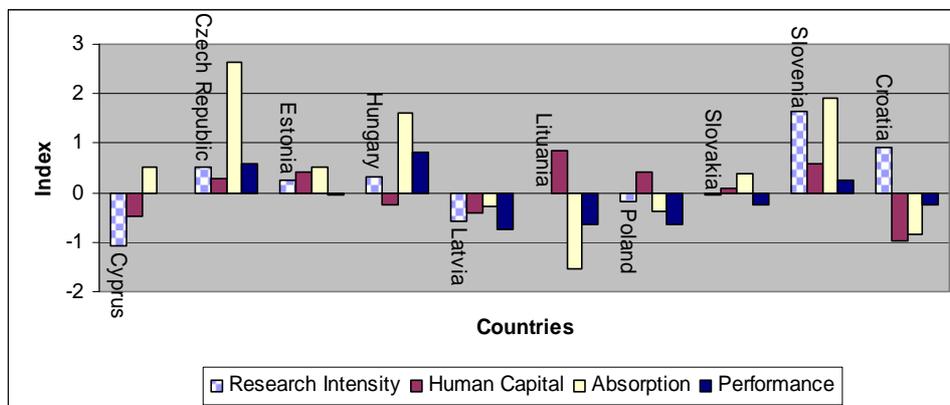


The proportion of persons with tertiary and post-tertiary education in the active labour force (age 25–65) is rather low (15.2%) and significantly below the average of the European Union. In order to catch up with advanced countries like Finland, it would be necessary to reach 40% of active labour force with postsecondary education and enlarge the proportion of PhD holders (as a recruitment basis for researchers) from the present 0.23% to 2% (Lučin, 2007). Such a goal request tremendous enlargement of students, research novices, university teachers, mentors and investments in education but a very few alternatives to this plan exists for transition to knowledge economy. A good news is that almost 94% of the population aged 20–24 completed some kind of upper secondary school while the two-thirds of youth population aged 18 enrolled the higher education system. The future of Croatia depends on establishing such a system which will

enable these young people to complete higher education and use their skills in productive way.

The pilot benchmark analysis of the Croatian innovation system with EU 25 and new MS (EU 10) (Švarc and Bečić, 2005) illustrates that CNIS is lagging behind the development of NIS in both group of countries. The most critical components of CNIS are (Figure 5) absorption capacities of companies measured by ISO standards of quality management, number of researchers in industry and Internet hosts (computerisation) in Croatia and human capital that includes investment in tertiary education, number of new scientists in engineers and educated labour force.

**Figure 5** Croatia and EU 10 – new MS composite indicators: divergence from average, 2001  
(see online version for colours)

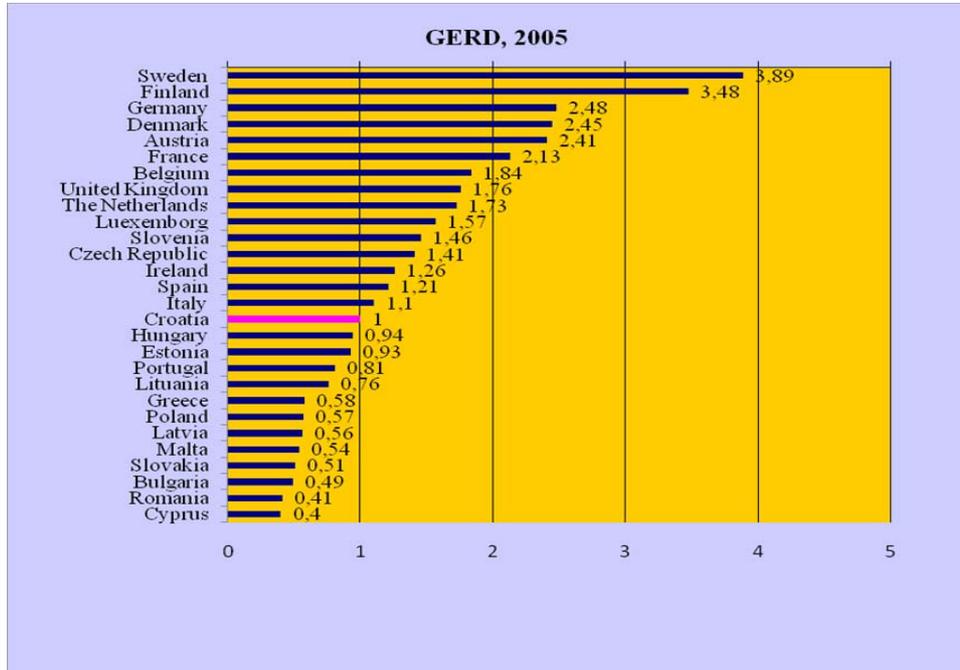


Although the recent analyses are missing, the innovation index produced by EC (Pro-Inno-Europe, 2007) confirms the results of the aforementioned analysis. Both the indexes allot Croatia into the least innovative group of countries together with Malta, Lithuania, Hungary, Greece, Portugal, Slovakia, Poland, Croatia, Bulgaria, Latvia and Romania. However, it is stressed that scores of all the countries are increasing towards the EU average over time with exception for Croatia and Greece.

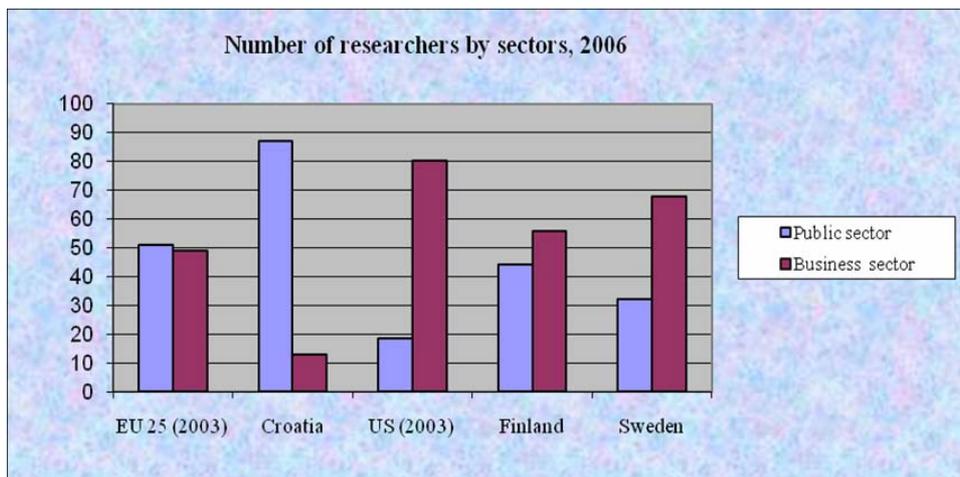
Croatia is competitive to EU countries only in research intensity measured by investments in R&D and number of researchers. Owing to the constant rise of investment in R&D (from 0.77% of GERD in 1997 to 1.24% of GERD in 2004, with the slight decline in 2005 to 1% of GDP) as well as in the number of researchers (Figure 6) Croatia is, together with Slovenia and Czech Republic, one of the leading countries in research intensity among the newly integrated EU countries (Figure 3). It is far ahead from Bulgaria and Romania as EU countries, FYR Macedonia as EU candidate country and Serbia as a potential candidate country.

Despite great share of portion of total investment into R&D the Croatian R&D system is suffering the two significant shortcomings: disproportional structure of R&D sector featured by the serious backwardness of business R&D and weak science – industry cooperation due to a low absorption power of the business sector and undeveloped industrial research.

**Figure 6** GERD and number of researchers in Croatia and EU countries, most recent available years (see online version for colours)



**Figure 7** Number of researchers by sectors in Croatia and selected countries, 2006 (see online version for colours)



Source: Eurostat (2006)

As opposed to most industrially developed countries where the industry finances and conducts most research and development activities, and hires most researchers, in Croatia, the public sector of R&D is prevalent. This is because the state finances over 50% of all research and hires the majority of researchers (85%) at universities and public institutes (Figure 7). The industrial sector finances around 43% of total investment in R&D and employs only about 15% of researchers. Besides, business sector invests about 0.43% of GDP in R&D (BERD), a large part of which comprises the temporary investments of a few large industrial corporations [NCC, (2003), p.110]. The vast majority of the R&D potential is heavily dependent on scarce budget resources, which amount to a meagre 0.62% of the gross domestic product (GDP) and ensure only basic survival. The satisfactory level of investment in R&D (i.e., almost 1.1% of GDP) has, therefore, proven to be insufficient to provide an adequate material basis for 85 % of the R&D human capacities.

Cooperation between science and business community in Croatia is relatively low and the most scientific and research potentials are not used for economic growth. The reasons behind are a low absorption power of the business sector for innovation and research results (Radas, 2004) and atomisation of universities which, thus, are lacking the critical resources for business and commercially oriented research (Švarc and Račić, 2007).

#### **4 Discussing dilemmas**

Although Croatia has established a relatively complex NIS, innovation-based competitiveness and innovation policy does not play significant role in Croatian economy and in its structural adjustment towards knowledge economy. There is an overall impression that CNIS, in spite it provides various incentives for the cooperation and innovation, exists for its own sake, unrelated to the sphere of business development, entrepreneurship or industrial technology progress. Its potentials for strategic development are simply not recognised among the main stakeholders of economic development: entrepreneurs, science managers and politicians. They are used to build economic development on factors different from innovation, knowledge, expertise and production, such as defensive inter-sectoral restructuring (dismiss of workers) and domestic market consumption (government as a main customer) and low-cost foreign direct investments which does not involve R&D (Radošević, 2004; Teodorović and Lovrinčević, 1998). The high profits in recently privatised service sectors like banks, telecommunications, real estate and commerce, strong state support to declining sectors like shipbuilding or agricultural sector provide the impression that relationship between innovation-technology-production-education is not the key development factor. Besides, the regular income from tourism owing to the exploitation of natural resources of the Adriatic Sea which usually remedies the state deficits supports this comfortable posture. It could be a reason that employment in high and medium high technology manufacturing sector in Croatia is, except Romania, the lowest in Europe (Figure 3). At the same time, the idea of tourism and agriculture as the pillars of Croatian economic strategy for 21st century is strongly boosted by the political deals and interests complemented by the lack of strategic visions of development. The opposite reasoning that future economic growth cannot be based on 'waitress and peasants' revenues, i.e., profit-low and work intensive sectors is becoming silent.

The reasons for such marginalised position of innovation are numerous and can be divided in at least four mutually interconnected groups: transitional economic deficiency, cognitive maps and mindset, public administration deficit and socio-cultural reasons.

#### *4.1 Transitional economic deficiency*

In the countries of the previous socialistic block, as Croatia is, the process of transition to market economy was strongly influenced by the Copenhagen criteria (European Council, 1993)<sup>3</sup>. These criteria were imposed by the European Union to transition countries to become modern economies eligible for membership in the Union and include functional market economy democratic governance, human minority rights and legislative alignment (*acquis communautaire*).

However, different countries apply different methods to meet these criteria. Croatia applied model of 'technical modernisation' (Rogić, 1998) which assumes transition to modern market democracy without implementation of real structural reforms in relevant sectors. Most significantly, the transition to market economy was performed 'technically' by mere privatisation of the previous state own companies instead of companies' real restructuring by professional managers. By the privatisation model known as 'empty shell model' (Županov, 2001), the companies have been sold rather cheaply to the politically apt persons so called 'rent seekers' who has guaranteed swift privatisation but had no interest in companies' development. The privatisation process regularly ended in the selling out of a company's fixed assets and devastation of technological competence and skills, turning it into an empty shell. This kind of privatisation paved a way to the process of deindustrialisation<sup>4</sup> and provides a rise of corruption on a large scale.

Another appearance of the de-industrialisation process is severe devastation of the industrial research institutes and centres of competences according to the model known as 'shock without therapy' (Radošević, 1996). This model is driven by the neoliberal market ideology and assumes withdrawal of the state from private business including support for research institutes and units. The combination of the 'empty shell model' and 'shock without therapy' model ended up in the heavy losses in technology accumulation, engineering skills and overall industrial base. The negative effects can be seen to their full extent today, when the absorptive capacities of companies for R&D and innovation appear as the critical component of systemic NIS and its use for transformation to knowledge economy.

The present industrial policy squeezed between the need of fast transition to market economy and devastated production sector mainly consists of privatisation and financial rehabilitation of technologically-obsolete industrial sectors. The lack of structural reforms, especially after 2005, slowed down the pace of negotiation and integration processes of Croatia with the European Union.

It should be stressed that many other institutions inside and outside pure economic domain, have emerged or been shaped primarily through privatisation as an underlying system of distribution of economic assets and related socio-economic power. These institutions such as weak legislation, ineffective judiciary, non-transparent and authoritarian corporate management, weak capital market, lack of industrial consortiums and strategic alliances, low-capital foreign direct investments, etc., have created a set of obstacles that have a huge influence on the low level national innovation capacities unable to apply systemic approach in NIS developing.

## 4.2 *Cognitive maps and mindset*

### 4.2.1 *Neoclassical versus evolutionary economic doctrines*

The concept of NIS and innovation policy is based on the idea of innovation as an integrative phenomenon. Innovation is an amalgam of research results, their technological application and commercial exploitation [OECD-Eurostat, (2005), p.15]. Therefore, innovation is essentially the result of the interactive process and knowledge flow between many actors and sectors such as scientific knowledge, engineering, production, financial sector, legal conditions, etc. Since all these sectors should be mutually supportive, they should be developed at same footing which requests proactive policy action of government that follows the systemic 'holistic' approach in NIS development.

However, the idea of proactive innovation policy, e.g., involvement of government in economic development as well as all these ideas of holism, interactivity and integration is poorly perceived and, in fact, opposed to the socio-cultural values and norms of the ruling elites in Croatia. These ideas simply do not fit into their cognitive maps and inherited mindset strongly influenced by the neoliberal economic doctrine of economic growth regulated by the 'hidden' hand of market.

According to the neoclassical model of development, which is dominant in the Croatian economic circles innovation capacity and technological development, is exogenous to socio-economic system and emerges spontaneously from scientific research as regulated by market forces. Therefore, the role of state is limited to the correction of market failures related to scarce investment in R&D by business sector and assumes financing of public science. The ideas of evolutionary and institutional economy which argue endogenous character of innovation and supports government incentives for innovation in private sectors and science-business cooperation can hardly be accepted for at last two reasons:

- any kind of state interventionism in private industrial sector, even in R&D, was considered as a relic of socialistic times that violate market economy
- integrative policy approach threatens the conventional science policy focused on traditional elitist-type science used to be abundantly financed by the state and was, thus, strongly discouraged by academic community.

### 4.2.2 *Systemic versus fragmented model of NIS*

Launching the HITRA programme in 2001 was, therefore, a sort of diversion among the elitist-type oriented scientist while, for entrepreneurs, it was just a new trendy initiative of public administration with no significance for the real business. Public administration designed HITRA rather ambitiously giving it the task to mobilise the scientific research potentials for structural adjustment to knowledge economy by accomplishing the three main goals (Švarc, 2004): fostering science-industry cooperation, reviving industrial R&D and encouraging commercialisation of the research results. However, in practice, HITRA was transformed into two interactive-type programmes (TEST and RAZUM) rather narrow in scope, tailored to provide a framework for direct cooperation between entrepreneurs and researchers and commercial application of research results. Very soon after the HITRA programme was launched, it has become obvious that realisation of individual HITRA projects strongly depends on the strength of the other parts of the

innovation system beyond research sphere and beyond the scope of HITRA itself. For example, the commercialisation of research results requires sound policy of intellectual property protection, new science management, new financial support instruments, absorption capacities of companies, etc.

Although HITRA was extended and improved over time its initial mission to establish a comprehensive intersectoral system for fostering innovation remain to be reduced to the 'interactive' programmes loosely related and supported by the rest of public administration. Generally speaking, Croatian Government has not invested sufficient efforts to promote innovation policy at the national level and to coordinate and harmonise the different ministries' efforts in technology development. Although the MSES succeeded to establish twice a time the intergovernmental body (in 2001 and in 2004) as a common platform for discussing innovation system harmonised development these bodies have never fulfil their function. The success of the two new high-level government bodies – the National Innovation System Council (NISC) of MSES and the Government Body for Science and Technology (GOVBOST) adopted by the Croatian Government in April 2008 remains to be seen.

Up to now, the lack of coordination turns to be one of the main obstacles to the systemic implementation of NIS causing its wasteful use or, by words of Lundvall, its 'abuse'.

#### *4.2.3 'Old' versus 'new' policy paradigm for economic growth*

As statistical indicators reveal, Croatia is competitive to EU countries only in research intensity in terms of number of researchers and investments in R&D in public sector. It illustrates the awareness of policy-makers that scientific research is an important factor of technology and economic development as well as their prudent efforts to develop science and knowledge. However, their support to knowledge development is oriented primarily to the supply side, i.e., public science separated from productive use of knowledge and its market realisation through innovation. While many countries introduced, at the beginning of the 1990s, innovation policy and large cooperative programmes for facilitating science-production integration (Lemola, 2002), science policy in Croatia remains focused at public science sector. The MSOS used to be a single financer and consumer of R&D which maintain and develop 'national science base', a public R&D sector which nowadays employs 85% of the Croatian research labour force. Such a policy corresponds exactly to the old paradigm of economic growth based on neoliberal ideas of public science as a 'national pool of knowledge' disposed to private business for acquiring the knowledge needed for technological development. The idea of the new policy paradigm to accelerate the science-business integration and production of innovation through innovation system has never become a policy agenda. Instead, the political elites in Croatia identified the policy paradigm of economic growth with the economic stabilisation launched in the mid of 1990s, privatisation and financial rehabilitation of inherited production sectors, which are labour and capital intensive and with low R&D and innovation consumption.

Therefore, despite HITRA made a shift from conventional science policy towards policy that promotes entrepreneurial spirit and knowledge transfer activities in academic community, the socio-cultural values and norms of the new policy paradigm (innovation policy) remains on periphery of the mainstream development policy.

### 4.3 *Socio-cultural factors*

A decade of 'semi-modernism' in Croatia complemented by the negative public image of privatisation as an abuse of political power which endorsed clientelism and corruption has born a set of socio-cultural norms and values which do not support entrepreneurial and innovation culture. The factors obstructive to innovation born in the period of transition to market economy are additionally boosted by the path dependent factors inherited from socialism such as state paternalism instead of private initiative, separation of scientific and production sectors, scientific elitism, lack of networking and cooperation, etc. (Högselius, 2003). They diminish the capability for socio-cultural and institutional changes needed for establishing a comprehensive innovation system. The scepticism towards innovation can be identified at the level of individual behaviour and corporate governance. At the individual level, the lack of faith in individual efforts, creativity and 'honest' job as decisive drivers of individual prosperity and self-realisation on the market resulted in widespread defeatism, opportunism and corruption.

Within the corporate governance system (Račić et al., 2008) innovations are often reduced to incremental modifications of existing products and/or processes which exclude risk taking and lead to the low economic effect and non-export orientation. Since innovation is not strongly embedded in corporate strategy and resource allocations, the government incentives turned out to be insufficiently strong motivational factors for innovation and cooperation with research institutions. Negative effects are also coming from disclosure and lack of transparency of corporate practices, authoritarian management and neglect of social and labour rights of employees.

### 4.4 *Public administration deficits*

There is a growing recognition that public administration in Croatia suffers the lack of administrative and governance skills and competences for swift integration of Croatia into the European Union. The lack of competences has a devastated effect on proactive innovation policy and governance mechanisms to steer innovation system to accelerate technology change and production of innovation. Public administration in Croatia suffers a lack of policy learning (STEP, 2003) an important mechanism for gathering and absorbing the experience and best practices from outside resources such as public administration of other countries, professional policy advisers, analytical and evaluation studies and personal networking.

The lack of competences and policy learning is mainly induced by the deficit of the 'western type' of governance culture and consists of three interconnected factors:

- a lack of strategic vision which produce disorientation in policy actions
- b irrational behaviour stemming from rigid hierarchy which force subordinates to follow mechanically commands and directives of superior
- c 'do not rock the boat' culture or inertia syndrome which is a principal reason for the passivity and submissiveness of administration (Poljance-Borić and Švarc, 2007).

This type of irrational administration is in a great discrepancy with proactive governance which requires collegial type of working, self-initiative and delegation of the task from the top to the bottom of administrative hierarchy. In Croatia, there is a domination of

passive public administration preoccupied with mutual controlling instead of governing. It is featured by the top-down command chain which ignores creativity, flexibility and responsibility of each individual public servant. Such an inert administrative apparatus is not able keep a pace with new government methods induced by globalisation, innovation-based competitiveness and technological advances.

A special problem is a lack of strategic visions of development, a presence of rather myopic policy instead of analytical studies and technology foresight exercise for directing future development. The single comprehensive document on strategic development of Croatia entitled 'Croatia in the Twenty-First Century'<sup>5</sup> has been produced by coalition government which won power in the 2000 elections. It consists of 19 separate studies and reflects desire of the new government to accelerate economic growth based on structural reforms including reforms of science and technology. The recent strategic policy documents which include science and innovation are produced by the MSES (2006, 2007). However, the implementation of these documents is, again, limited to the science and innovation policy under the responsibility of MSES with a weak influence on the remaining parts for innovation system.

## **5 Conclusions**

The overview of the present state of the CNIS and the main factors of it marginalised position in development strategy of Croatia leads to the conclusion that there is a complex set of mutually interrelated factors that produce institutional deficit of CNIS and its weak position as a practical tool for strategic development. Since the institutional deficit of NIS in Croatia is persisting, the appropriateness of NIS as a model for transition to knowledge economy is reasonably questioned. However, the strategic development visions are rather deficient in today Croatia and no alternative paths of strategic development based on knowledge, education and innovation are presented or explicated by the ruling elites. The only option for economic growth is currently perceived in revitalisation of family agricultural farms and tourism complemented by reforms of industrial, financial and legal sectors pushed forward by the European Union integration process. It seems, thus, that integration process itself is today a main driver of economic development as the transition to market economy used to be a decade before.

The concept of NIS as a tool for transition to knowledge economy has never been seriously concerned by ruling elites. The reason behind probably lies in the narrow cognitive maps which exclude the alternative development models, different from standard neoliberal economy. The narrow-minded set up is additionally supported by the incomplete transition to market economy (privatisation, reforms of legal and administrative systems, etc.) which detours the efforts of ruling elites from long-term strategic development towards daily problem solving stemming from incomplete transition to market economy. Therefore, it could be stated that NIS as model for transition to knowledge economy, although it is slow and fragmented does not have alternative at the moment.

In this context, it would be more useful to analyse which factors produce a syndrome of superficial understanding of NIS that cause substitution of systemic model with its fractional alternative. Fractionalisation means in essence reduction of NIS to a number of

interactive programmes under the responsibility of MSES separated from the other components of NIS which inevitable ends in the classical misuse of the concept and threatens the use of NIS as a practical and viable model of development.

The brief analysis of the main reasons of fractionalisation of NIS in Croatia points to the various factors that can be roughly classified in four main groups: transitional economic deficiency, cognitive maps and mindset, public administration deficit and socio-cultural factors (Table 1).

**Table 1** A tentative list of factors obstructive to systemic concept of NIS

Economic factors	'Empty-shell' model of privatisation, devastation of industrial research, loss of technological competences, weak financial market
Cognitive maps and mind sets	Uncritical faith in neoliberal economic theory, linear model of innovation, policy interventions related to market failures, cognitive conservatism, lack of openness to experimentation with new institutions
Public administration deficits	Lack of policy learning, lack of strategic visions, lack of professional competences, irrationalism, lack of cooperative culture, self-initiative, delegation of tasks, inertia syndrome, 'do not rock the boat' attitude
Socio-cultural factors	Semi-modernism (deindustrialisation, descientisation, retraditionalisation), scepticism, opportunism, paternalism, corruption, lack of entrepreneurial spirit, weak corporate governance skills

The important fact is that the factors are strongly interconnected in the process of mutual co-inducement, coevolution and supportiveness. For example, the wish to escape from the socialistic planned economy and the challenges to meet Copenhagen criteria made a platform for uncritical exploitation of neo-liberal ideology and 'empty-shell' model of privatisation. The privatisation model complemented by the process of deindustrialisation has a strong influence on shaping the inherited set of social and economic institutions and produces an initial institutional set up of CNIS. The changes of this initial institutional set up towards systemic NIS were obstructed by the complex set of disintegrative forces of economic, cognitive, political and socio-cultural discourse, partly path-dependant and partly induced by the transition process itself. The obstructive factors that produce misuse of NIS as a model of development such as corruption, monopolies, weak legal and judiciary system, economic voluntarism, political irrationalism, inert cognitive maps, long curve of policy learning, etc., cannot be overcome by spontaneous market regulations but requests concerned policy actions. It seems that Croatian society, after a period of technical modernisation, innovation policy learning through HITRA programme and growing critics of slow dynamism of economic growth has become mature enough to accelerate social and political changes needed for concerted policy actions. The reforming processes that should follow socio-political changes driven by public policies oriented towards strategic development are the key driving factors of efficient CNIS and transition to knowledge economy.

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## Notes

- 1 See the web page of Pro-Inno-Europe, available at <http://www.proinno-europe.eu/>.
- 2 WBC consists of Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro and Serbia.
- 3 Also, available at <http://www.auswaertiges-amt.de/diplo/en/Europa/Erweiterung/KopenhagenerKriterien.html>.
- 4 The process of deindustrialisation is just one component of the process known as semi-modernism, which is a term coined by the Croatian sociologist Županov (2001) to describe the mixture of modern and traditional elements in Croatian society during the last decade of the 20th century. The remaining components are descientisation (marginalisation of science, a climate of anti-intellectualism and anti-academism), retraditionalisation (the process of desecularisation and the so-called 'moral and social renewal' back to the ethical values of the 19th century) and, finally, the 'balkanised' irrational administration interested only in their sinecure and benefits.
- 5 More detailed information about this policy document are available at the ERAWATCH web page, <http://cordis.europa.eu/erawatch/>.