SOCIAL CAPITAL

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Chapter 2

SOCIAL CAPITAL AND INNOVATION POLICY IN CROATIA: SCIENTIFIC COMMUNITY AS A SOURCE OF INNOVATION

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ABSTRACT

This paper provides the results of the first empirical research aimed at analysing and understanding the influence of social capital on functioning and performing of innovation policy in Croatia. It is part of the wider project on social evaluation of the Croatian innovation policy and innovation system which is based on the survey conducted in 2007 and targeted at project leaders who have taken part in one of the first innovation policy programme in Croatia (HITRA-TEST programme). The programme was launched in 2001 with the aim to foster science-industry cooperation and commercialization of research results of the public research sector. It has provoked within the scientific community intensive debates concerning its efficiency, appropriate use of pubic money as well as ethical dilemmas about commodification of science that calls for shedding some lights on the innovation policy from the sociological point of view.

The research starts from the presumption that project leaders within TEST programme, being the first in Croatia who applied for technology-oriented projects, are the agents of socio-cultural and institutional change that consists of the shift from the prevailing elite-type of science towards more productive use of the science. That can be identified with the shift from the standard science policy towards innovation policy. The investigation of their social characteristics (e.g. age, gender, institutional affiliation, area of research), attitudes towards commercialisation of science and entrepreneurial university and dimensions of social capital such as trust in institutions and value orientation provides a valuable picture of the group that responded to calls for collaboration with industry. It also gives an indication of the wider socio-cultural

environment that shapes innovation policy implementation. The main hypothesis of the research is that motivation for application to TEST programme, as well as realisation of the project and satisfaction with achieved results is conditioned by: 1) set of variables of individual and scientific characteristics of the participants, 2) social capital defined as system of values and attitudes which regulate individual behaviour, attitudes toward commercialisation of knowledge, general value orientations and trust in the institutions. The four hypotheses were tested within this framework. The first hypothesis on dominantly scientific motivation for applying to TEST is confirmed. Second hypothesis that realisation of TEST projects has accomplished primarily scientific results also is confirmed while the third hypothesis that participants who have accomplished commercial results are more satisfied with the achieved results has not confirmed.

Finally, the fourth hypothesis that performance of innovation policy is related to the deficit of social capital was confirmed due to findings on value structures of participants.

The paper concludes that high presence of traditional values along with the attitudes toward commercialisation of science illustrates the low capability of the Croatian society for institutional change and confirms the crucial role of social capital for successful implementation of innovation policy.

1. Introduction

In recent years there are growing tendencies to connect the concept of the national innovation system (NIS) with the concept of social capital as an invisible social "glue" which helps economic behaviour and economic growth (cf. Nielsen, 2003; Lundvall, 2007). The tendencies are driven by the increasing need to explain the differences in efficiency of the national innovation systems and related innovation policy as the intentional instruments of governments for managing science, technology and innovation for transition to knowledge economy. 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 embedded in socio-cultural and political processes and therefore both are contextual, path dependent and locationally specific (Mytelka and Smith, 2002; Furman at al, 2002). The fruitful ground for such a standpoint is provided by the original concept of NIS brought by Freeman, Lundvall and Nelson[1]. They basically understand NIS as a process of interaction among different institutions and actors that accelerate producing, using and dissemination of innovations. The tendencies are additionally strongly supported by the emerging of the "new innovation paradigm" (Lundvall and Borras, 1997; Mytelka and Smith, 2002) that has widened and shifted the notion of innovation from its original technical and technological nature towards a complex social phenomenon (OECD, 1992).

The reasons to analyse socio-cultural and political aspects of the Croatian NIS stem from the two intriguing observation. First, Croatian economy, although leading in the region, suffers slow growth and weak competiveness while technological capabilities are falling back

[1] The authors defined the NIS in the following ways:

" ... the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge ... and are either located within or rooted inside the borders of a nation state." (Lundvall, 1992):

"... a set of institutions whose interactions determine the innovative performance ... of national firms." (Nelson, 1993);

"...the network of institutions in the public and private sectors whose activities and interactions initiate, import,

rather than catching up with the EU countries. The lack of structural changes in economy towards new innovation-based companies or knowledge based sectors combined with the low innovation index (Pro-Inno Europe, 2007),) provide a platform for a thesis that Croatia failed to capitalise inherited[2] scientific potentials in order to accelerate transition to knowledge economy. Although, there are standard tendencies to assign economic difficulties to the war damages that were definitely huge with a devastated impact on economy, the level of national innovation capacities and supporting factors like administrative burdens, violation of the rule of the law, etc. cannot be ascribed to the war damages alone. Rather, they are caused by some more subtle socio-cultural and political factors that slow down reforming processes of institution which, although not strictly economic, determine the pace of economic progress. Such institutions belong to different sectors of justice, law, public administration, privatisation, competition policy, etc., that suffer from the slow reforming process. Possibly, the best illustration of their sluggish institutional change is slow adaptation to the standards of "*acquis*" within the integration processes of Croatia with EU which already received critics from EC (European Commission, 2007).

Second intriguing reason stems from the fact that Croatian government invests significant efforts, especially since 2001, to develop Croatian innovation system and innovation policy. Besides, Croatia is also a leading country in the region in research intensity since its investments in RandD and research workforce surpasses not only Western Balkan Countries (WBC)[3] where Croatia is located from the geo-political point of view, but also many new EU member states and the states on South-East of Europe. The recent policy documents[4] illustrate strong dedication of the line Ministry of Science, Education and Sports (MSES) to achieve Lisbon and Barcelona goals in order to transform Croatia into a country of knowledge. After all, Croatian NIS can be described as a relatively complex system of various institutions and supporting programmes while innovation policy has a track record of at least 10 years and should enter a mature phase.

However, the influence of NIS and innovation policy programmes on structural changes in economy in a broad sense and, more importantly, on science system in a narrow sense is rather modest or even non-existing. For example, public RandD sector strongly dominates over technologically weak business sector, despite declarative commitment of government to transform Croatia into a knowledge based economy. State is a prime financier and performer of RandD activities with almost 80% or researchers affiliated to public institutes and universities. There are a general lack researchers, PhD students, mentors (Lučin, 2007) as well as closely related qualified workforce in the private business sector leading to the weak absorptive capabilities of companies for innovation and lack of interest for research. Marginalised position of science and innovation in economic development provides a ground for certain critics towards NIS and innovation policy and calls for identification of the reasons behind. In the context of social and institutional embedding of innovation and national innovation capacities the "reasons behind "are recognised in the "hidden" socio-cultural

[2] Croatia used to be, together with Slovenia, the most advanced republic of ex-Yugoslavia from the economic and technological point of view.

[3] WBC consists of Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Montenegro and Serbia

[4] Science and technology policy of the Republic of Croatia 2006-2010, adopted by MSES in June 2006 and

factors that are often summed-up in the notion of social capital[5]. Therefore, the starting point of the research is that social capital has decisive, although not a straightforward influence on the low efficiency of the Croatian innovation system and policy. In terms of institutional and evolutionary economics that original frames the concept of NIS these social factors regards the quality of formal and informal institutions and their interplay in the process of constitution of NIS (Lundvall, 2007).

The relationships between innovation policy as a "formal rules of the game" imposed by the state and informal institutions (socio-cultural factors, social capital) that shape behaviour of the main stakeholders of NIS (scientists, entrepreneurs, policy makers) we have explored through a wider research on social evaluation of the Croatian NIS within a scientific project financed by Croatian Ministry of Science, Education and Sports entitled "Social Evaluation of Croatian Innovation System in the Function of Knowledge Society" (2007-09). The research presented in this paper is part of this wider research and concerns one selected innovation policy programme, Technology-Related Research and Development Projects (TEST programme) launched by the Croatian government in 2001. The conclusions about the social shaping of TEST programme and its role in the wider institutional and socio-cultural context are drown from the attitudes and standpoints of a fraction of scientists who have taken a part into TEST programme. The value orientation and trust in institutions have been analysed with the aim to connect the elements of social capital to the role of the selected innovation policy programme and innovation policy in general.

The paper is structured in the four main parts that follow the introduction. The second part is devoted to the explanation of the theoretical background of research regarding the concept of NIS and innovation policy, after which a basic relationship between innovation policy, social capital and institutions are presented. In the third part are presented research aims, design and methodology. The fourth part discusses the main results of research in the following five sub-sections: socio-demographic characteristics of respondents, motivation for participation in the TEST programme, realisation of TEST, benefits of TEST, satisfaction with the results and social capital related to the TEST programme. The latter sub-section considers respondents' value orientations, attitudes towards research commercialisation, science-industry cooperation, traditional and entrepreneurial university and trust in institutions. The final section summarises the main findings and offers some concluding remarks.

2. Theoretical Context of Research: National Innovation System and Innovation Policy

Innovation policy is usually defined as an "amalgam of science and technology and industrial policy" (OECD-EUROSAT, 1997). This definition reflects, in essence, the nature

[5] Some scholars tend to ascribe the difficulties of the overall post-socialist transformation primarily to insufficient or negative social capital thereby promoting the idea of a social capital with three pillars – trust, civic norms and cooperation – is central to the economic development and modernisation of the previous communistic countries. For example, the falling apart of the ex Yugoslavia is ascribed to the lack of bridging (inclusive) and surplus of bonding (exclusive) forms of social capital (Nielsen, 2003,p. 45.) while others (Knack and Keefer, 1997, p. 1267) ascribed it to the instability of trust and civic norms. For an annotated bibliography on social

of innovation as a phenomenon that integrates scientific knowledge, its technological application and commercial exploiting. The final task of innovation policy is to foster innovation by capitalisation of science through productive use of national scientific and technological potentials. In the simplest way, it consists of public policy programmes that foster commercial application of science and assist technology transfer through science-industry links. The best impression of the scope and variety of the innovation supporting programmes is provided within the INNO-Policy Trend Chart that offers a database of innovation policy measures across 33 European countries (European Commission, 2004)[6].

The most appealing feature of NIS's analytical approach 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 strategic policy visions, management skills and governance competences. For small and developing countries like Croatia, NIS brought rather encouraging implication by pointing that competitiveness of a nation does not depend on the scale of RandD but rather "(...) upon the way in which the available resources are managed and organised, both at the enterprise and at the national level" (OECD, 1992:80). 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 concept of NIS has an astonishing take-up and has been rapidly adopted by the 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; Mytelka and Smith, 2002; Lundvall, 2007). In times it emerged, in the mid 1980ties, NIS brought forward science and technology as main competitive factors in the globalised economy, contrary to the dominant neoclassical perspective which based competitiveness on standard methods of cutting down production costs and prices (Lundvall, 2007). Framed by the evolutionary economic perspectives (Nelson and Winter, 1982), NIS presents a radically different approach form the *laissez faire* option of the neo-classical economy. It emphasises the endogenous character of business development arguing that pace of technological and economic progress is decisively determined by managing and organisational abilities of socio-economic actors to create innovation-conductive intuitional environment. Contrary to the conventional wisdom that basic prerequisite for healthy economy is the retreatment of the state from economic processes the proponents of the NIS suggests the crucial role of pro-active innovation policy of national government in fostering innovation. The deliberate policy action and political wisdom of national political elites to establish appropriate institutional set-up – the national innovation system - appeared a critical factor of economic success and social well-being[7].

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[6] Trend Chart is only a segment of the PRO-INNO Europe, a complex project of EU devoted to innovation system and policies (http://www.proinno-europe.eu/index.cfm?fuseaction=page.home

[7] Economic sociology and political economy views markets and states as strongly related, emphasizing the role of states in structuring markets and creating. Largely, these studies are inspired by Karl Polanyi's analysis of the social construction of a market society in the 19th century and his message that self-regulating markets do not emerge ex nihilo, but there is a crucial role of the state in their creation. As Polanyi (1944: 139) writes, "there was nothing natural about laissez-faire; free markets could never have come into being merely by allowing

Obviously, institutions are increasingly being recognized as the central for explanation of differing growth performances (Freeman, 1995). According to Lundvall (1992) a distinction can be made between a narrow and a broad definition of the intuitional set up of an innovation system. As Freeman stresses (Freeman, 2002) the narrow approach concentrates on those institutions which directly and deliberately promote the acquisition and dissemination of knowledge such as RandD departments, technological institutes and universities. The "broad" approach recognises that these "narrow" institutions are embedded in a much wider socio-economic systems in which political and cultural influences as well as economic policies help to determine the scale, direction and relative success of all innovative activities.

2.1. Explaining the Linkages between Innovation Policy, Social Capital and Institutions

The ambitions to understand the performance of national innovation system and implications of innovation policy as rooted in the nation specific organisational and political competences bring the topic of social capital and the topic of innovation system together. It is rather plausible to claim that social capital is essential for efficient NIS since positive social capital by definition facilitate useful interactions and connections among people: it helps to overcome differences in norms and values to undertake collective actions, etc. Shortly saying, without sharing common trust, norm and networks, the essential categories of social capital, both the NIS as a system of institutional interaction and innovation policy as a deliberate collective action in fostering innovation are hardly possible. However, to explain how social capital influences innovation policy and institutional change is not a simple and straightforward task. The reasons behind them stem from still "elastic" and broad approaches to the concepts of both the social capital and institutions. Their influence on the national innovation capabilities and governments' capacities to manage innovation processes are yet under exploration faced with the problem how these social and institutional influences can be determined and measured.

The idea that productive resources could reside not only in physical capital and human labour but also in social relations among people i.e social capital is pioneered by James Coleman (1988) and Robert Putnam (1993). Coleman was primarily responsible for introducing the concept of social capital to educational research (OECD, 2001, p. 23) while Putnam found trust and civil engagement could be positively correlated with economic growth. Putnam compared the North and Southern Italy and founded evidence that stronger social capital expressed in social trust, norms and networks enabled North to achieve significantly better levels of governance, institutional performance, and economic development than South (OECD, 2001). However, the social capital in Putnam' sense collapses numerous aspects of socio-cultural and political factors of economic behaviour and growth to only three categories: trust, norms and network (Nielsen, 2004). It certainly enables measuring of social capital but in a rather broad sense and on the aggregate levels of households, states and regions. Typical research of this kind correlates social values to social

development such as World values studies, European values surveys[8], World Bank studies on poverty and social exclusion, act.

The Putnam's and Coleman's research gives rise to the growing body of literature[9] on social capital. It is a research topic of many scientific disciplines, primarily of anthropology, sociology, economy and political sciences, which significantly differs in definition, scope and methods of analysing social capital (OECD, 2001, p 40). For example, from the economic point of view the contribution of social capital to innovation is achieved by reduction of the transition costs between firms and between firms and other actors such as research institution (cf. Akcomak, and Ter Weel, 2006, p.7). By contrast, political scientists emphasis the role of informal institutions in shaping innovation like personal networks, clientelism, corruption, traditional culture and a variety of legislative, judicial, and bureaucratic norms (Helmke and Levitsky, 2004). Some scholars correlate and measure the impact of social capital and economic growth (Knack and Kefer, 1997; Zak and Knack,2001; Akcomak and Ter Weel, 2006; Parts, 2004) government performance (Ritzen et al., 2000, Tavits, 2006; Knack 2002), innovation (Landry at al. 2000, Fountain, 1998), etc.

However, in order to analyse the impact of social capital on the efficiency of NIS and innovation policy, the most useful theoretical framework is provided by those conceptual approaches that channel the influence of social capital on innovation through institutional environment and the quality of governance. Institutions are the critical factors by which countries' innovation systems differ since the quality of institutions, the pace of their improvements and dynamic of change determine the national innovation capabilities and related economic growth. On the other hand, the abilities of state administration to create and coordinate the appropriate institutional frameworks by different policy actions and public programmes are central to determine the successfulness of NIS.

The institutional quality and quality of governance are often closely related partly because they are strongly correlated and partly because they are overlapping. For example, successful capitalisation of science through university spin-off companies assisted by technology transfer centres or science parks is a combination of appropriate institutions and policy measures which can be hardly delineated. Therefore, successful NIS like one in Finland is always an amalgam of policy actions and institutional factors and their synergic interplay (Schienstock, 2007).

The most promising theoretical framework for connecting social capital, governance and NIS is provided by Mosses Abramovitz's concept of "social capability" for institutional change. As Freeman stresses (Freeman, 2002) Abramovitz (1986) coined the expression of "social capability" to describe the capacity of a society „ ...for institutional change, and especially for those types of institutions which facilitate and stimulate a high rate of technical change, e.g. innovation system". Therefore, social capability for institutional change turned out to be a decisive factor for establishment of efficient NIS as an instrument of policy making for economic growth in globalised knowledge based economy. For example, a lack of social capability to create institutions like functional market, rule of law, property rights, secularism, productive exploitation of science, civilian egalitarianism etc. will greatly hinder economic progress and overall well being. However, social capability is a diffuse concept, not

[8] The comparative study on social values in Croatia and EU is provide in Rimac and Štulhofer (2004).

[9] See, for example, the Social Capital Gateway availiable at the: http://www.socialcapitalgateway.org/NV-eng-measurement.htm

easy to capture and measure. It encapsulates dispersed social dimensions of interaction and relationship between formal and informal institutions which compose NIS.

In search for theoretical concepts that would explain institutional differences of NIS, as a social category, economists often bring into play social theories such as theory of social capital, theory of social networks[10] and social interactivity or simply look for socio-cultural factors of shaping innovations.

A solid ground for social studies involvement in innovation system analyses is provided by the established interpretation of a NIS as a set of formal and informal institutions, with the latter being socially rooted (Lundvall, 2007). The formal institutions are tangible institutions (organisations) that constitute the technological infrastructure such as universities, science parks, business clusters, etc. while informal institutions are intangible and can be understood, as Lundvall stressed (Lundvall 2007, p. 14) in a "broad sociological sense as informal and formal norms and rules which regulates how people interact". To understand how these informal institutions (norms and values) shape the way formal institutions and organisations function and how they interact with other parts of the innovation system is certainly most relevant for the understanding of the system as a whole and for understanding the differences among the systems.

Within the institutional context innovation policy can be defined as a set of formal institutions or "rules of the game" devised by the government in order to change informal "societal" and cultural institutions or rules of behaviour of the main actors of NIS. Changes in informal institutions should influence changes in tangible organisations as an institutional set-up of NIS. For example, government programme for fostering innovation in Croatia like the HITRA-TEST programme (a target of our research) is a set of government devised formal rules with the aim to make changes in behaviour of the main stakeholders of the Croatian NIS – scientists, mangers and policy makers. Changes in stakeholders' behaviour should result in changes of the institutional (organisational) landscape of the Croatian NIS and their efficiency.

3. Research Aims and Design

Basic starting point of our research on social evaluation of the Croatian innovation policy is the thesis that deficiency of social capital is one of main obstacles for innovation policy to fulfil its mission. Since trust in institutions, values and norms are standard measures of social capital we have measured in our research these dimensions of social capital in relation to (dis)function and to the efficiency of innovation policy in Croatia.

The research of social dimensions of IP is performed through the analysis of the one selected innovation policy programme entitled Technology-Related Research and Development Projects (TEST programme) as an example of innovation policy practice in Croatia. TEST programme were launched by the Croatian government in 2001 as an essential part of the first innovation policy programme entitled "Croatian Program for Innovative Technological Development" - HITRA. HITRA was developed after a period of policy learning on innovation policy trends and rationalities strongly influenced by knowledge transfer from the neighbouring counters (Italy and Germany), OECD literature and European

policy on innovation (Švarc, 2004). It was designed rather ambitiously adopting the task to mobilise the scientific research potentials for structural adjustment to knowledge economy by accomplishing the three main goals fostering science-industry cooperation, reviving industrial RandD and encouraging commercialization of the research results. However, in practice, HITRA was soon transformed into two interactive-type of programmes (TEST and RAZUM[11]) rather narrow in scope, tailored to provide a framework for direct cooperation between entrepreneurs and researchers and commercial application of research results. In addition to TEST and RAZUM, HITRA provides support for technological infrastructure technology transfer centres as a wider institutional set up of NIS. Since 2003 HITRA was extend by the new sub-programmes "Jezgre" aimed at supporting scientific services and STIRP aimed at complex technological projects in cooperation of at least three partners form science and industry.

Although HITRA has been largely extended and reformed over time towards more comprehensive innovation system, the TEST programme has been running since its beginnings till nowadays in almost unchanged manner. The procedures of application, evaluation and monitoring of technology projects as well as raison d'être of the whole programme remains the same as in the initial stages which provides a useful ground for evaluation of the programme and different kinds of empirical research.

By definition, TEST programme (MSES, 2002) is focused at development of new technologies (products, processes, services) prior to their commercial use up to the stage of original solutions (prototype/pilot stage). It is especially designed to encourage commercial application of research results and science-industry cooperation. Therefore it and provides a framework for direct cooperation between entrepreneurs/industry and public research institutions. Both individuals and legal entities, researchers and enterprises, are eligible for the Program TEST but research should be carried out at registered scientific research institutions since they have adequate resources (staff and equipment) and is coordinated by principal investigator who must have a scientific rank (qualification).

TEST/ HITRA have introduced a range of completely new instruments and organizational and institutional novelties to science policy like the Technology Council, the regulations on intellectual property rights (IPR), the new methods of evaluating and monitoring of projects, etc. In spite of these novelties, there is a common attitude that HITRA and TEST have not changed much science policy and do not have influence innovation and technological development. Moreover, by time, the disputes of the role, efficiency and functionality of the programme and technological infrastructure have risen. The fruitful ground for the critics is provided by the lack of the standard performance evaluation of the TEST programme. It was expected that TEST would generate collaboration between companies and public research organisations since companies would take advance of the programme by financing their RandD needs through research organisations. It is expected also, that programme would produce results, such as: commercialisation or research results via interested companies, new patents/licences, new products/processes/services eligible for commercialisation, new contract research between research organisation and industry,

[10] For more information about social innovation network see Taatila at al. (2006)

[11] RAZUM programme is a sub-programme of the HITRA programme aimed at supporting university spin-offs and knowledge based companies It assumes commercial application of the results of the TEST programme

additional investment of companies in the follow up phase of the project, new projects initiated by companies (industry), start-up companies within RAZUM programme.

However, the performing-based evaluation of the programme has not been made in spite TEST comprises almost 300 granted projects and covers almost 7-years span (Table 1).

Table 1. Overview of the number of the TEST projects

	2001	2002	2003	2004	2005	2006	2007	Total
Submitted projects	184	105	61	62	72	121		605
Accepted projects	95	54	35	28	25	37	24	298
Percentage of acceptance	51,7	51,4	57,3	45,1	34,7	30,5		49,2

Source: Risović, 2008.

The evaluation deficit of TEST is not driven so much with the potential lack of the results[12] but mainly by the lack of evaluation competences of the public administration which runs the programme. Evaluation incompetence complemented by the lack of awareness of the importance and role of evaluation produced a negative feedback on the programme itself and innovation policy in a whole. It gives a rise to the disputes about the transparency of the programme, its efficiency, effectiveness, granting policy, and corruption of both the administration and researchers. These disputes were strongly supported by ethical dilemmas on commodification of science and its orientation to business that threats scientific excellence and autonomy[13]. Innovation policy as a mechanism by which science could be translated into technological and economic progress has been faced with the strong opposition which argue separation of science and innovation, research form commercialisation, university from industry. The clash between mode 1 and mod 2 of knowledge production (Gibbons at al, 1994) and antagonism towards the "Triple helix model" (Etzkowitz, 2003) has been and still is strongly present.

Finally, it should be stressed that research of social aspects of innovation policy implementation and success, so called social-evaluation studies are regularly substituted by the performing studies based on quantitative indictors that remain easy to identify and measure. Evaluation studies of NIS and innovation policies usually employ performing indictor on research/innovation inputs (investments in research, research personnel, training) or outputs (number of patents, science-industry contract research agreements, university spin-offs companies, number of business centres, etc.). The outcomes or the influence of the policy measures on the wider policy context, and the feedback effects, with a view of producing strategic changes in NIS or innovation policy is rarely a scope of policy analyses[14]. Therefore, this research is a pioneering attempt to connect social capital with government policy and its influence on intuitional change within the innovation system in Croatia.

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[12] A range of commercially visible results coming from the TEST projects ready for commercialisation or already commercialised were presented in t the presentation of the President of the technological council, a MSES body responsible for assessment and monitoring (Risović, 2008)

[13] Majority of discussions are available at the Connect portal, an Internet forum of the Croatian scientists (http://portal.connect.zrinanost.org/)

[14] For more details about the strategic role of evaluation studies of innovation policy and interplay between

3.1. Defining the Main Hypotheses

Here is presented part of the research from our project that tried to correlate performance of innovation policy as instrument of government policy with social capital. Our research starts from the main hypothesis that motivation for application, as well as realisation of the project, and satisfaction with achieved results of the TEST project is conditioned by: 1) set of variables of individual and scientific characteristics of the participants, 2) social capital defined as system of values and attitudes which regulate individual behaviour, attitudes toward commercialisation of knowledge, general value orientations and trust in the institutions.

Hypothesis 1 (H1): Application for TEST programme was lead by scientific motivation of the participants because they are primarily scientists and performing scientific research is their main professional activity;

Hypothesis 2 (H2): Realization of TEST projects has accomplished primarily scientific results and not commercial results. Therefore, partial success of TEST programme can be observed as the change of scientific community's perception of the role of the science and commercialisation;

Hypothesis 3 (H3): Participants who have accomplished commercial results within their projects are more satisfied with TEST programme.

Hypothesis 4 (H4) – The measured dimension of social capital (trust in institutions, value orientations, attitudes towards science and commercialisation) influence low performance of the TEST programme.

This hypothesis has faced us with the dilemma about the performance of the TEST programme which was a pioneering action of both, the government and scientists, to connect science and technology in Croatia. Could we interpret the results of the TEST programme as a failure or success? Since the standard performing evaluation is missing, the thesis about the low performance is based primarily on data about the results of the project and their use collected by our questionnaire. These results (number of publications, patents, use of the results for commercial purposes) suggested that outcomes of TEST are primarily used for scientific research. In spite of the fact that performance of the TEST should be a matter of further discussion, we concluded that TEST has relatively low performance. Besides, the more general outcome of TEST in terms of its impact on more intensified science-industry cooperation (number of contract research, university-spin offs, innovative companies, etc.) is not present or at least was not analysed and elaborated in Croatia.

The following socio-cultural characteristics of the researchers are analysed as independent variables:

- social characteristics (e.g. age, gender, institutional affiliation, area of research, publishing record);
- value orientations (e.g. traditionalism, anti globalism, statism);
- trust in institutions (e.g. science, education, polices, army, government, parties);
- attitudes towards commercial application of science and science-industry cooperation
- attitudes towards traditional and entrepreneurial university.

Dependent variables are:

- motivation for participation in TEST;
- benefits from participation in TEST;
- realisation of the project:
  - results of the project
  - use of the results
- benefits of participation in the TEST for personal career, scientific research and cooperation within industry.

3.2. Methodology and Sample

The analysis is based on the questionnaire-based survey conducted in 2007 that targeted the project leaders who have taken part in TEST programme. The information about the project and project leaders have been identified from the web-based Inventory of the TEST projects provided by MSES[15]. Only project leaders of the completed projects have been included in the questionnaire. Data were collected by self-administrated questionnaire sent by mail and with return control.

Sample Structure

The research starts from the presumption that project leaders within TEST programme, being the first in Croatia who applied for technology-oriented projects, are the agents of socio-cultural and institutional change. The change consists of the shift from the prevailing elite-type of science (mode 1 of knowledge production) towards more productive use of the science which is characteristic for the mode 2 of knowledge production. This shift can be also identified with the shift from the standard science policy towards innovation policy.

They represent the most educated part of the Croatian labour force which has demonstrated the openness toward the new ideas and toward new models of collaboration among scientific organizations. They also see the need for technological development. As such, they are carriers of certain socio-cultural values and attitudes towards commercialisation of science and science–industry cooperation that are country specific. The investigation of their social characteristics, dimensions of social capital and attitudes towards commercialisation of science and entrepreneurial university provides a valuable picture of the group that responded to calls for collaboration with industry but it also gives an indication of the wider socio-cultural environment that shapes innovation policy implementation and functioning. However, it should be bear in mind that they present a sort of self-selected group of respondents who posses intrinsic motivation to answer the questionnaire. The motivations are probably stemming from their satisfaction with the programme as such as well as their own results. On the other side, this self-selectiveness underlay their main feature as the carriers of new ideas and institutional changes. Unfortunately we had no access to heads of failed or uncompleted projects which would give us valuable insight in many important aspects related to project failures and different barriers in realisation. In the interpretation we

took into account the fact that our sample is not representative for all applicants to TEST and that collected data have limited reliability. In this light we have expected to get the opinions which are more positive to the whole HITRA – TEST project.

In the period 2001-2007 there were 605 applied projects, out of which 298 were accepted for financing (Table 1). Our sample included heads of the 212 technological projects which were completed till year 2005.

120 researchers have responded to the questionnaire, making a response rate of almost 57%. 65% of respondents are male and 35% are female researches. The sample presents a self selected purposive sample of successful applicants to TEST projects.

4. Discussing the Results

4.1. Socio-Demographic Characteristics of Respondents

Majority of respondents in our sample are coming from university departments (76%), while only 17% are coming from public institutes (Figure 1). This proportion reflects the dominant position of universities in the Croatian research system since, in terms of total researches in Croatia, about 60% are employed at universities, 25% at institutes and 15% in private industrial sector (Švarc and Račić, 2007).

The involved scientists form public institutes are mainly coming from the Institute "Ruđer Bošković", the largest and world-known institute in Croatia in natural sciences. 7% of researchers are coming from other institutions like hospitals, computing centres, or they are in retirement.

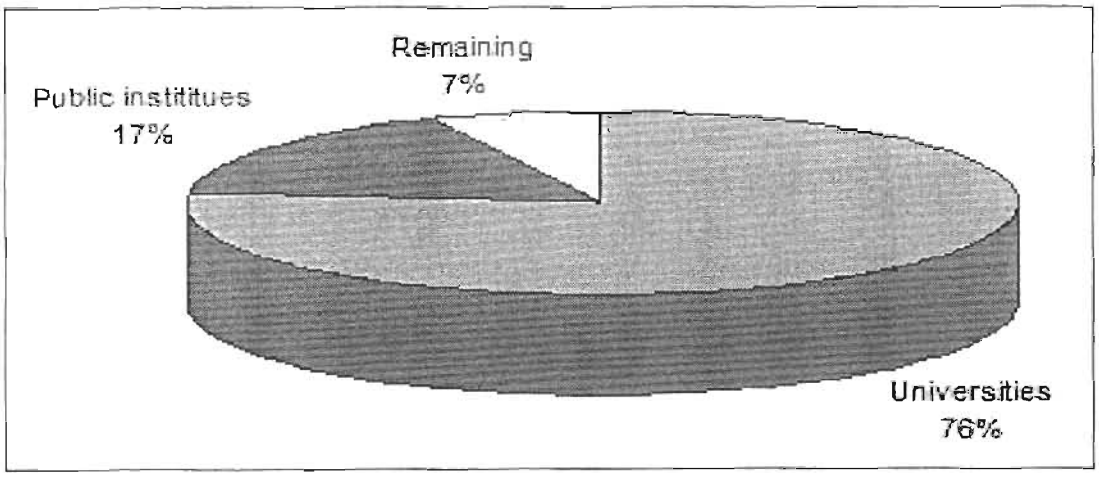


Figure 1. Respondents by employment.

Some of the respondents (7.5%) posses their own company while some of them (9.2%) are working parallel in another firm or institution (Figure 2). It illustrates that some Croatian researchers are quite familiar with entrepreneurship.

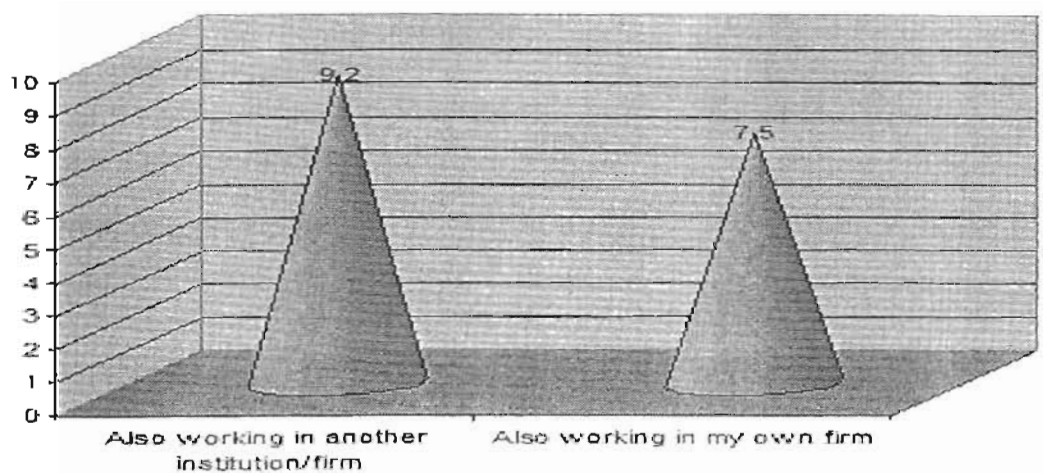


Figure 2. Additional (part time) jobs of respondents.

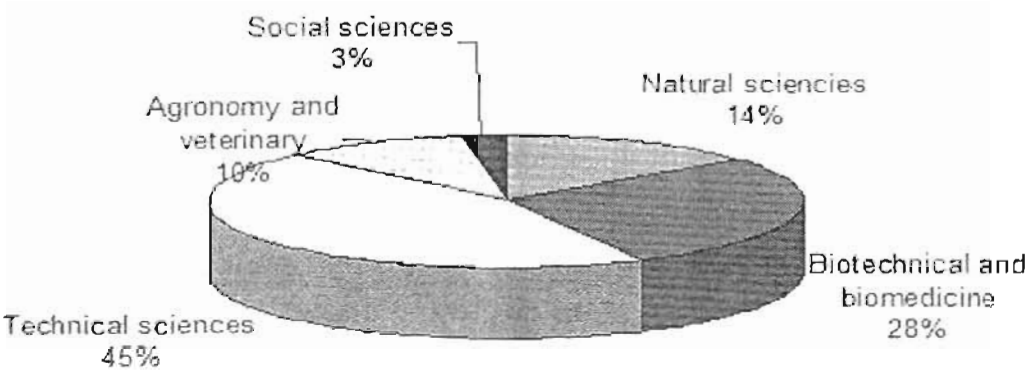
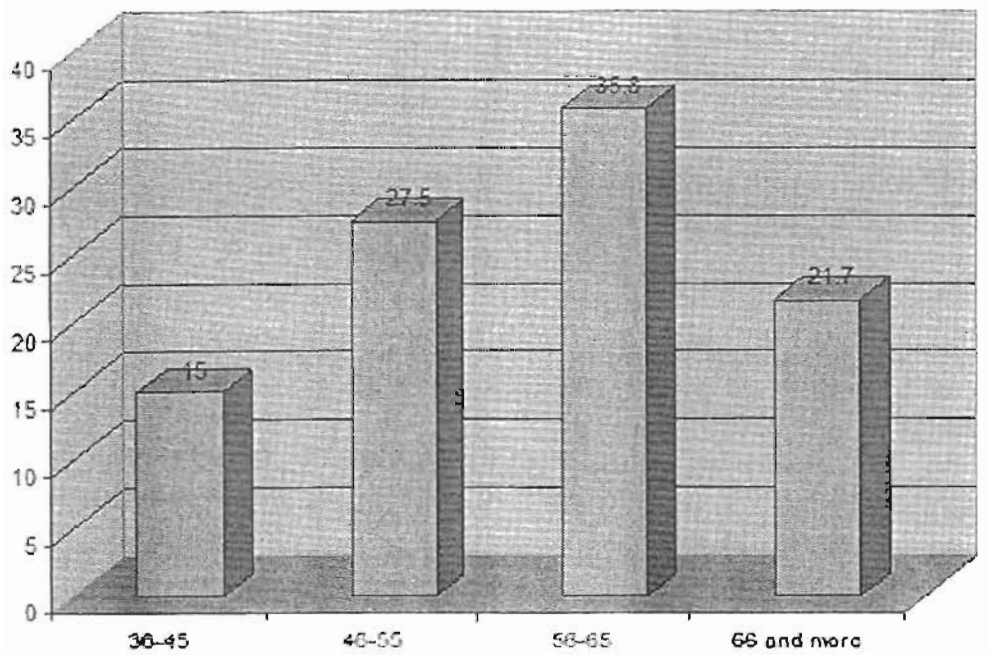


Figure 3. Respondents by area of research.



Majority of researchers are in technical sciences (45%), then in biotechnical sciences and biomedicine (28%) while 14% of respondents are affiliated to natural science and 10% to agronomy and veterinary. A small proportion of 4% of respondents are coming for social sciences, primarily economy and psychology (Figure 6). Majority of respondents belong to rather mature group of scientist since 57.5% is over 56 year old and 21.7 % of them is over 66 (Figure 4). However this is not unexpected since Croatian scientific community is rather old in general and, on the other side, older scientists have some advantages in comparison to younger researchers when technological activities are concerned.

First of all, due to their long working experience they have had more opportunities to establish contacts and cooperation with industry (some are dating from socialism) or generate some "tangible" research results which applicability they wish to "test" under the TEST programme. Further on, they usually have established their personal network of researchers - research teams- capable of carrying on complex projects like technological ones. Finally, they have more "spare" time that could be invested in activities additional to core activities (teaching and scientific research). Researches in the most productive period of life, ages from 36 to 55, are more engaged with standard research and teaching activates and their involvement in TEST programme is probably more depending on their perception of personal benefits from TEST. As analysis revealed the contribution of TEST to their personal carrier is not very high. In situation when the greatest benefit form EST is additional material resources and equipment for scientific research (which should be provided anyhow), a rather high level of enthusiasm is needed to add time and energy consuming TEST project to the standard engagements of "science" and "teaching".

The scientific production of respondents consists, apart from studies and analysis, primarily of scientific papers in international journal, as well of papers in the Croatian journals and books (Figure 5).

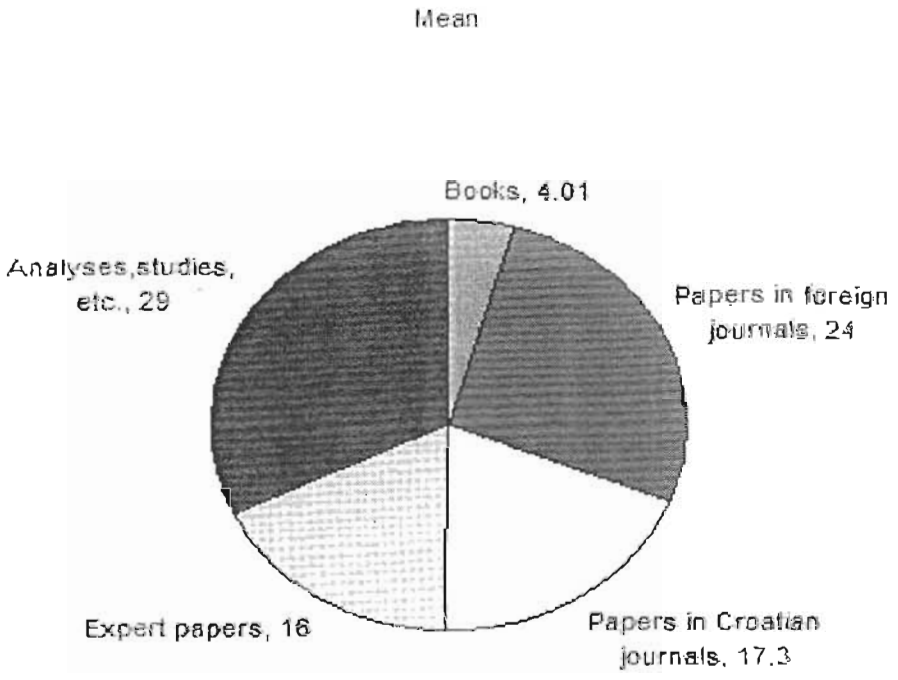


Figure 5. Type of publications (mean).

Technological outputs like patents are not an important activity of respondents since 83% of respondents have not declared any registered patent. The remaining 17% of respondents declared altogether 44 patents. However, the distribution of patent production per researchers is very uneven; for example, eight respondents (approx.7%) declared one patent each, while one respondent (approx. 1%) declared 8patents alone (Figure 6).

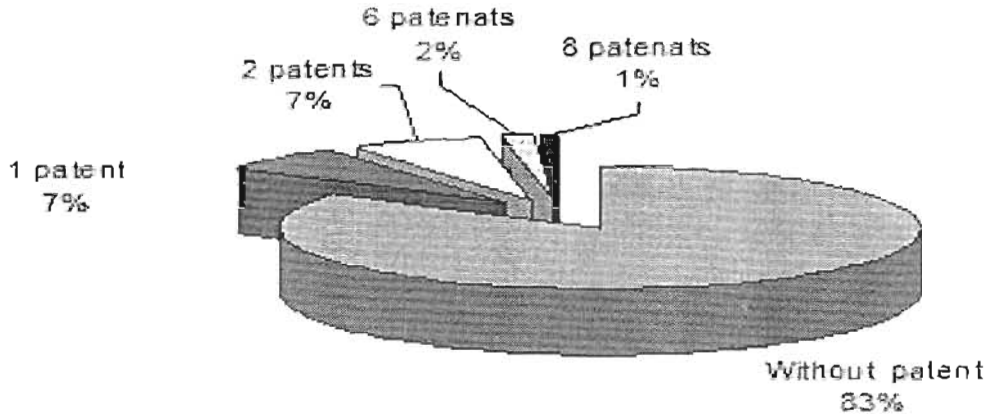


Figure 6. Absolute number of registered patents by respondents prior to TEST projects (in %).

4.2. Motivation to Apply for TEST Projects

The principle motives for applying to TEST programme are defined by the MSES, within the goals of the TEST programme announced in the Public call for project submission. They consist in developing new technologies (products/processes/services) feasible for commercialisation. Both, the research institutions and business companies or individual innovators are invited to apply for project financing. The latter should apply via research institutions.

The analysis reveals that all the projects were proposed by researchers while participation of entrepreneurs were only indirect as the providers of initial project ideas Such projects which which were initiated by the ideas coming from industry/companies are 16% while remaining were inspired by the ideas of researchers themselves. It illustrates that programme, although intended for both, innovators from business and researchers sphere, was largely dominated by scientists and serves their purposes. Therefore, the intention of this research was to go beyond the "officially" defined motives and to find out the hidden interests of researchers which made them to apply to TEST programme. These motives are not necessarily connected with presumed technological outputs and their commercial exploitation.

Indicator for hidden motivation to apply to TEST programme was the question: "Apart from developing new technology what was your additional motives to apply for TEST project?" Since the multiple choices in answering were allowed, we were able to identify the three main types of motivations, as follows:

1) *science*-driven motivation that consists of intention of researchers to buy new research equipment and to get additional financial resources for their research work;

2) *industry cooperation* driven motivation that consists of wish of researchers to develop their capabilities for cooperation with industry and to acquire new funds for research with industry
3) *profit-driven* motivations that consists of the intention to gain initial capital for start-up firm and the intention to sell patent/license
4) *mixed motivation* that consist of both the elements of the science-driven and industry-cooperation driven motivation.

Most of the participants, almost 60% of applicants to TEST were guided by "mixed" motivation while 20% stated that their main motives for participation was "scientific" since they wanted to buy new research equipment and gain additional financial resources for the scientific research. Only 12,3 % were motivated by cooperation with industry while 4,4 % were "profit" oriented and try to get initial capital for start-up firm and for selling patent/license. The frequencies indicating the hidden intentions for applying to TEST are given in Table 2.

Domination of "mixed" motivation indicates the ambiguous way researchers understand possibilities of research commercialisation. They prefer to combine their scientific research with possible industrial application and commercial exploitation. Their prime interest is, in essence, to secure additional funding and equipment for their scientific research while cooperation with industry and "money making" is a welcome ingredient but rarely their prime motive. Since funding of the science projects in Croatia is rather modest and insufficient for more ambitious research undertakings, the TEST programme was recognised by research community as a channel for additional financial inflow for scientific research provided by the government.

Table 2. Motives for applying to TEST programme

	N	%	Cumulative %
Science-driven	24	21,1	21,1
Industry cooperation-driven	14	12,3	33,3
Profit-driven	5	4,4	37,7
Mixed motivation	71	62,3	100,0
Total	114	100,0	

Table 3. Importance of commercialisation of project results when applying to TEST

	N	%	Cumulative %
I was thinking about commercialisation but it was not in the first plan	56	46,7	48,3
I have indented to commercialise but without concrete plan	42	35,0	83,3
I had detailed plan of commercialisation	20	16,7	100,0
Total	120	100,0	

Such a conclusion is confirmed by their answers related to the importance of commercialisation (Table 3) and commercialisation plans (Table 4) for submitting project proposal. The possibility of commercial exploitation of research for submitting project proposal was important only to a minority of respondents, to about 17 % of respondents who have developed concrete plan of commercialisation prior to project submission. The remaining 83 % had a vague ideas of commercialisation, out of which 35 % was just "thinking about commercialisation" while another 45% expressed intentions to commercialise research results but conceiving no concrete plans.

Majority of those who has developed some kind of commercialisation strategy based their commercialisation plans on the enlarging the contract research with industry (21%) and developing business services like testing or quality control (16,7%) (Table 4).

Table 4. Commercialisation plans

		N	%	Cumulative %
Valid	0	49	40,8	40,8
	Enlarging contract research with business	26	21,7	62,5
	Developing business services (testing, quality control, etc.)	20	16,7	79,2
	Lunching production within a firm I am working for	6	5,0	84,2
	Launching production in strategic partnership	14	11,7	95,8
	Selling patent/license	2	1,7	97,5
	Launching my own company	1	,8	98,3
	Something else	2	1,7	100,0
	Total	120	100,0	

The next preferable commercialisation plan consists in launching production either with strategic partner (11.7%) or within companies researchers are working partially (5%). A few respondents wanted to sell a patent/license and launch their own company. However, almost a half of respondents (49%) have not responded to this question at all stressing, thus, that commercialisation was not really a priority for majority of respondents.

In the analysis of the results of TEST program and their use we were interested in how really important was commercialisation of the results. We supposed that motivation was different among participants in the programme depending on significance to commercialize and on existence or non existence of commercial strategy developed by participants prior to project submission. Considering the share of actually commercialised results from TEST we have also tried to find out are there any differences in the motivation depending on age, gender, level of education, professional position and type of the institution.

After a regression analysis for motivation to apply to TEST as a dependent variable significant explanatory factor was only the level of education (higher the level of education – higher the motivation), while professional position, involvement in other projects, number of publications, previous engagement in different projects, and importance of commercialisation

The analysis of motivation and the role of commercialisation for project submission confirm the first hypothesis (H1) that participation in the TEST programme was driven primarily by scientific interests. Participants in TEST are scientists whose main interest is performing scientific research since it determine their carrier and professional status. The ambiguous "mixed" motivation of the majority of respondents illustrates that researches wanted to combine their scientific work and possible technological application, that was quite natural from their perspective. The "hidden" motives are, from the scientists point of view highly justified since their intentions were focused on strengthening scientific activities.

4.3. Realisation of TEST Program

Following the structure of the "Final report for TEST projects" determined by the MSES, the results of the TEST projects are classified in the three main groups as given in the Table 5. The research results of the nine projects (7.5 %) serve for submission of project proposal to the RAZUM programme, a follow-up phase of the TEST programme aimed at establishing a start-up company (university spin-off). 19.2 % of projects produced the feasibility studies while majority of TEST projects (72,5%) ended up with the project Final report.

Final report contains description of research results or technologies developed within a project, e.g. prototypes, production processes, software, working or measuring procedures, new services, etc.

However, it does not indicate either the commercial "maturity "of the research results or the stage of their commercialisation (e.g. industrial application, market exploitations, etc.) Therefore, a question about the use of the research results after project completion was asked[16]. Since the multiple choices were allowed, we summed up the use of the results into the three groups: scientific, commercial and "another project use" (Table 6). Majority of respondents (67%) used the results for the scientific purposes, i.e. for the continuation of their scientific projects or for participation in international projects, 39% use the results for commercial purposes and 4% use the results for new projects within HITRA programmes – Jezgra and STIRP.

Table 5. Results of the TEST projects by the main three groups

		N	%	Cumulative %
Valid	0	1	,8	,8
	Submission of the project to the RAZUM programme	9	7,5	8,3
	Feasibility study	23	19,2	27,5
	Final report on new technologies 1	87	72,5	100,0
	Total	120	100,0	

Commercial use of the results includes researchers' attempts to establish start –up company by submission of project proposal to HITRA-RAZUM programme,

commercialisation through different existing companies (e.g. Tena, CROSCO, Dukat, Hedna, Lik-Kem, TLM) or commercialisation in another way (e. g on-line education, selling the patent, etc.).

Table 6. Use of project results within TEST programme

Use of the research results	All respondents N	Percentage of Total =120
Scientific use	80	67 %
Commercial use	47	39 %
Another project use	5	4 %

When respondents compare achieved results with the results they expected to obtain prior to project submission, almost 70% of them are very satisfied or satisfied with the obtained results (Table 7). There is no significant difference in satisfaction with the results between the groups of respondents who have and who have not commercialised their research results.

Table 7. Satisfaction with realised results considering planed results

	N	%
Not satisfied at all	2	1,7%
Not satisfied	4	3,3%
Partly satisfied	30	25,0%
Satisfied	49	40,8%
Very satisfied	35	29,2%

This outcome disapproves our Hypothesis 3 that participants who have accomplished commercial results are more satisfied with the achieved results. However, it is in compliance with the Hypothesis 1 that participation in the TEST programme was led primarily by scientific motives. Participants in the programme are scientists by vocation and achieving the results which contribute to their "core business" - scientific work - make them rather contented. Potential commercial application which was requested by the TEST programme is inherent, to a certain degree, to the all obtained results. We can suppose that this possible applicability was sufficient to justify each researcher's participation in the programme even if the results were more scientific than technological.

As analysis revealed, satisfaction with realised results is not significantly correlated with none of the independent variables such as age of respondents, number of publications or patents, type of institutions, etc.

The analysis of published results generated within TEST projects shows that scientific outputs largely overwhelmed technological outputs like patents. Eleven respondents protected their research results by patents and produced altogether 21 registered patents on analysed projects (Figure 7).

For comparison, scientific outputs includes 417 published works, primarily scientific papers (66%) published in foreign (48%) and Croatian journals (18%). Professional papers contribute with 28% and books with 6% to total scientific publishing (Table 8).

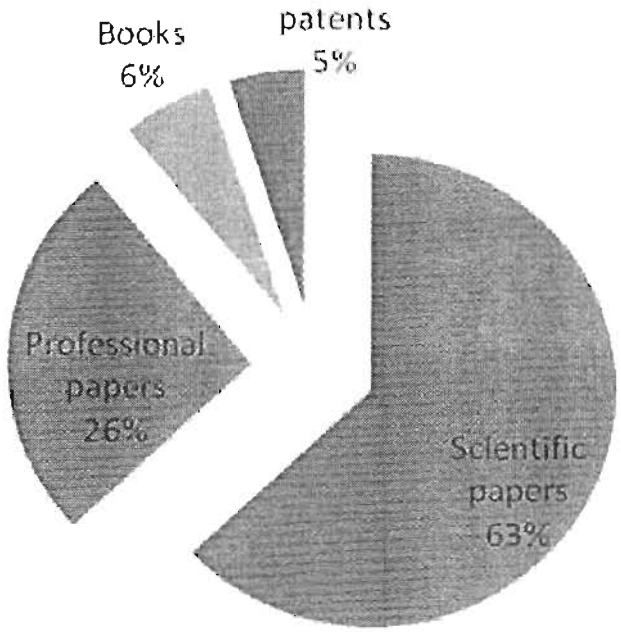


Figure 7. The structure of published outputs and patents from projects.

Table 8. Scientific publications coming from the projects

Scientific publishing results	Publications	Publications (in %)
Total scientific papers	278	66 %
1.1. in foreign journals	203	48 %
1.2 in Croatian journals	75	18 %
Total professional papers	112	28
2.1 in foreign publications	42	10
2.2. in Croatian publications	70	18%
Books	27	6%

Published outputs of TEST programme reflects, in essence, the general ratio between scientific and technological publishing in Croatia since Croatian scientists publish about 100 papers per one registered patent (MSES , 2006).

4.4. Benefit from Participation in TEST Programme and Satisfaction with the Results

The benefit from participation in TEST program was measured by scale of 13 statements.

After performing of factor analysis three main dimensions of benefits were identified (Table 10):

1. Benefits for scientific research;
2. Benefits for cooperation with industry
3. Benefits for the personal carrier.

The analysis revealed (Table 9) that researchers estimate that their main advantage of participation in the TEST programme is related to their cooperation with industry. Participation in TEST enables researchers to establish new contacts with final users/entrepreneurs and to gain additional experience in cooperation with industry. Testing of new ideas, a variable offered in the questionnaire, has not appeared as significant in scale construction but is perceived by researchers as the most significant among all the offered alternatives of benefits (mean 4.0).

Table 9. Researchers' benefits from participation on the TEST programme

	N	Minimum	Maximum	Mean	Std. Deviation
Benefits for scientific research	116	1,00	5,00	3,1608	,83956
Benefits for cooperation with industry	108	1,00	5,00	3,7176	,91044
Benefits for the personal carrier	102	1,00	5,00	3,0147	1,18459
Valid N (listwise)	98				

The benefit for scientific work was a second most important benefit for researchers since TEST programme provided them with: (a) additional financial resources for scientific research, (b), new research collaborators, (c) new scientific equipment, (d), enabled them to attend scientific conferences and (e), serves a source for publishing new scientific papers.

TEST programme was the least important for development of personal carrier since the participation in the TEST programme has a rather modest impact on researchers' expert image and scientific promotion.

Table 10. Scale of the benefits from projects

Scale: Benefits	Cronbach's Alpha
Benefits for scientific research Additional financial resources for scientific research Procurement of the scientific equipment Gaining additional research collaborators Attending international conferences Publishing new scientific papers Attending conferences in Croatia	.687
Benefits for cooperation with industry Making new contacts with final users/entrepreneurs Gaining additional experience in cooperation with industry	.768
Benefits for the personal carrier Contribution to my expert image Contribution to my scientific promotion	.604

There are no significant differences in benefit from TEST concerning gender, age,

there is weak positive correlation (Pearson Correlation .273, Sig. (2-tailed .003) between scale of "benefit for scientific research" and satisfaction with achieved results (Table 7). The participants who benefitted in scientific research were slightly more satisfied with results. Once again we might interpret this result as the indicator of the hidden motivation in extra funding for scientific research. Other interpretation might indicate that there are shortcomings in TEST programme which didn't facilitate full commercialisation as expected.

4.5. Social Capital and TEST

The central hypotheses that we have tested in our research concerns the influence of social capital on the performance of TEST programme as a certain instrument of innovation policy in Croatia (H4). As we have stated before the role of institutions (formal and informal) was recognised as a crucial factor for explanation differences in economic growth rate and entering knowledge based economy/ society in general. Implementation and success of innovation policy as an instrument of public policy depends on government actions, i.e. formal and informal norms and rules of the government programmes as well as on socio-cultural factors which shape, as Lundvall (Lundvall, 2007) stressed, how people interact and the how the institution of NIS function. The important aspect of socio-cultural factors are values, norms and trust that commonly form standard indicators of social capital in sociology.

It is well known that Croatia, as all transition countries, suffers from deficit of social capital (Rimac and Štulhofer, 2004) as a lack of cooperation and networking, on the one side, and the domination of the traditional values (statism, traditionalism, anti-globalism) on the other side. In our research of social aspects of TEST as an instrument of innovation policy, we tried to identify the general value orientation and trust in institutions of the Croatian research community as well as their attitudes towards commercialisation of science.

Since our sample is self selected group of scientist who successfully applied and completed technological projects (explicitly designed for commercialisation) we might expect to find in this population higher presence of values and attitudes that are more inclined to commercialisation of knowledge, entrepreneurial university and more intensive cooperation between science and industry. Also inclusion in such governmental programmes as TEST which serves as the incentive for entrepreneurship could indicate certain higher trust in institutions. Our hypothesis 4 is that the measured dimensions of social capital influence the low performance of TEST programme. The dimensions of social capital we have operationalized as:

- attitudes toward commercialisation of science;
- attitudes toward traditional and entrepreneurial university;
- general value orientations;
- trust in institutions in Croatia.

4.5.1. Attitudes toward Science, University, Commercialisation and Value Orientations

One of the hypothesis in the project considers values as a part of socio-cultural heritage of socialism as important factor that produce a long-term impact on behaviour of actors in the system, thus, it determines the social capabilities for knowledge capitalisation and transition

to knowledge society in the long run. The dimensions from socio demographic profile such as gender, position in organisation, type of professional career, area of research were correlated with different types of values like egalitarianism, traditionalism, statism, openness and international integration, and market orientation. Two separate scales of attitudes towards the role of science and university regarding commercialisation, science–industry cooperation and academic entrepreneurship were constructed. The first scale "Attitudes toward commercialization of science" (Scale 1) was intended to measure differences in attitudes toward commercialisation of research and science-industry cooperation while the second scale "Traditional and entrepreneurial university"(Scale 2) consider the role of university with the stress on the new type of entrepreneurial university which assumes new relationship between universities, industry and government (Triple helix paradigm).

The scales of attitudes toward commercialisation of science and toward traditional and entrepreneurial university were constructed after factor analysis for each of the scales (Principal component and Varimax rotation) suggested factor solutions. Reliability of scales (Cronbach's Alpha) is shown along each scale (Scale 1 and Scale 2).

Scale 1. Attitudes toward Commercialisation

Factor analysis of 13 components resulted in 5 factors solution. Since the last factor is saturated only with one component we have added this component to third factor because it concerns the quality of science. Finally, the first scale consists of four dimensions toward science commercialisation and science-industry cooperation, as follows:

1. Industry not interested in cooperation with science
2. Elite science
3. Inert and low quality science
4. Deficit in technology transfer (infrastructure)

Scale 1. Attitudes toward commercialisation of science

Scale: Attitudes toward commercialization of science	
1. Industry not interested in cooperation with science	Cronbach's Alpha
Big business doesn't recognize use of our research The number of entrepreneurs – enterprises which are interested in cooperation with scientific institutions is too small Foreign business owners are not interested in to use Croatian science and research and development keep in their countries	.724
2. Elite science	
Scientists and university professors don't want commercialize scientific results and cooperate with business because the results doesn't matter in scientific career advancement. In Croatian academia dominates the culture of elite science, «Current contents» and «Wos» Government haven't started big development programs which would include business –science cooperation (technological platforms, research consortiums).	.544
3. Inert and low quality science	
Scientists and university professors are often inert and don't have enough incentives for commercial projects and business cooperation	.584

Business is not satisfied with the performance of Croatian research institutes and universities In Croatia there is no mobility of researches between science and business sector which doesn't enable flow of knowledge In our scientific community prevails the attitude that it is not ethical to sell scientific results and making business from science as public activity	
4. Technology transfer deficit (infrastructure)	
There is lack of agencies – offices by research institutes and universities which would actively support commercial use of research (patenting, finding partners) Existing technology infrastructure in Croatia (technology centres, business innovation centres) is not functional	,625

Participants mostly agree with attitudes about the deficit of technology transfer infrastructure (Table 11). Lack of infrastructure that should help commercialization is followed by inert industry that does not initiate the cooperation with science. Coming from academia the scientists seems to think that the least problem of commercialization is in the low quality of science.

Table 11. Attitudes toward commercialization of science by statistical means

Attitudes toward commercialization of science	Mean
Industry not interested in cooperation with science	3.8739
Elite science	3.7871
Inert and low quality science	3,4804
Deficit technology transfer (infrastructure)	4.1134

Scale 2. Attitudes toward Traditional and Entrepreneurial University

Factor analysis of 20 components suggested 2 factors solution. The first factor we named traditional university because this factor is highly sutured with attitudes stressing inappropriateness of university-industry cooperation and academic entrepreneurship. Second factor is satured with the attitudes in favour of entrepreneurial university and university - industry cooperation as a source of new ideas and financial means.

Scale 2. Attitudes toward traditional and entrepreneurial university

Traditional university:	Cronbach's Alpha
The main task of universities and pubic institutes is to conduct basic research in order to enlarge the national knowledge stock Public institutes and universities should be financed exclusively from public resources Financing of public institutes and universities by business companies is harmful since it undermines scientific autonomy ("tuning" of research results) Business should not finance scientific research at public institutes and universities since it restricts scientific freedom and objectivity Commercialisation of research is not a regular activity of public institutes and universities Scientist can be a businessman only exceptionally	,721

Scale 2. (Continued)

Academic entrepreneurship is not a good idea since one is allowed to establish a company and make profit by using public resources Scientific and academic institutions do not need to deal with business since another institutions should take care of it (e.g. technology transfer centres, etc.). The whole idea about science commercialisation is essentially wrong since science is not an entrepreneurial activity The idea about protection of intellectual property over research results is wrong since it prevents free knowledge flow	
Entrepreneurial university	
The main task of universities and pubic institutes is to conduct not only basic research but also applied research and development The main task of universities and pubic institutes is to conduct research with the direct practical application Public institutes and universities should be financed partly from business companies The idea of Lisbon agenda that 2/3 of investment for science should be provide by business is a good and it should be implemented in Croatia The idea of Lisbon agenda that 2/3 of investment for science should be providing by business is a good but its implementation in Croatia is not realistic All the public institutes and universities should take care about commercialisation of research results (e.g. patents and licenses). Academic entrepreneurship is useful since it enables scientist to become an entrepreneur and make of profit from his/her research Cooperation between scientific institutions/universities and business is welcome as a source of new ideas and knowledge Cooperation between scientific institutions/universities and business is welcome as a source of additional financial resources The idea about protection of intellectual property over research results is good since it enables scientists to make profit from their research	,595

Table 12. Traditional and entrepreneurial university scale by statistical means

	Mean
Traditional university	2.5766
Entrepreneurial university	3. 8623

In the attitudes toward university – industry cooperation participants in TEST program are as expected much more in favour of entrepreneurial university (Table 12).

ANOVA (analysis of variance) of differences among groups and value orientations showed that our sample represents a relatively homogenous population that shares common values and norms. All our respondents are generally in favour of commercialisation of science, the result we have expected having in mind our sample of self selected researchers who applied for "commercial" technological projects. Nevertheless, since our analysis of motivation to apply for TEST program tried to "uncover" other motivation beneath declarative "commercial orientation" we looked for other factors that might be related to value systems characteristic for scientists.

There were no significant differences regarding the type of institutions where participants

of commercialisation and cooperation with business than scientists from the universities. Also satisfaction with results of TEST programme was not significant variable.

Some differences that were significant are backing up previous results. Researchers in the area of engineering and biotechnology agree more with the deficit of technology transfer infrastructure. Since in this area of research commercialization is more developed than in others it is expected result. The group with detailed plan of commercialisation is more in favour of entrepreneurial university and more critical toward traditional university. We have also found in the same scale (traditional and entrepreneurial university) statistically significant difference between group who commercialize the results of their projects within TEST programs and group who used results for scientific use (further scientific projects). "Pro commercial" group is more in favour of entrepreneurial university and more critical toward traditional one and vice versa.

Scale 3. General value orientations

Scale of the general value systems was constructed after value analysis ran on 37 components suggested four factor solutions. We have merged first and the fourth component in the first scale – traditionalism and globalism. Second scale is commercialisation of knowledge ad third one is statism.

Scale 3. General value orientations

Scale: Value orientation	Cronbach's Alpha
Scale: traditionalism and anti globalism Peasant is the most reliable support of our nation Worker is the carrier of our economic development Croatia should restrict import products to protect domestic market Foreigners should not be allowed to buy real-estate in Croatia Big international companies do more and more harm to local Croatian companies International organizations take to much authority from Croatian government Growing exposure to foreign films and music is harmful for national culture	.812
Scale: commercialization of knowledge Knowledge should be commercialized- to free human creative potentials Knowledge should be commercialized- to accelerate Croatian development Knowledge should be commercialized- to enable competitiveness of Croatian economy	.887
Scale: statism State should have a leading role in overall financing science and research State should have a leading role in fostering entrepreneurship Government should stimulate a partnership between research and industry Government should define the role of science in industrial and social development Government should solve problems in management and organization of science	.632

All respondents have relatively high score on orientations of traditionalism and antiglobalism but also they are highly in favour of statism in their value orientation which means that they still think that government needs to regulate everything (Table 13).

Table 13. Value orientations by statistical means

Value orientations	Mean	N
Traditionalism and anti globalism	3,0666	116
Commercialization of knowledge	3,9479	118
Statism	4,3103	116

High positive score on orientation toward commercialisation seem to be contradictive to that. There are to possible interpretation of this contradiction. Respondents don't see the connections between globalization (opening of market) and more opportunity to commercialize knowledge. In fact they are looking for protection for themselves by advocating closed market. They are more inclined toward protectionist role of government that would protect them since the market in that sense has never developed .The positive attitudes toward strong role of the state in their value systems are the consequence of domination of statism in socialism which protected them from market competition. Government in previous regime "protected" scientists by giving certain privileged status to science but also kept them in isolation from market mechanisms and influence of industry. Here we must mention that in former socialistic self management system (which was rather specific for ex-Yugoslavia) a specific science - industry cooperation existed but regulated and controlled by the government. Therefore, it is not commercialisation of knowledge in contemporary terms. Regardless the principles of cooperation, existing science-industry links and networks still relies on the old alliances that were established in former regime.

Since today there is no market for their research and from industry destroyed by privatization there is no cooperation, the only way to keep science alive is by protective role of the state and by restrictions – closed market.

Other explanation is not contradiction but supplement to the first. The fact is that there are no structural improvements in changes and adaptation of old institutions toward new institutional structures in society in general and in science system particular. For example, there is lack of legal instruments and agencies to protect innovations in science which would strongly support market philosophy in science. Instead of innovative culture which dominates in knowledge society for our scientific research the dominant culture remains the "survival culture" where protectionist role of government is critical (there is no trust in legal system or market).

This interpretation supports our hypothesis of important relationship between deficit of social capital and low commercialisation rate in science.

4.5.2. Trust in institutions

Trust in formal institutions is an important indicator of social capital. It indicates the satisfaction of individuals with the socio-political institutions in an a given society which is closely related to the readiness of individuals to use the institutions for meeting their needs. Otherwise, they will try to avoid the institutions and "rules of the game" implicit to the given socio-political institutions and try to satisfy their needs in another, very probably, in a much more informal way. Low trust in institution should be an important indicator to the government that something is "rotten" in the system and should be changed.

The analysis reveals, quite expectedly, that scientist have the greatest trust in science and education systems while the least trust is in judiciary system and political parties (Table 14).

Table 14. Trust in institutions

	Not at all	Not very much	Medium	Quite a lot	A great deal	Mean	Stand. Dev.
Science		6	25,6	50,4	17,9	3,8	0,801
Education	0,8	7,6	39,8	42,4	9,3	3,52	0,803
Army	6	11,2	50	25,9	6,9	3,16	0,932
Health system	2,6	18,8	42,7	33,3	2,6	3,15	0,843
Police	4,3	25,9	47,4	19	3,4	2,91	0,87
Government	6,9	26,7	44	19	3,4	2,85	0,926
Public administration	16,4	42,2	35,3	4,3	1,7	2,33	0,863
Judiciary system	35,9	39,3	21,4	1,7	1,7	1,94	0,893
Political parties	36,8	42,7	18,8	0,9	0,9	1,86	0,808

Political parties are a phenomenon for themselves since almost 80% of respondents do not have trust at all or not very much. Trust in army, health system, police and government is about "medium". If we take that higher trusts is determined by 50% of respondents belonging to the categories "quite a lot" and "a great deal" than only science and education system are worth of trust while all others are not. As previous research revealed, a similar low trust in institution is a characteristic for the majority of citizens in Croatia. The earlier investigation of social capital in Croatia (Sekulić and Šporer, 2006) showed that Croatian citizens shares the same level of trust as our respondent in judiciary system (mean 2,19:1,94), government (mean 2.16:2,85), police (mean 2,5:2,91) and political parties (mean 1,85:1.86) However, differently from scientists, the citizens of Croatia have the highest trust in army and police as well as in church (trust in church was not measured in this research).

Conclusions

Research presented in this paper is as a part of wider project on social evaluation of innovation policy, where we tried to explore how certain dimensions of social capital are correlated with the implementation of TEST programme as an instrument of innovation policy.

TEST program as part of the first innovation policy in Croatia have raised growing debate about its role and challenges despite lacking standard performing evaluation of the programme that could justify its usefulness and efficacy. Driven by such lack of standard evaluation a social evaluation of the TEST programme has been undertaken within a separate scientific project. It should have explored how some aspects of informal institutions, understood in a broad sense of socio-cultural factors including social capital, influence implementation of TEST as an example of the "formal" innovation policy measure.

Dimensions of social capital like values and anitudes were not a subject of standard evaluations of innovation policies despite the growing recognition of socio-cultural embeddedness of national innovation capacities and innovation systems (Lundvall, 2007; Furman at al. 2002; Freeman, 2002). Besides, it should have a strong learning and strategic – orientated function since it help to identify the bottlenecks, institutional or social obstacles to successful implication of the innovation policy and provides the direction for its improvements.

We started with main hypothesis that motivation for submission project proposal, realisation of the project, and satisfaction with the achieved results within the TEST projects are related to, apart from set of variables of individual and scientific characteristics of the participants, also to social capital. Social capital was defined as system of values and attitudes which regulate individual behaviour toward TEST programme. Social capital was operationalized thorough the respondents' general value orientations, trust in institutions, as well as through their attitudes toward commercialisation of science and traditional/entrepreneurial university.

Hypothesis 1 (H1): Application for TEST programme was lead by scientific motivation of the participants because they are primarily scientists and performing scientific research is their main professional activity.

The analysis of motivation to apply to TEST project has confirmed our first hypothesis. Analysis of "additional motivation" of respondents who applied for TEST programme having commercialization plans and who highly ranked the importance of commercialization indicates that participants in the programme preferred combination of scientific research with its possible commercialization. TEST programme, due to its similarity in application procedure with scientific projects typical for science system and eligibility only for applicants affiliated with research institutions, seemed to be recognized mainly by scientists as a right opportunity to provide additional funding and equipment which is regularly insufficient in academia. The involvement of the innovators from the business sphere was performed mainly through the provision of the initial idea of the project. It stresses, therefore, the importance of inter-sectoral networks between scientists and entrepreneurs.

Hypothesis 2 (H2): Realisation of TEST projects has accomplished primarily scientific results and not commercial results. Therefore, partial success of TEST programme can be observed as the change of scientific community's perception of the role of the science and commercialization.

The analysis of the results of projects within TEST programme confirms our second hypothesis. Realisation of the TEST program is one simple and straight forward indicator of the performance of the innovation policy measure and its functionality when implemented in society. All our respondents successfully completed their projects and the outputs have formally satisfied requirements of the programme. Nevertheless, majority of them used the results of project for continuation of scientific research projects (almost 70% of all the respondents). The outputs of projects are mostly publications and only a relatively small number of them are patents (5%). However, it should not be neglected that almost 40% of all the respondents used the results also for commercial purposes which could serve as an argument of relatively good performance of TEST.

Insight in the structure of the values hold by participants in TEST programme might back up second part of the same hypothesis. High scores on attitudes toward commercialization of science and entrepreneurial university proves that at least one part of academia (although not

insignificant part) is aware of the necessity for traditional science to change and turn closer to cooperation with industry in order to survive unavoidable international competition.

Hypothesis 3 (H3): Participants who have accomplished commercial results within their projects are more satisfied with achieved results.

Third hypothesis was not confirmed because there is no significant difference in satisfaction with the results between the groups of respondents who have and who have not used their research results for further commercialisation. Majority of participants are satisfied with the results that were accomplished within project realisation. Taking into account the findings about motivation of the participants, rejection of the third hypothesis seems to logically follow these results. If the motivation to submit "technological project" was not primarily commercially driven, or it was driven by "mixed" motivations (as it was a case for more than 60% of all respondents), the accomplishment of the scientific results has met the expectations of the respondents. As stressed before, all the formal requirements determined by the Call for project proposal were fulfilled contributing to the personal satisfaction of participants.

Hypothesis 4 (H4): The measured dimension of social capital (trust in institutions, value orientations, attitudes towards science and commercialisation) influence low performance of the TEST programme.

Our fourth hypothesis is confirmed due to structure of values that we have found in our sample. Significant presence of traditional value system (statism, antiglobalism and egalitarianism) among academia as well as in the society in general affected the instruments of innovation policy not to realise intended results like cooperation of science and industry and commercialisation of research through new technologies.

However, they also expressed high appreciation for the commercial application of knowledge in order to accelerate Croatian development and competitiveness of the economy. Although their values might look like eclectical mixture of traditionalism looking for protection of the old privileged science and embracing, at the same time, new role of science in building knowledge based society, it clearly points to the social capital as critical variable in implementation of innovation policy.

We can conclude that the full commercialization of projects within TEST programme didn't come through due social capital deficit, lack of social and business cooperation, lack of networking or lack of what in theory of innovation system is called knowledge flow between sectors. In order to really commercialize the innovative ideas government needs, apart from establishing formal institutions (e.g. interface institutions like technology parks), to foster socio-cultural norms and system of values which prefer productive use of science through university-industry links and other forms of research application. The change in value system and behaviour is needed not only in scientific community, but primarily in the business sector that showed warningly lack of interest for cooperation with researchers. To find a strategic partner from business was one the main barriers recognised by scientists for researcher commercialisation. However, higher level of social capital in terms of trust in institutions (e.g. government) and values in favour of individualism, risk taking and entrepreneurship are needed. The petrified system of values which dominates the most educated part of the Croatian society, "the carriers of the new ideas" as we have named them, illustrates that Croatian society suffers from the low social capability for institutional change. Informal social institutions i.e. social capital consisted of norms, values and trust have not changed much since period of socialism. The low social capability for institutional change presents,

therefore, the main obstacle, not only to the better performance of innovation policy but also to faster economy development and social progress in general.

In order to identify the factors that would accelerate social capability for institutional change the further investigation focused on informal institutions such as traditional culture, civil society, personal networks, clientelism, corruption and a wide variety of legislative, judicial, and bureaucratic norms will be needed.

LITERATURE

Abramovitz, M. (1986.). Catching up, forging ahead and falling behind, *Journal of Economic History*, 46, 385-406.

Akcomak, I. S., and Ter Weel, B. (2006), Social capital, innovation and growth: Evidence from Europe, Working paper series #2006-040, UNU-MERIT, Maastricht University.

Albert, M. and Laberge,S. (2007), The Legitimation and Dissemination Processes of the Innovation System Approach: The Case of the Canadian and Québec Science and Technology Policy, Science, Technology and Human Values, 32; 221-249 (available on line: http://sth.sagepub.com/cgi/content/abstract/32/2/221).

Coleman, J.S. (1988), Social Capital in the Creation of Human Capital. American Journal of Sociology Supplement 94 (1988): S95-S120.

Etzkowitz, H. (2003), Learning from transition: The Triple Helix as an innovation system, in: Švarc, J., Lažnjak, J., Šporer, Ž., Polšek, D. (eds.), *Transition Countries in the Knowledge Society: Socioeconomic Analysis*. Institute of Social Sciences, "Ivo Pilar", Zagreb. str.39-61.

European commison (2004), *TrendChart - Innovation Policy in Europe*. EC, DG-Entreprise and Industry, Brussels

European commission (2007), *Croatia 2007 - Progress Report*, Commission Staff Working Document, SEC (2007) 1431, Brussels.

Fountain, J.E. (1998), Social capital: its relationship to innovation in science and technology, *Science and public Policy*, No. 2. April 1998. pp. 103-115.

Freeman, C. (1987) Technology, policy and economic performance: Lessons from Japan. Pinter Publishers, London.

Freeman, C. (1995). The "National System of Innovation" in historical perspective, *Cambridge Journal of Economics*, 19, 5-24.

Freeman, C. (2002.). Continental, national and sub-national innovation systems - Complementary and economic growth, *Research Policy* 32, 191-211.

Furman, J.L., Porter, M.E., Stern S.. (2002.). The determinants of national innovative capacity, *Research Policy* 31, 899-933.

Gibbons, M. at al (ed.), (1994), *New Production of knowledge: Dynamics of Science and Research in Contemporary Societies*, SAGE Publications Ltd. pp. 171.

Helmke, G., Levitsky, S.(2004), Informal Institutions and Comparative Politics: A Research Agenda, *Perspectives on Politics*, December 2004, Vol. 2/No.4, 725-740.

Knack, S. (2002) 'Social Capital and the Quality of Government: Evidence from the States', *American Journal of Political Science* 46 (4): 772–785.

Knack, S., Keefer, P. (1997), Does social capital have an economic payoff? A cross-country investigation, *The Quaterly jouranal of eceonomci*, 112 (4), November, 1997, 1251 – 1288

Kuhlmann, S. (2003), Evaluation as a source of „strategic intelligence", in: Shapira, P. and Kuhlmann, S. (eds.), *Learning from science and technology policy evaluation*, Edward Elgar Publishing Limited, UK i USA, str. 352-381.

Landry, R., Amara, N., Lamari, M. (2000), Does social capital determine innovation? To what extent?, *Paper prepared for the 4th international conference on technology policy and innovation*, Curitiba, Brasil, August 28-31, 2000.

Lučin, P. (2007) *Strategic framework for science development*, The Second Congress of Croatian Scientists from the Homeland and Abroad. Split. 7 -10 May 2007 (in Croatian).

Lundvall, B.A. (1992), National system of innovations, towards theory of innovation and interactive learning". Pinter Publishers, London.

Lundvall, B.A. (2007), National Innovation System: Analytical Focusing Device and Policy Learning Tool, Working paper. R2007-004, Swedish Institute for Growth Policy Studies, Östersund, Sweden.

Lundvall, B.A, Borras, S., (1997). The globalizing learning economy: Implications for innovation policy. *Report based on contributions from seven projects under TSER Program*. DG XII, Commission of the European Union.

MSES (2002), Croatian Program for Innovative Technological Development (HITRA): Collected Programmatic Papers, Ministry of Science, and Technology of the Republic of Croatia (MSES), Zagreb

MSES (2006), Science and technology policy of the Republic of Croatia 2006-2010, Ministry of Science, and Technology of the Republic of Croatia (MSES), Zagreb.

Mihaylova, D. (2004.), Social capital research in Central and Eastern Europe and the Former Soviet Union: An annotated bibliography, Centre for Policy Studies, Budapest, Hungary.

Mytelka, L.K., Smith, K. (2002), Policy Learning and Innovation Theory: An Interactive and Co-evolving Process. *Research Policy* 31, 1567-1479.

Nelson, R. (ed.) (1993), National Innovation Systems. A Comparative Analysis. Oxford University Press, New York/Oxford.

Nelson, R.R. and Winter S.G. (1982), An evolutionary theory of economic change, The Belknap Press of Harvard University Press, str. 437.

Nielsen, K .(2003), Social capital and systemic competitiveness, in: Dolfsma, W. and Dannreuther, C. (eds), Globalisation, Social Capital, and Inequality: Contested Concepts, Contested Experiences, Northampton, Mass.: Edward Elgar. 2003, p. 33 – 52.

OECD (1992), Technology and economy. The key relationships, (TEP Report) OECD, Paris.

OECD-EUROSTAT, 1997. Oslo Manual. Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, 2nd ed. OECD, Paris.

OECD,(2001), *The Well-being of Nations: The role of human and social capital*, OECD , Paris.

Polanyi, K. (1944), *The Great Transformation: The Economic and Social Origins of Our Time*. Boston: Beacon Press.

Pro-Inno-Europe (2007), *European Innovation Scoreboard 2007*, Comparative analysis of innovation performance, EC, Brussels.

Parts, E. (2004), The role of social capital in economic development of transition countries, *Ekonomika* 68, 1-14

Putnam, R. (1993) *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton: Princeton University Press.

Rimac, I., Štulhofer, A. (2004). Socio-cultural values, economic development and political stability as correlates of trust in the European Union, In: Ott, K. (ed.), *Croatian accession to the European Union, Institutional challenges, Institute of Public Finance*, Zagreb, 301-327.

Risović, S. (2008), Application of the TEST programme in business, paper presented at the conference: Innovation society and technological development, CROSS and the Croatian chamber of commerce, Zagreb April 24, 2008 (in Croatian).

Ritzen, J., Easterly, W., Woolcock, M. (2000), On "Good" Politicians and "Bad" Policies: Social Cohesion, Institutions and Growth, Working Paper. No. 2435. The World Bank Development Research Group.

Schienstock, G. (2007), From path dependency to path creation; Finland on its way to the knowledge based economy, *Current Sociology*, Vol. 55 819, 92-109.

Smits, R., Kuhlmann, S. (2004.), The rise of systemic instruments in innovation policy, *Int. J. Foresight and Innovation Policy*. Vo.1. Nos. 172, pp. 4-32.

Sekulić, D., Šporer, Z. (2006) Trust in institutions of the citizens of Croatia, in the book: (ed. Horvat V.) *Which EU do we want? In search for the reasons of democratic deficits.* Henrich Boll Stiftung, Zagreb 2006 (in Croatian).

Švarc, J. (2004.), Innovation policy in Croatia: the first 10 years, *Proceedings of the 65th Anniversary Conference of the Institute of Economics,* Institute of Economics, Zagreb. November 18-19, 2004, pp. 379-402.

Švarc, J., Račić, D. (2007.), *The role of tertiary education in research and innovation*, Chapter five, in: Dujić, Ž. i Lučin, P. (ed.), OECD Thematic review of tertiary education: Country background report for Croatia, MZOS, April 2007, p.54-69.

Tavits, M. (2006), Making democracy work more? Exploring the linkage between social capital and government performance, *Political Research Quarterly* 2006; 59; 211-225.

Taatila, V.P., Suomala , J. Siltala, R., Keskinen.S (.2006), Framework to study the social innovation networks. *European Journal of Innovation Management*. Vol. 9 No. 3, pp. 312-326.

Zak, P. J., and S. Knack (2001): "Trust and Growth," *Economic Journal*, 111(470), 295–321.