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## **Institutional context of the innovation based economy**

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**Abstract:**

In recent years, innovations have broadened social scientific research also with the issue of institutional analysis. Another aspect contributing thereto is the extensive growth of indicators and databases, which from an international comparative view characterise not only the scope and the structure of innovation resources and innovation performance, but also the institutional environment affecting innovation activities. The objective of this text is to contribute to the discussion concerning the nature of institutional changes, which accompany the growing influence of innovation performance on current economy and its social environment. The chosen objective responds to a practical problem, which is associated with headlong institutional adaptation of the Czech economy and society to the prevailing framework conditions of the EU and its unexpected consequences. The formulation of the mentioned objective and the issues reflects itself in the structure of the text. The basis hereof is an analysis of the development of economic concepts characterising qualitative changing in the relations between science and technology: i.e. the science push concept, the market pull concept, the concept of the national innovation system and the concept of knowledge-based economy. Their analysis reacts to the debated issues and clarifies that (i) the development of the specified concepts counts less and less with the "ceteris paribus" assumption and permanently reconstructs the conception of "externalities" in such a manner enabling it to include institutional factors into the analysis, furthermore, that (ii) regulatory measures in the area of science, technology and innovation are supported by expertise of social sciences. The following text is oriented to two tracks of discussion and reasoning. The first track is oriented rather to an excursion into the methodological issues of institutional analysis: showing the limits of quantitative indicators and the causal relations in these analyses, concurrently explaining specific cognitive requirements. The second track (including the final chapter) makes use of social science concepts related to the study of institutions and presents an model of institutional framework for innovation development, the cognitive abilities of which are confronted with the findings on the development of innovation resources and performance in the CR.

**Key words:** institution, institutional change, innovation, national innovation system, innovation policy, knowledge-based economy, knowledge, expertise, causality, equivalence

**JEL Classification:** B25, B 41, B 52, D 83, L22, O31, O33, Z13

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## 1. Introduction

The objective of the study is to contribute to the understanding of the situation, circumstances, or the factors affecting the conditions of the performance growth of innovation resources in the CR, as well as encourage a discussion about these research and practical issues. A standpoint has been gradually asserting itself among the social science community and political actors that innovation performance is not only subject to the growth of technical and economic resources, but also to changes of their institutional development and its social environment. At the same time, it is becoming obvious that both factors are interrelated: resource restructuring may not necessarily lead to their more effective performance, if it is not embedded institutionally; an institutional change can be enforced with difficulty, if not supported by growth and resource redistribution. Therefore, what may and must be the nature and the extent of changes in the structure of innovation resources and institutional changes in the area of innovations?

When searching for an answer to the question above, the beneficiary circumstance is that a specialist and practical reflection of the innovation issue has a certain tradition in our country. This corresponds to the long established industrialization trends within the society, which, based on a diffusion of technical and economic institutions, enforced the social influence of their actors and in addition, stabilized the forms of their mutual reflection and interaction. Nonetheless, looking at the current level of specialist and practical knowledge relating to the innovation issue does not imply that traditional familiarity with this topic would facilitate easier understanding of the present nature of innovations. There obviously is a certain discontinuity, or gap to current EU situation, in effect here, two causes of which may be indicated.

The first the considered causes is related to structural and industrial changes in the society and their impact on current economic situation. These changes made headway more markedly in the economically developed and politically open societies from the 1960s. They opened a new technical and social trajectory, concisely designated as post-industrial<sup>1</sup> by D. Bell (1973). The closed political system of the former socialist countries impeded and obstructed the enforcement of these structural changes, even if significant resources were expended on innovation resources (research, education, technical development and modernization investments, including ideological concepts of science as the key production power). Consequently, an orientation stereotype<sup>2</sup> established itself in the practices and ideas of people, which U. Beck (1993) cogently earmarks as an implication of the so-called simple modernization. In brief, an apprehension that all innovation resources are derived from science. Such a concept is beneficial for the status of scientists or for the legitimisation of investments into an area, which does not bring an immediate practical effect. However, it is disfavourable in its social consequences, as it “lightens“ liability (and limits motivation) of both the

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<sup>1</sup> A professional discussion concerning structural changes of the present-day societies has become far more ample; also economic branches are involved in it, e.g. the technical trajectory concept was formed by evolutionary economics (see further discussion), or another fertile area is the comparison of economic systems. I use Bell's term, i.e. post-industrial society, indicatively and also because it is analytically relevant and relatively close to the practical experience of technically oriented actors and environments. These circumstances are analysed in detail in another publication (see Müller, 2002).

<sup>2</sup> The roots of these orientation patterns are deeper and have formed during the process of the successfully running industrialization in the Czech lands (for details see Janko, Těšínská, (ed.), 1999).

political bodies and practically acting people. In the social scientific studies of science and technology, this approach was designated as the “push of science” (i.e. science push approach). This approach has been applied in the developed countries since the early 1960s (in the period, when, according to Bell’s concept, exhaustion of specific type of industrial development began to manifest itself). Nevertheless, in the former socialist countries it became a prevailing framework for justification of current decision-making. The consequences of its persistence may be observed also on the obstacles, which the present-day efforts to enforce innovation policy into practice in the CR are encountering. Thus, the first reason of the above outlined discontinuity, or gap, understanding of the nature of innovations is based on the impact of structural dependencies, which exhibit themselves in both the institutional pattern, legitimation strategies and orientation knowledge.

I see the second reason in the simplified (mechanical) acceptance of regulatory practices from the framework regulatory conditions of the EU. These practices result from gradual learning and qualitative changes, which asserted themselves in institutional setting, as well as in the regulatory regime. Without knowing the way, by which these changes are shaped, it is difficult to comprehend their function and sense. This significantly limits their application in domestic conditions (still affected more by industrial patterns of conduct) and discredits their significance. Moreover, one of the social and cultural consequences of these global changes is accepting greater autonomy, diversity, and creative initiative. According to this perspective, it is not necessary to imitate the framework conditions in a strict sense. It is fully legitimate if they are creatively developed in relation to the potential of conceivable (post-industrial) changes, when they are seeking to find their place within the frame of the given conditions and with the aid of effective productive resources.

In the following text, I would like to focus on the relationship between innovation resources and competitive economic performance. This relationship is intermediated and it represents a challenging research problem, which I would like to address conceptually, especially with view to the above-mentioned insufficient reflection of the term “innovation” in professional literature, as well as in the actions of the practical actors in the key spheres of innovation resources. As far as the professional perspective is concerned, I mainly focus on the economic interpretation of innovations and their overlapping into other social sciences. Identifying such overlaps is more fruitful in a more general conceptual level. Therefore, I have also included the topics of knowledge-based economy (KBE) - as emphasized in the title of this essay - into the analysis. The practical aspects manifest themselves particularly in the second part of the text oriented on a concrete analysis of the institutional aspects of innovation performance. Nonetheless, I do not comprehend the relationship between professional knowledge and practical knowledge traditionally, i.e. as a mere transfer of expertise to practical action, but in an interactive and circular manner, which is currently asserting itself as a prevailing approach in sociology and in social sciences, examining qualitatively based changes in the societies. According to this approach, professional (modern) knowledge is formed in the sphere of scientific disciplines and their communities, as well as in the sphere of the practical actors and their institutions. Its claims to (social) validity are supported not only methodologically, but also by the rate and the nature of knowledge circulation between experts and practical (lay) actors.

The limiting condition of knowledge formation conceived in such a manner is both the segmentation of expert knowledge into various disciplines and the low rate of interdisciplinary and problem-oriented research as well as excessive segmentation of practical conduct into branches, sectors, professions, etc. A distinctive feature of the post-industrial environment is challenging such segmentation and encouraging integrative approaches.

The orientation of the discussion on the topic of institutions and their change anticipates a clear standpoint to methodology issues, namely how to study institutions. Such claim is even more pressing, if institutions are not understood in terms of their material resources only, but also as patterns of conduct, motivations, value orientations. As a rule, this issue is solved by referring to the nature of data (hard and soft data) and to their evaluation by means of generally accepted diagrams: hard data are more accurate and more reliable; while soft data are less accurate and less reliable. This concept corresponds to the prevailing interpretation framework of modern societies, which seeks support in formally based knowledge. Quantification is undoubtedly a very effective form. How could current societies exist if no quantitative form had been created e.g. for exchange of products with various use values, if time had not been conceived in the form of hour time and if locations were not expressed graphically on maps? However, research of the consequences of these quantitative orientations on people's lives, as well as their impact on social cohesion indicates their insufficiency in understanding the nature of institutions. Thus, I would like to dedicate a certain methodological excursion to these issues.

The reason for including the methodological excursion in this text is also the fact that when analysing institutions, the comparative analysis method is applied. A beneficial circumstance for its application are easily accessible databases, which have been generated recently for the purposes of the research of the diverse aspects of KBE. The diversity of the indicators (numerical), which depict the quantitative as well as qualitative aspects of these phenomena and facilitate a significant reduction of the examined phenomena into data and their subsequent handling, represent a major contribution to the analysis of social phenomena connected with the width and the intensity of the resources of current economic growth. Nevertheless, this advantage conceals certain risks. The indicators and their methodologies have been conceived for many decades and are not only the product of statistical skills. They have been formed in the context of the political and public expectations, current regulatory practices, and active participations of social science disciplines, which were involved in their creation and design. Transferring data into the environment without such a hot-bed may hardly serve for the benefit of understanding the subject issue. They may be easily abused for defending various partial interests, without serving as the base for a better understanding the articulated issues.

The above-specified notes indicate the orientation of this discussion. It lays priority emphasis on discourse and theoretical questions. However, it does not seek to explain them methodologically but also with view to their evolution in the specific social environment of modern societies. It will enable us to understand why and under what circumstances various approaches, various theoretical concepts, explaining and delimiting the examined facts, and various indicators alleviating the empirical aspects of research have been reached. Such a view will then enable us to use comparative analysis more reliably in the context of integration processes, to avoid ungrounded comparison

and to implement additional views and findings, if there are significant differences in the nature of the relevant environment.

The text is organized according to the purports and key research issues outlined above. The following chapter clarifies the relevant economic concepts, which characterize qualitative changes in the relations between science and technology in the previous decades: these comprise the science push approach, the concept of the national innovation system and the concept of KBE. I shall also explain, which their topics can be compared in order to improve our understanding relationship between economy and technology and which topics indicate a cognitive discontinuity of both realms and so constraining our knowledge about them. The concept of the institutional framework for innovation development is namely the newly emerging topic, which is the subject of various interpretations. The third chapter resumes with this topic and discusses the institutional issues both in the terms of theoretical approaches and the methodological aspects. It rather presents an excursion into divergent social science branches, with the aid of which it intends to understand a nature of modern knowledge and institutions. The remaining two chapters focus on the issue of institutions and distinctly overlap the discourse of economic research. The fourth chapter characterizes institutional issues of KBE. It reacts to the strategic concepts of competitiveness, environmental obligations, and social cohesion as the key productive factors in modern societies (Lisbon Objectives). A conceptual model of the institutional framework for innovation development is proposed in the last chapter.

## **2. From Economic Growth to Knowledge-Based Economy, From Research Policy to Innovation Policy – The Symptoms of Institutional Changes in Present-Day Societies**

Current efforts aimed at thematizing the relationship of economy and technology (or the industrial resources representing a specific relation with nature) within the concept of knowledge-based economy (KBE) have achieved significant success. It has been applied politically in the Lisbon strategy, which counts with competitiveness and social cohesions to be main factors of economic growth and accepted by the EU authorities (2000). The importance of this political step cannot be necessarily recognized, if it is not supported by the research and debates in experts' communities as well as by political actors and provisions. This concerns also our domestic situation. It is not hard to imagine how many domestic social scientists would react, if there is any reaction at all, to the basic thesis of this strategy – to stimulate relations between competitiveness, employment, environmental issues, and social cohesion with an aid of innovation and knowledge. These questions have not been here duly articulated and examined so far. I would like to address this issue and doing so to briefly show the path, which had lead to such agenda in social sciences in the west European societies. I presume that such reflection may also point at the risks associated with cognitive “short-circuits”, which may emerge from study of such complex issue, its excessive simplification or improper ideologization. Naturally, I shall only follow the key topics and arguments.

The KBE concept has not been only a result of economic research in the last decade. It draws from Schumpeter's initiative and from the tradition of this line of economic studies, which often were surviving on the edge of economic science, although, step by step, it has enabled to reflect the transforming relationships between the economic

sphere and technology, as well as their social framework. Nonetheless, the interpretation of technology in the perspective of economic science is also affected by other theoretical approaches. A more deeply embedded point of conflict was and still is the conception of the relation between capitalist/market forms of regulation (and power) and specific (communitarian) forms of regulation and authority in science and technology.

It was J. Schumpeter, who had already depicted that in a capitalist market regime innovation was becoming a key factor of competition (as opposed to the factors of cost rationalization or maintaining monopoly advantages), which was changing the nature of the competitive market environment and its co-ordination function. At the same time, he had noticed that more active relations between academic institutions and industrially oriented firms were emerging and becoming a significant source of technology advancement (Schumpeter 1946).

The Schumpeter's findings outlined above concisely anticipated the impact of technology on the post war economic development in modern societies. They also manifested themselves in the institutionalisation of basic and applied research and by implementing **research policy** as a significant, regulatory means enhancing more active utilisation of science in technology and economy. The research policy was then based on supporting research from public funds in the particular country, the distribution of which was decided by the scientists themselves, as they enjoyed public trust. Moreover, it was generally believed that what the scientists discover, would be usable in practice. This experience reflected namely the generally accepted practices of "big science" (military, space, energy research), which were developed at that time in the USA, the United Kingdom and in France (and often copied by other countries).

The above specified situation reflected itself among economists (from the 1960s) with the aid of a dispute on what factors were more important for economic growth – whether it was the above indicated impact of science on technology on economy (science push) or whether the determining factors were the market factors (market pull). Empirical findings mobilized by this dispute resulted in a more active conceptualisation of technology with view to its conceivable economic and social consequences (see Freeman, Lundvall, 1988). Elsewhere I have referred to four approaches, which arose from this discussion and which propose possible concepts of technology: neoclassical, Pythagorean, system and the concept of technical trajectories or regimes (Müller, 2002a). The first of these counts more on the predominance of economic factors (in which technology is embodied), the remaining three point to the specific forms of economic regulation of technology. Dosi, Pavitt and Soete (1990) summarize theoretical initiatives into the so-called **non-reductionistic preconditions**, which should be accepted when theoretizing in contemporary economic science. They are formulated in the following manner:

- The behaviour of economic actors cannot be reduced to simple and universal rationality of their actions, which would consistently facilitate maximization of the exploitation of available resources and means;
- Markets and economic processes, which are effected within their frame, constitute institutional forms bound to specific historic periods, cultures, and countries;
- Non-market factors (including regulatory interventions or policies in the strict sense of the word) represent a permanent characteristic of the formation of economic systems

and a substantial part of the methods, by which the economic mechanism is fine-tuned and developed;

- There are certain combinations of *institutional factors and decentralised market processes which are mutually complement one to another* (emphasised by K. M.) in the effort to achieve economic output.

The above specified economic theory preconditions concisely characterise the conceivable contribution of economic research of technology for the development of economic thinking in general. They point to the fact that economic theories (tacitly) apply assumptions, which reduce the view on economic reality in a manner inhibiting the understanding of those factors bearing on close interaction and interconnection of economic and industrial resources.

The last named assumption was conceived on the background of the experience of economically developed countries (namely OECD Member Countries) when forming regulatory policies in the area of science and technology. Available theoretical concepts helped to monitor and assess the applied objectives and means of regulatory policies, which were explicitly refined at regular meetings of the ministers responsible for these areas. An important evolution characteristic of such experience or regulatory practices is a certain conceptual/paradigmatic change, which may be characterised as *a shift from the linear “science push” or “market pull” concept towards interactive models*, better characterising the set of factors and actors facilitating the growth and exploitation of industrial resources. In the area of regulatory policy concepts and means, this change is characterised as *a shift from research policy to innovation policy*. Thus, innovation as a term is broadly revived, although unambiguously in the sense of the neo-Schumpeterian theoretical approaches. It particularly characterises institutional changes in relation between the industrial sphere and the other spheres of the society. Moreover, other areas of social science have been also focusing on the topic of the institutional preconditions of the development of innovations.

In the early 1990s, the “**national innovation system**”<sup>3</sup> concept has become the nodal and orientation point of cognitive and regulatory activities. Even if substantial diversity was ascertained among the monitored countries in institutional organization as well as in regulatory practices in the area of innovations, also concordant features were identified in both areas. Thus, this finding facilitated the formulation of generally shared (and therefore necessary to a certain extent) preconditions for the functioning of the national innovation system – a specific set of *an institutional universals of the national innovation system of modern societies*. This system was characterised in the following manner:

- ⇒ As a complex interconnection of science and technology distinguished by a specific method of technical design and practices, as well as by a system of growing scientific knowledge surrounding it; the institutional base of this scientific-technical complex is the national education system, which is structured according to it, and therefore, this results in an effective interaction between the university and industry that is a source of long-term economic growth;
- ⇒ As an innovation activity of private enterprise actors or businesses, which is contemplated as adaptability to new circumstances (thus, it covers in-house technical

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<sup>3</sup> Essential support of this concept was provided by comparative research conducted in 15 OECD countries in the early 90s, the results of which were published in 1992 (see Nelson, 1992).

and research capacities of firms); the technical competency and orientation of businesses has support in supplier and customer links;

- ⇒ As an activity of governments, which supports innovation activities either directly or it creates a favourable innovation environment through monetary, fiscal and industrial policies, as well as by influencing the education system.

Therefore, comparative analyses and shared regulatory practices confirmed that the institutional framework for innovation development is formed by a mix of means of the private enterprise and the public (governmental) sector. It covers namely the profit oriented role of businesses in the competitive market environment (although a part of the industry is nationalised in some countries); publicly supported education systems (although the private sector exists in this area in many countries) and academic research (although the scope of such support varies); publicly and state regulated control and financial support of the development of domestic innovation resources.

Another significant point in the development of innovation concepts was their acceptance within the programmes of the bodies of the European Union. This was accompanied by active cooperation between EU bodies and relevant research facilities. The first result of this cooperation was a *Memorandum on innovation policy of the European Communities (An Integrated Approach to European Innovation and Technology Diffusion Policy: A Maastricht Memorandum)*.<sup>4</sup> Its basic principles may be summarised as outlined below:

- The technical effect on economy is not only linear or flowing “downstream” through the individual technical development levels (e.g. from research to development, from first generation of technology to the second one), but is characterised by *multidirectional interactions* between these levels, having effect in the same time period; thus, innovation takes place there, where there are interactive relations between information flows and the economic actors and where these flows are permanently evaluated from the point of view of adaptation strategies of relevant actors;
- Technical capacities and abilities are the result of the development of a *long-term* process, which gradually creates growth possibilities and significant economic *advantages* for the economic actor; which, however, also represents a *disadvantage*, as it binds substantial managerial and human capacities to a specific area and “closes” itself to other technical possibilities (not only with respect to interests, but also the ability to become aware of the new technical opportunities). “Delayed” adaptation to technological development is often rather expensive. Similar inertia may be observed also at the product, field, and sector level. The task of the technology policy is to signal in time an entry of new and exit of the existing technology;
- The development of technology is dependant on the dynamic development of *professional knowledge* and on the assimilation of the flow of professional information by means of proper appropriation (not only by accepting it without understanding its significance, as well as its use in subsequent communication and cooperative activities among its relevant actors). The dynamics of the new segments of professional knowledge, which usually is of a *interdisciplinary* nature (e.g. information technology, new materials, new technological approaches), may be best controlled and utilised in education institutions, nonetheless, this role is subject to *public* support. Re-skilling activities relating to individual businesses are usually connected with their local context and cannot rely on targeted public programmes only. However, public support of small

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<sup>4</sup> A group of evolutionary and neo-Schumpeterian economists participated in the preparation of project and in acceptance of their contribution the project was labelled by place of their location at University of Maastricht.

businesses with more complicated access to current professional knowledge resources is worthwhile;

- The innovation process is conditioned *locally* and it is distinguished by extensive diversity and variation among businesses, branches, regions, etc. Such diversity expands the growth opportunities of the economic actors, provided that they are able to make use of them. However, the existing diversity and flexibility is affected by the *nature of environment* and *structural preconditions*: i.e. namely the concentration of knowledge resources, which is influenced by the technological level and tradition of the industrial firms, by a developed network of science and technology institutions and by the existence of (larger) firms, which continue to specialise themselves, nonetheless within the frame of strategies oriented on production programme diversification. The positive influence of developed pro-innovation and publicly supported infrastructure, as well as the key position of several large firms and finally, the adaptable system of medium and small firms – all this is obvious especially in smaller countries (see Freeman, Lundvall, 1988);
- The technological change represents a mutually conditioned system process. Even if the first and last mentioned aspects point to the diversification effects of current technology, which can be well utilised economically in terms of open market regimes, technology, in its nature, is *system* based and its control is not feasible without similar preconditions on the part of economic and political forms/regimes of control /co-ordination (see Soete, Arundel, 1993).

The mentioned Memorandum influenced the activities of the EU authorities in the area of industry and trade. In 1995, a concept for innovation support was accepted, i.e. the Green Paper on Innovation (see Green Paper on Innovation, 1995), followed by an action plan in the successive year (see First Action Plan for Innovation in Europe, 1996), which was aimed at (i) supporting effective innovation cultures; (ii) at establishing legal, regulatory and financial innovation frameworks, and (iii) at supporting the orientation of research on innovation changes. The five year experience of innovation support in the conditions of the EU – owing to the diversity of its cultural resources and politically supported integrative changes in economy and social spheres – outlines not only positive shifts in these directions, anticipated earlier by the Maastricht Memorandum, as well as new issues, which are the subject of present-day discussions and efforts aimed at their solution. It is claimed that a certain system was achieved in terms of articulation, interaction and dynamic growth of innovation resources. Nevertheless, it seems to be difficult to concentrate the mutually created resources into these areas, which have a significant impact on the further development of innovation systems. These issues particularly comprise:

- Active use of information and communication technology;
- Creation of more effective forms of protection of industrial and intellectual property;
- Advancement of the conditions for the mobility of knowledge, its creators and users, which may be achieved namely by means of extensive and divergent professional education and training programmes;
- Improvement of the conditions and the forms of the funding of innovation activities and projects.

The Maastricht Memorandum formulates the conception framework for the strategic orientation of the innovation policy in economically developed countries, while the Green Paper is more focused on specifying the regulatory means of such policies. Both

these documents thus define the framework conditions for innovation-based actions and outline the *institutional setting* of an infrastructure for support of innovation.

The reorientation of the innovation policy objectives on the institutional environment issues, on establishing a sufficiently articulated and balanced **infrastructure for innovation development** is based on previous strategic approaches characterised by support of well-performing actors/firms (“picking up winners”), and by selection of “prospective” directions of innovation activity (associated with foresight-type activities). Such experience reminds to us dilemmatic nature of research in social sciences: is a more important role played by a study of actions and their potential or should a researcher be focused on the study of structures, circumstances affecting such actions? Even if the advocates of the former or the latter approach usually compete with one another, preferring “their own” approach and rejecting the “other”, there are many good reasons to combine their application in the research. In this perspective, I also understand the current shift from the research policy to the innovation one and the emphasis laid on the infrastructure issues. While studying infrastructures both issues – the locations and the structural circumstances - are taken into account, without excluding monitoring and the support of the top *innovation actors and locations*. Nevertheless, their performance is seen more as a consequence of the developed innovation infrastructure.

A specific aspect of the infrastructure supporting innovation is its **systemic** nature. Today, the term “system” has become quite common in social sciences. However, its conceptualisation is one of the greatest “hot” points of dispute. How are the individual parts combined in a complex setting? How are the parts detached from such setting, integrated into other complexes or how are they able to create certain integrity after becoming independent? What is the reason for establishing certain integrity and order? At present, social sciences are trying to resolve this issue more with the aid of partial approaches (not only by means of a universal system theory): various angles of view enable us to acquire more reliable knowledge on the conceivable forms of social order and its systemic setting.<sup>5</sup> I do not wish to point to the various approaches, which formulate specific ideas relating to the issue of systemic social setting. Nonetheless, I would like to emphasize the fact that systemness may and must be formulated theoretically, always in relation to a specific area. Elsewhere, I have already referred to the possibilities of sociology to characterise the systemic setting of innovation resources and effects in relation to the society as a whole (Müller 2002). I sought support in sociological modernization theories. Similar attempts may be also observed in other sciences. As impossible I see the path defining the integrity requirement solely in relation to the distinctive social consequences of certain types of technology and knowledge. These concepts use usually the term “society” without explaining the nature of their ordering (e.g. information, communication or knowledge society). These views may only record various social consequences of technology, or demonstrate the predominance of technical rationality over the practical aspects of conduct. They cannot interpret and assess them, if they do not work with an acceptable conception of the society. This conclusion is also supported by the previous analysis of the development of theoretical approaches that aim to analyse the relation between science and technology. As apparent from the comparison of the above indicated interpretations of the relationship of science

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<sup>5</sup> The specified formulation is linked with the rejection of unitaristic interpretations of social reality seeking support in the universal validity of various principles.

and technology, their framework is distinguished by an ever more robust approach to the study of influence of social and institutional factors in the concept of economic growth.

A qualitatively new step in the research of the relations between technology and economy is currently forming on the background of **KBE concepts**. As indicated above, the KBE concepts have played an essential role in the Lisbon Agreement. The framework of this agreement – its long-term horizon (10 years), its orientation on the issue of competitiveness and social cohesion, as well as willingness to institutional changes – establishes a favourable practical framework for verifying the significance of the KBE concepts with respect to the consequences, already resulting from this practical programme. The scientific reflection of KBE issues is expected to help orientate political actors on the mobilisation of available resources in favour of desirable EU objectives.<sup>6</sup>

Of course, the practical significance of the KBE concepts does not reduce their diversity. Such cognitive way has to be accepted as a necessary aspect of the effort to conceptualise the current complex situation. Simultaneously, it is important that the individual concepts are assessed according to the cognitive power. A concise characteristic of the substantial trends of studies of the relations between economy and technology, which are aiming at conceptualisation of KBE, has been offered by L. Soete (Soete 2002). He follows a trend, which aims to integrate specific features of knowledge accumulation into formal growth models (new growth models). It is presumed that knowledge may be deemed as goods having similar characteristics as any other investments goods: they are produced, exchanged, accumulated and they are subject to wear and tear. However, there are certain differences compared to physical goods. Knowledge may be “stored” into a specific form (e.g. a patent, publication, design) and formally appropriated by its creator or bearer (an individual or organization). Nonetheless, they are not capable to fully appropriate it (as a defined product) and fully control its effects. On the contrary, many may use such knowledge, without the need to invest as much in its production as its creator. Investments into knowledge thus provides higher returns than knowledge, which its creator is able to appropriate (social return rate). Nonetheless, it does not secure a reliable ownership position and therefore, it does represent suitable goods for a competitive environment (it represents non-rival goods). Although, the creator (manufacturer and seller) of knowledge has an advantage when exchanging knowledge, as specific information is at his/her disposal, which are not available to the purchaser (information asymmetry phenomenon). Due to the above specified reasons the market alone is not a suitable social form of knowledge production and accumulation. The mentioned conceptual trend may be supported empirically by findings concerning the actions of financial actors and the preparedness of financial capital to invest into innovation businesses (risk capital), the establishment of specific financial markets, such as the NASDAQ, the reorientation of financial policies on more flexible forms (e.g. currency policy), the behaviour of businesses when financing research (preferring own research instead of contractual research), and the transformation of the forms of interaction between academic and industrial science.

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<sup>6</sup> The five years of the effect of the Lisbon Agreement reflected itself in Kok’s Report, which indicates unsatisfactory fulfilment of the objectives thereof; it sees obstacles in insufficient management of highly challenging nature of these objectives through adequate coordination of national activities, whereas the reasons are seen in the contradiction of the political priorities of the member countries.

Another conceptual trend has been formed within the context of analyses of information and communication technology (ICT) impact on the knowledge accumulation process and it is usually designated as “**new**” **economy**. ICT substantially expands the possibilities of applying professional/codified knowledge. This markedly manifests itself in the area of science, technology, education, financial markets, trading markets and in a range of other services, where improved access to codified knowledge evidently results in a growth of these areas. Nevertheless, this globalisation and growth trend gives rise to a number of issues and thus, questions, whether it actually is a new form of economic order. Analyses of these trends indicate many limitations or conditionality of their growth potential: well. Due to ICT implementation, the existing institutional forms are exposed to strong decentralisation pressures signalling the formation of a new organization principle designated as networks; social and economic utilisation of such networks depends on the approach to them, which is not self-evident – it is subject to impact of existing structures and particularly depends on the specific profile of human resources and their infrastructure, which are capable of using codified knowledge in local conditions. This experience indicates not only specific limits in transfer of codified knowledge, but also the growing significance of locally bound (non-codified/tacit) knowledge and its bearers (human resources). However, in this context human resources cannot be comprehended only in their skill-based (qualification) adaptation to new technology possibilities, but also in the consequences of ICT on the functioning of modern institutions (impact on decentralisation trends, on formation of new organization principles, on new ways of social exclusion, on the transformation in social communication forms, etc.). The latter issues are monitored analytically to a large extent by the concepts of “new” economy and form their empirical basis.

Last but not least, conceptual initiatives exhibit themselves within the context of the expanding effect of codified knowledge on routine conduct practices, which is examined and thematized by a conceptual trend called **Learning Economy**. This trend was clearly identified during the study of innovation resources. It has shown that ability of people to use existing professional findings plays a much greater role in innovation capacity growth than exploration / production of these findings. Utilisation of codified knowledge cannot be seen as a passive activity (as it is often interpreted by help of current dichotomies between science – technology or basic – applied research). Utilisation represents a creative process – an application of existing findings in new contexts. Universities are confronted with similar experience: their traditional function in research and teaching is strongly influenced by their ability to actively apply existing knowledge in new contexts of their potential customers. Another example can be followed in practices of firms, which are focused on competitive environment monitoring and utilizing findings of successful competitors (an example of benchmarking). In consequence of these processes, social distribution of knowledge is becoming more complex (more extensive and intensive). It seeks support in a more diversified social background of knowledge resources (not only in basic research or leading technology fields) and in its institutional framework (see above indicated innovation infrastructure concept, responding to these new conditions of knowledge production, distribution, and application).

The specified overview shows that the KBE concepts represent rather the “push” of theoretical interpretations than the “pull” of empirical verification. Nonetheless, their fertile effect sets forth a more reliable orientation in the discussed issues than that, which is solely based on the findings of individual social scientific disciplines. Lindley

aply adduces that “consideration of the knowledge society blurs several boundaries which have hitherto governed our thinking, especially those between “the economic and the social”, between the market and the organization, between competition and cooperation, between the companies and the communities ...” (Lindley 2002, p.99). Another argument may be added to this claim: all of the above indicated representative trends of theorizing about KBE emphasize the significance of institutions and institutional change. Transformation of knowledge resources into economic effects is intermediated by various institutional forms/regimes and the dynamics of their transformations. I have referred to this aspect when discussing the significance of the infra-structure or system preconditions for innovation activities. In this respect, congruence exists between these analysed concepts. However, a qualitative change in understanding systemic nature of knowledge societies represents a new approach. It is especially apparent in the relation between the national innovation system concept and the KBE concept.

The importance of system aspects has been already emphasized by a comparative research of national innovation system (see Nelson, 1992) characterised hereinabove. An implicit prerequisite of this research was to find a specific institutional framework, that optimises the transformation of innovation resources (science a technology or codified knowledge) into economically relevant effects. Coincident features were sought in the diversity of institutional forms (resources of research and development and regulatory means). Such findings were to facilitate a growth of functional connections, like „resources → institutional forms → effects“, and to assure that with a specific resource structure and under specific institutional preconditions innovation effects can be achieved.<sup>7</sup> However, empirical observations guided by the KBE concepts (and following namely processes associated with the creation of research and innovation space within the EU) have falsified a productive role of this cognitive scheme. The institutional forms, which intermediate transformations of innovation resource into relevant economic and social effects, are so diverse that the above defined functional and optimisation prerequisite cannot be accepted. On the contrary, the following preconditions should be accepted: a) there is no functional (causal) relationship between the scope and the structure of science resources and technical effects; b) there is no functional (causal) relationship between the scope and the structure of technical resources and economic effects; c) there is no functional (causal) relationship between the scope and structure of economic resources and social effects.<sup>8</sup> Nonetheless, these preconditions do not mean that there is **no** relationship between science, technology, economy and social development. They point to the fact that the relationships between these spheres and resources are organized (institutionalised) in different ways, and that by help of different way the same outcome can be attained. Thus, such claim confirms the standpoint of evolutionary economics that diversity (of resources and structural conditions) is becoming the growth resource or competitive advantage. The importance of this factor is confirmed also by the experience gained from the integration and harmonization processes in the EU: the nation-based diversity of individual countries is

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<sup>7</sup> Nelson’s study embraced OECD Member Countries and reflected the long-term effort of this organization aimed at the standardisation of indicators of research and development resources and partially of their economic effects. Its findings seem to characterise *common* features of national innovation systems rather than the diversity of their regulatory and institutional regimes.

<sup>8</sup> In this connection it is necessary to underline that for the time being, statistical and analytical data monitor the framework of national states and the institutional forms, which have evolved in these states. Nevertheless, innovation activities have been evolving also in the supra-national and global framework, which, however, is currently not institutionalised and statistically analysed to a reliable extent.

seen as an obstacle when forming effective (converging) forms of administration (governance) throughout the Union, although, in relation to other globally existing complexes, it may manifest itself as an advantage. In addition, fundamental historical experience of the European continent documents that its social and power setting was always based on a tension between decentralisation and centralisation forms of governance, thus, on a certain ability to enforce systematic forms of governance and control also in conditions of diversity. I shall return to present-day manifestation of this phenomenon later. Now, I would like to point to the significant methodological consequence of the preconditions defined hereinabove.

### 3. Theoretical and Methodological Issues Relating to the Study of Institutions

Do the above-indicated preconditions concerning the relationship between resources and effects mean that it is necessary to abandon the causality and functionality principle? This would exclude social science from the “family” of modern sciences since they are based on this principle. This path is impassable. More viable is the more specific interpretation of the **function and causality principle**. A whole range of social scientists has been dealing with this problem, especially those involved in the issue of institutions. Institutions are the most apparent form of social orderliness and they provide a possibility to study and understand its nature. Current findings of such studies indicate the productivity of two theoretical approaches: the *functional* approach, based on the possibility to recognize human needs and the normatively-based social organization and control of the society derived therefrom, and the *cultural and anthropologic* approach, taking into account the situation (including deficiencies) of human beings, chances of their adaptation to current environment and the role of institutions in such interface. While the former approach envisages functionality as a relationship of parts with the complex / system (each part converges to the complex framework), and distinguished by a certain closeness to the environment, the latter approach is based on openness of institutions to the environment; their integrity is shaped by an ability to adapt to changing environment and recover / re-found their value pattern according to new situations. I would like to clarify the latter approach, as it relates to a problem, which I have identified in the discussion of current KBE concepts and their understanding of systemic nature of social orders. I start from the observations of N. Luhmann, who formulated these issues in a similar context, having asked the question, how institutions could function in an orderly manner in the current, quite diversified and complex conditions (Luhmann 1974).

A specific concept has established itself in modern science, seeing functions as a causal relationship between two phenomena or variables, which has corresponded to the cognitive approach of science to nature. A precondition for applying functional relationship conceived in such a manner got into the background – namely, the precondition of **equivalence** or homogeneity of the relation between the examined variables. A mathematic determination of the function represents its ideal type and anticipates its application in areas, where equivalence may be applied (in technology, economy). Therefore, causality is merely a special case of equivalence, one of the areas of a functional arrangement of phenomena. The relationship between cause and consequence is not a manifestation of regularity, but **invariance**. Societal sciences soon encountered cognitive constraints of narrowly envisaged functionality. It was necessary to specify the nature of the environment or of the relationships between the variables as

homogenous. Thus, the *ceteris paribus* assumption was and is extensively applied in economic science, showing the variance of the relationships between the variables, which is excluded from cognitive considerations. For sociology, the solution of this problem presented a basic cognitive challenge. Classic sociology was able to point to the various types of the environment, which may intermedate the relationship between conduct and forms of social organization. A number of social manifestations was specified, which are capable of stabilising social conflicts, such as roles, social norms, institutions, etc. In the mid 20<sup>th</sup> century, T. Parsons (1951) proposed a synthesising approach seeing function as a manifestation of needs, conflicts, and their balancing. He specified culturally based “links” between the resources and effects of human conduct – latently operating regulations, which he designates as *generalizing mechanisms* (enhancing homogeneity). These constitute symbols, money, power, enjoyments, also designated as the media of power. Within this concept, the manifestation of function as a manifestation of invariance is shaped structurally. The successive period (since the 1960s) of social turbulences and the “crisis-like situation” of modern institutions (competitive based markets and political systems) cast doubt on the structurally based social functions, concurrently detailing the view on the functionality concept, on which Luhman’s functional approach is based. This approach also takes into account certain preconditions. Firstly, it does not see institutions as a manifestation of purposefulness (i.e. operating regardless of their environment), but as a manifestation and a capacity of reflexivity to the environment – i.e. to the other institutions. Secondly, it allows for the separation of human conduct from the expectation of actors (thus, the actor does not act strictly according to a pre-assigned objective). Both these preconditions facilitate a system-based approach to the analysis of social relations and institutionalisation – the key words being communication, self-reference, selection, and complexity reduction. In such context, the predictive value of social sciences is based on specifying a set of *functionally equivalent alternatives*, which are available as solvable problems. Thus, function represents an equivalence of alternatives (under conditions of variations of variable complex systems). The comparative method and comparability options represent the key methodical approach of this cognitive approach.

The indicated methodological excursion corresponds to the above monitored cognitive issues emerging out of studies of innovation resources and their performance. Comparisons of their national forms and institutional setting/system organization initially pointed (with the aid of relatively high quality and comparable indicators) to a certain equivalence of diverse national forms. Theoretical findings of the regulatory (coordinating) experience guided by the KBE concepts consider the equivalence of possible alternatives as open, as a challenging issue. In the text hereinbelow, I would like to point to some topics and arguments, which, in my opinion, are already responding to this issue.

The first topic relates to the **term of knowledge** and the coherences with derived terms: codified knowledge, local (tacit) knowledge, information, communication, teaching, learning, etc. With respect to the study of innovations, it is useful to comprehend these terms more as a process rather than condition and to examine the diachronic nature of their reproduction – the resources and forms of production, distribution, and utilisation. With view to “inflationary trend” in utilisation of these terms, I would like to draw attention to their basic characteristics.

The term knowledge obviously designates modern (scientific) knowledge (and its specific features when surveying nature or society), the opposite of which is laic or everyday knowledge (which, however, is affected by modern knowledge). Both forms of knowledge differ in their form of conception and use. Professional knowledge is of an abstract nature, so it may be standardised/codified and therefore also transferred and adopted (e.g. by learning). Everyday knowledge is linked to concrete practices of conduct, its codes facilitate human coexistence in a locally-based everyday context (because they also represent immediate interaction with cultural values), which, however, are difficult to transfer to other situations of conduct and collectiveness.

The post-war expansion wave of modern knowledge (after World War II) led to first findings concerning the possibilities of disseminating and adopting theoretically based (modern) knowledge. The category of basic, applied research and development were constructed in order to facilitate such changes. The next wave resulted as a consequence of the mass growth of education, especially of specialist university education and the information and communication technology boom. The context of applying and codifying theoretical knowledge has expanded significantly and with it the possibility (and the need) to delimit borderlines of the expert knowledge to that one, which is hard to codify (i.e. communicateable and transferable), as it is linked with a quite specific or local context. It is represented by common-sense experience and knowledge which is accumulated in the course of routines and habits of everyday practices.

If knowledge is codified, it may be digitalized, communicated by means of modern communication technology and utilised on to a wider extent. Nonetheless, communication is not only a matter of digitalization and informatization. It also represents a process of the formation of social relationships and identity. To put it simply, we may claim that communication is a source of a social consensus, while non-communication is an indicator of social dissensus/differentiation. This is a key aspect for the production, distribution, dissemination and the use of namely value-based and symbolically formed knowledge. Thus, knowledge is not only the result of evidence of material reality and congruence in its evaluation. The evaluator of knowledge is the respective professional community, its power and institutional structure. Such communities and institutions have been established in the area of academic and industrial science, basic and applied research, in research sectors (e.g. according to the Frascati Manual classification) and sectors serving for the application of research findings.<sup>9</sup> Reproduction of knowledge is then intermediated by passages or barriers between the above named institutions involved in the production, dissemination and application of professional knowledge.

The relation of socially conceived communication of knowledge sets forth another question: the question of the distribution of knowledge and its use when establishing authority/power. These aspects are “embedded” in an institutional framework, which was aptly characterised for the purposes of the subject issue by the national innovation system model. According to this “model”, the distribution of innovation oriented knowledge is positively affected by an interaction between the academic and industrial sphere, between the activity of innovative firms (with advanced intramural R&D) and the pro-innovation oriented policy of the state. The above outlined KBE concepts

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<sup>9</sup> Nevertheless, the effect of codified theoretical (modern) knowledge and its social consequences should be studied on a wider basis – within the extent of its formative impact on current societies (as aspired after by the concepts the knowledge societies). I have developed this argumentation line already in the quoted publication (see Müller, 2002).

confirm and further develop this model. They advance it more with respect to the *process approach* to the study of innovations and newly emphasize the important role of the institutional framework for innovation performance. In general, we may say that the new findings not only emphasize the *significance of intermediating capacities* (between the academic sphere, the industry and regulatory policy), but also *transformations* in the respective institutions.

A conceptual trend oriented on the monitoring of ICT consequences clarifies that this technique enables *an interconnection of scientific research, market analysis with flexible production* (see Boyer, 2002). Such expansion is largely supported by the learning economy concept, which points to a much closer interaction between human resources mobilisation (learning, skill growth) and organizational innovations. It constitutes distinctive democratisation of knowledge resources and corresponding processes of institutional change. Learning is not only based on reading, practical testing or doing, but on comparing and communicating. The growth of this potential manifests itself empirically within the context of benchmarking practices – the process of comparing, evaluating and professional reviewing (peer reviewing) – and a shift from naive forms of benchmarking to intelligent ones (see Lundvall, Tomlinson, 2002). The enforcement of more intelligent forms of comparison is not only conditioned *methodologically* – only comparable should be compared. It is also affected by the nature of and the environment in the organizations. More open and flexible *forms of organization* enable us to understand that benchmarking results are always only partial (and are likely to legitimise the current state rather than a possible change). Their role rests in permanent activity: in the need of permanent environmental monitoring, in a self-comparison with other firms and in learning from the more successful. Another factor affecting the application of benchmarking is the *nature of the environment* – competitive forms of markets. They promote closeness of firms, formation of hard and fast borderlines among them and thereby limiting also the possibility of learning from others. On the contrary, a cooperative environment stimulates the transfer of knowledge relating to these practices into other businesses and the elevation of the overall standard of their administration and management.<sup>10</sup> The emphasis on the mix and the balance of competitive and cooperative forms of coordination seems to be the most important finding arising from the study of KBE. It was particularly supported by coordination experience within the EU, which is searching for a balance between centralisation and decentralisation factors. Conceptually, this experience is formulated by the so-called *open coordination method*. Similar experience is also confirmed by cluster analysis, which has been developed on the corporate level. It is a method of administration (governance) applied in a more diversified and interactive environment and distinguished by a combination of formal and non-formal methods, as well as “by determining the spectrum of actors and partners of the coordinated area, by selecting and confirming the data relevant for the appraised situation and by presenting proposals for the improvement of the regulatory policy“ (Teló, 2002, p. 250).

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<sup>10</sup> A positive result of these activities is the formation of favourable preconditions for the *cultivation of the environment* for conduct and business (promoting moral aspects) and concurrently, the preconditions for the formation of effective legislation. Such an environment creates certain enclaves of informal congruence “from below”, which predestines easier generation of formally based *legislative* actions. A competitive environment may also establish congruence, e.g. with the influence of corporate interests, although, with significant social costs, if the autonomy of the actors and the informal nature of this congruence is to be preserved.

#### 4. Variability of Regulatory Regimes of Knowledge-Based Economy and a Conceivable Path for Institutional Change

In order to characterise the changes in the key institutions affecting infrastructure for support of innovation I would like to use sociological findings concerning the issue of an institutional change. From a general view, one can claim that an institutional change comprises two phases: the process of de-embedding or de-institutionalisation, which is affected by the resistance of “embedded” (deeply rooted) interests, and the process of re-embedding or re-institutionalisation, which includes the enforcement of interest-based structures, their legitimisation impact and general acceptance of new value orientation.<sup>11</sup> The above stated arguments arising from the economic analysis of KBE considerably converge with this sociological knowledge. They point to a number of dis-embedding and re-embedding means, which are emerging within the frame of academic institutions, the business sphere and the regulatory policy. For example the advancing differentiation of the actors in these institutions can be considered as a epiphenomenon of the de-institutionalising processes; while benchmarking practices and methods of open coordination signal means of re-institutionalisation. Similar finding can be identified while comparing the concept of the national innovation systems and the KBE concepts: not only a question of differentiation inside innovation-based institutions and their reorientation, but also a question of the nature (possibilities and limits or forms) of their interactions is the point. Such claim is well supported with the concept of administration (governance) and its cognitive outcome. Boyer explains that application of ICT largely promotes differentiations and coordination trends which are resulting in a growing diversity of the regulation or governance regimes. While Nelson laid stress on the importance and consistence of fiscal, monetary and industrial policies when supporting the growth of the national innovation systems, Boyer points rather to a larger diversity of the innovation resources and regulatory means to play a strategical role. He draws attention to the various types of economic factors affecting the growth of innovation resources and their performance: factors of competitiveness – e.g. as suggested by OECD strategies; demand and export factors – e.g. emerging in newly industrialised countries; service factors – e.g. appearing in the USA, funding factors – e.g. identified in the USA and UK), and moreover, he specifies social-based regulation options. His attempt to expand the spectrum of influential factors by social and political aspects are beneficial for the purport of this analysis. He proposes a concept of “*a social innovation system*”, the institutional forms which are taking into account the nature of externalities, Three three types of such forms are suggested ((Boyer 2002, p. 166):

- **Market-Based Type** – its characteristic features are based on an intensive rate of specialisation, on the concentration of resources into selected fields, on developed resources of academic science and university education (and less developed specialist education and training), on a developed financial system (including venture capital), on a flexible labour market, and with certain lags in patent practices and adaptations to post-industrial challenges; this type mainly concerns USA, UK, Canada and Australia;

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<sup>11</sup> It should be considered that in this concept, institutional change is not contemplated as a rationally purposeful process (seeking the most suitable means to achieve the intended objectives), but also as shifts in value orientation, accompanied by conflicts and social interests involved. Institutional change will enforce itself by means of newly situated actors and interests and will “settle” itself only with the aid of an accepted (although variable) value orientation.

- **Social democratic Type** – it enables a shift to new (post-industrial) production models, laying emphasis on the significance of public research (especially in the area of services, e.g. medical research), expending large amounts on education, it is limited by a less developed financial system, it utilises the influence of multinational corporations; an example of the development of this type are Scandinavian countries;
- **Public Institution Type** – it utilises means provided by a social state when supporting public services (particularly education) and when solving unemployment problems (with a relatively high unemployment rate), it is distinguished by lower production of academic science, a less developed financial system, low workforce mobility; examples of this type are France, Italy and the Netherlands.

Even if objections may be raised as to the “purity” of these types (e.g. Germany has developed academic science), this typification attempt may be well utilised for the intent and the procedure of the investigated interpretation of changing relationship between technology and economy. It documents that even in the perspective of economic approaches also the other levels of “externalities” can be taken into consideration, the thematization of which creates favourable cognitive preconditions for an interdisciplinary approach.

That said, it can be claimed that the KBE concepts indicate that economic performance utilising knowledge and innovation resources is conditioned by extra-economic (social and cultural) factors. Further on, the above-mentioned typification attempt may support our arguments in the foregoing discussion of the methodological discussion: the proposed types of the social system of innovations may be viewed not only as a source of conceivable comparison and identified differences in regulatory regimes; with respect to the institutional aspect of the analysis it is more adequate to approach the analysis of innovation infrastructure regimes from the point of view of their possible *equivalence* when achieving innovation performance. Thus, the question is not about which system is more effective, but whether these systems are equivalent in terms of their functioning, which set of factors facilitates such equivalence and which factors have a formative role in the governance and organization of innovation setting. From a rather simplified view, the above indicated types of the social innovation systems may be contemplated as equivalent systems/regimes, even if their performance parameters are currently different. In such (system-based and long term) perspective it can be claimed that current weaknesses of one regime/system may turn out to be its strong points.

## **5. Proposed Theoretical Approach to the Analysis of the Institutional Framework for Innovation Performance Growth (Situation in the CR)**

In the final part, I would like to make use of the findings of the previous two chapters concerning the nature of institutional changes, which affect the growth of innovation resources and their performance. I would like to compare these findings with the results of social studies of science and technology, which currently also focus on an analysis of institutional coherences associated with the issue of innovations (for details see Müller, 2002). The analysis finds empirical support in comparative studies of regulatory policies in the area of science and technology in modern societies, which are significantly applied when coordinating science a technology within the EU. Their basic idea is drawn out in the heading of the previous chapter, which also determines the factors affecting the changes in concepts of regulatory policies (a shift from research

policy to innovation policy). Concrete circumstances and deficits for the application of the innovation policy in new member EU countries (including the CR) were presented in the other studies (e.g. see Innovation Policy Issues 2001; Müller, 2001).

Certain outline of a conceivable theoretical approach to the institutional analysis of innovation resources and their performance have been outlined in the previous chapter. I have often applied the term infrastructure in order to characterise the specific precondition for a growth of innovations, restructuring of their resources and upgrading their effects. This term not only designates the important parts of certain wholeness but namely the ways of their interconnection.<sup>12</sup> The interpretation further shows, that monitoring of the regulatory regimes of innovations by social sciences resources has helped specify a set of factors affecting innovation processes. Within this understanding it can be claimed that the growth of relevant factors may have an extensional (widely affecting other factors) and an intensive dimension (concerning the quality of relation). The former dimension became obvious in the previous interpretation, in which all discussed KBE conceptions articulate an extensive dimension – a growing influence of wider scope of social spheres on knowledge production. Similarly, the intensive dimension, which I see in reflexive abilities and coordinative efforts of innovation actors (supporting a formation of an infrastructure), has also been sufficiently documented by the previous arguments of KBE studies.

With the reference to the cited empirical analyses of the innovation systems in the CR, it can be claimed in the context of the previous development, all institutions have developed in the Czech Republic, which are today considered as a necessary precondition of the growth of innovation resources and performance. Such knowledge claim can be supported by comparative study of both the national innovation system in the CR and the regional infrastructures for support of innovation. As an example, I have chosen the infrastructure for support of innovation in the region of Prague, which has been studied in the framework of other projects.<sup>13</sup> In **Annex 1** hereof I present a diagram illustrating the extensional dimension of innovation infrastructure: (i) it comprises various types of public (non-governmental) professional as well as entrepreneurial associations; (ii) functionally specialised public and local administration and self-administrative bodies, which are able to define political interest in selected issues, including issues challenging in terms of technology and organization; (iii) academic (university) science organizations, which have at their disposal research capacities linked to education programmes, and finally, (iv) organizations in the business enterprise sector with specialised research and investment capacities. According to the extensive dimension, this institutional setting has been identified to be comparable with the other studied regions. However, a problem arises if we look at the distribution of innovation resources, which are generally based on available research and development resources (here, the imperative of innovation is essential), which, however, in their use becoming more dependant on the governance and reflexive capacity of innovation actors, their orientation by and openness to the other actors of

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<sup>12</sup> In social science literature, the term structure was taken from anthropology, where it designates both – a unit composed of parts as well as the social fabric interconnecting the parts. It was only the later socialisation pressure and the influence of the nomotetic approach within social sciences that oriented this term on the functional embedding of the “parts” and their governance by instrumental measures without investigating their possible interaction.

<sup>13</sup> For details see the Report on the BRIS Project Results (Bohemian Regional Innovation Strategy), which analysed the options of applying a region-based innovation strategy in the capital of Prague and utilised the findings from similar research projects in selected capitals of the EU (Metropolis Project) – see <http://www.tc.cas.cz>.

infrastructure for support of innovation, and availability of an effective pattern of intermediary resources and organizations.<sup>14</sup> The **Annex 1** is indicating in a graphic form the existence of infrastructure for support of innovation in the region of Prague but its weak infrastructural social fabric. Such argument becomes even more evident if a comparison is made with a more advanced region (**Annex 2**, which characterises the infrastructure for innovation support in the region of Helsinki). The region of Helsinki is noted not only with a larger extent of the interactivity and interconnections of individual organizations, but also greater weight and a far more specified focus of these organizations on the issues of innovation performance. A more significant role is also played by intermediary organizations operating among research institutes, companies and financial institutions. The Helsinki infrastructure for support of innovation is a good example intensity dimension in a formation of such institutional framework. But how to approach these issues, which I have merely outlined graphically, in a justified argumentative way?

The above described example of the analysis of the regional infrastructure for support of innovation has an important cognitive advantage, i.e. that it facilitates sufficient mapping of organization activities in relation to the relevant environment as well as the other organizations as well as their self-organizing capacities (bottom-up processes). However, its disadvantage is based on the fact that it does not capture the “penetration” of these influences into regulatory practices and their reverse effect on the framework conditions of conducts and activities of firms and the other organisations (top-down processes). The interactive relationships of these two processes (“bottom-up” and “top-down”) – and regulatory environment parameters – have been and are being shaped mostly within the national states. Moreover, the de- and re-institutionalisation processes may be examined more reliably within this framework, including processes characterising the intensive dimension of the infrastructure for innovation support and the factors affecting it. Certain assessment of this kind was provided by the above-specified comparative study of innovation policy in the accession countries, including the CR (Innovation Policy Issues, 2001). On the background of prevailing trends in the EU, the concepts, means and actors of the innovation policy in the CR were appraised. The study characterises domestic weaknesses in resources and regulatory practices by the arguments indicated below:

- Insufficient influence of the cultural environment, which would stimulate innovation and creativity – especially in the area of education, professional training, promoting successful practices (benchmarking);
- Innovation is not seen as a priority of reform activities in the area of regulatory and legislative forms and standards;
- Insufficient number of smaller innovation-based firms;
- Insufficient support of diffusing/disseminating knowledge and technology into economy;

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<sup>14</sup> The term intermediary capacity or organization is applied when analysing institutional relations. It points to experience that the adaptation of institutions to new conditions (and to the other institutions) takes place step-by-step: at first, intermediary organizations and capacities are established to support interconnections among the institutions, and afterwards, their experience is used in the adaptation of the institutions themselves. The abundant experience of the developed countries offers e.g. good insight in the way of intermediation between academic institutions and the industry. However, their manifestations is less studied at the “borderlines” between the other institutions of innovation infrastructure.

- Political and regulatory decision-making is insufficiently coordinated in order to enforce innovation policy objectives and means.

The mentioned findings unambiguously point to regulatory, legislative and cultural deficits, inhibiting the implementation of the intensive dimension of the infrastructure for support of innovation, which would facilitate a growth of its social cohesion. The assessment is confirming, that for the time being, a gradual de-institutionalisation process is underway in the CR.

The above-mentioned findings enable (and require) us to propose a more complex model of the institutional framework for support of innovation. I am using the approach defined by Hollingsworth and have adapted it in order to be able to interpret the specific conditions of the radical changes (transformations) of regulatory regimes in the new EU member countries. Hollingsworth's theoretical approach is based on the definition of the triple function of institutions: (i) the institution are understood as a set of customs and assumptions, which are not doubted and which enable rational communication, selection and decision-making at an individual level – this function is in a line of an anthropological approach to the conception of institutions; (ii) the institution as a form of constraint (in resources, possibilities to act), which concurrently effects the allocation and distribution of (limited) resources; (iii) the institution as a form of effective incentives, coordination, reducing uncertainty and solving conflicts. The last two aspects more likely relate to the functional concept of the institution. When applying this concept the innovation process (and its systemic nature) can be analysed at the following levels:

- At the level of fundamental values, rules and tendencies to social ordering;
- At the level of a specific forms of social co-ordination (markets, hierarchies, binding networks, associations, the state, communities, clans) and their configurations; at this level mobilisation of the resources of competitiveness and cooperation, formal and informal resources of communication and conduct takes place, as well as their stabilisation (balance), which enables avoiding possibilities of their mutual destruction;
- At the level of function-based sectors, which are composed of a group of organizations providing specific services or products, creating function-specific rules and forms of conduct for such operations; these e.g. are education, production, banking, state administration institutions (sectors), etc.;
- At the level of associations or networks of organizations, which enable them to attain specific objectives;
- At the level of the internal pattern of organizations, which is distinguished by diversity of situations, in which the organisations are operating and leads to various rates of their performance.

An advantage of the above-indicated model (see **Annex 3**) is that it makes possible to study institutions in their functional, self-regulatory (bottom-up) dimension, their (top-down) regulatory dimension and value support and orientation. Thus, it does not only take into account the “top of the iceberg” (the last level), but also all underlying levels of influence. The indicated model may be *dynamized* by a combination of different pattern of bottom-up and top-down interactions, and advanced to a form of (ideal) types of such interactions and so improve our understanding of institutional change. The above discussed differences in conceptual approaches to the study of institutions are offering first approximation for such typification: the functional (ideal) type, which operates with narrow pattern of core factors (located in the centre of its environment –

see the diagram in **Annex 3**) and anthropological (ideal) type, which is noted with broader utilisation of socio-cultural resources.

Let us make closer look at the ways, how cultural factors can be mobilised in favour of institutional setting for support of innovation. With reference to the scheme of **Annex 3** it should be mentioned that the cultural resources are described as a top level (indication of their importance and autonomy) of suggested scheme but in analytical terms its resources and actors are interacting with all underlying levels, and are in specific terms embedded in their institutional setting (justifying or undermining their autonomy). Let us develop this argument further on with help of general reflection of institutional changes, which have been described by concept of a transition from simple to reflexive modernity. Such changes have been quite essential, concerned all levels of suggested scheme and that is why they were reflected as a “crisis of modern institutions”. Indeed, a series of institutional shifts were triggered (since the 1970s in the western countries) and have resulted in subsequent adaptations in modern institutional pattern. The above-discussed case of a transition from research policy to innovation policy can be mentioned as a good indicator of such a change in relationship between economy and industrial sphere (see left side of scheme in **Annex 3**). However, in case of the post-socialist countries, some of them later the new EU member countries, the institutional change has happened in a rather radical and functional way: these countries were expected to introduce market forms of coordination as quickly as possible. In fact, the framework of institutional setting, as described in the **Annex 3**, has not been taken into account, or it was expected that an implementation of formal factors of market would result in functioning of market institution. Moreover, top-down economic regulatory provisions should bring about market related bottom-up economic activities with their positive social impacts. What has happened can be labelled as unintended consequences of implemented reforms. It was not possible to retain the “borderline” between the basic forms of social coordination – markets and hierarchies of public decision-making, which has resulted in a loss of their effectiveness, in a “descend” of public (enterprising) activities into informal coordination regimes and clientelism. The original impulses to shifts in the value orientation in the direction of modern, meritocratic patterns of action and responsibility were soon dampened by traditional values patterns (mistrust to a fair economic and political assessment). Such situation is described on the right side of the scheme in **Annex 3**.

For the above-mentioned reasons it seems to be more productive to approach to the analysis of the situation in the post-socialist, and later new EU member, countries in the perspective of the functionalist concept of institutional change. According to this approach (e.g. in Luhmann’s concept), the formative role of institutional change is played by the resources concentrated around the functional specifications of institutions, the effect of which is determined more by relations with the other institutions than to the overall regulatory and cultural conditions. Furthermore, processes, which take place at the third and fourth levels (of organisations and their capability to form associations), have a decisive effect. Their result subsequently affects the enforcement of changes at the other levels (at the second level – the efforts to maintain efficiency of essential coordination forms and resistance to corruptive practices; at the first level – of value orientations - it is a tension between freedom for action and manipulating practices of the new power and corporate centres; and at the fifth level – the enforcement of effective forms of corporate administration and organization combined with formation of codes of corporate and business culture).

The above-indicated importance of functionalist approach in the analysis of current institutional situations in the new EU countries does not exclude a need for application of both the functional and the anthropological conceptual approaches to study the situations and types of institutional changes. Such advice is also related to the issue of unintended consequences of implemented social projects and reforms, namely extremely heterogeneous social environment which has arisen out of reforms. Such heterogeneity cannot be effectively controlled without various chances for cultural shaping are taken into account. For this particular reason the anthropological approach should be involved into the institutional analysis. Institutional actors may, namely, react differently to the top down (regulatory) pressures and also variously accept requirements of mutual obligations and constraints. The advice for implementing both cognitive approaches is also supported by the fact of existing institutional gap between new EU member countries to common practices of core EU countries, which was generated by the divergent coordination regime (second level of the model) in the former socialist countries (with the closed forms of governance and social control). It is not only the result of a certain delay in development (on the given path), but also the result of a long-term movement along a different trajectory. That said, basic message of this contribution can be underlined: not only in conditions of the growing influence of knowledge and innovation on economic growth but also in situations of radical institutional change, it is necessary to consider institutional aspects in analytical terms; and in doing so the availability of a comprehensive concept of institutional change can play quite a positive cognitive role.

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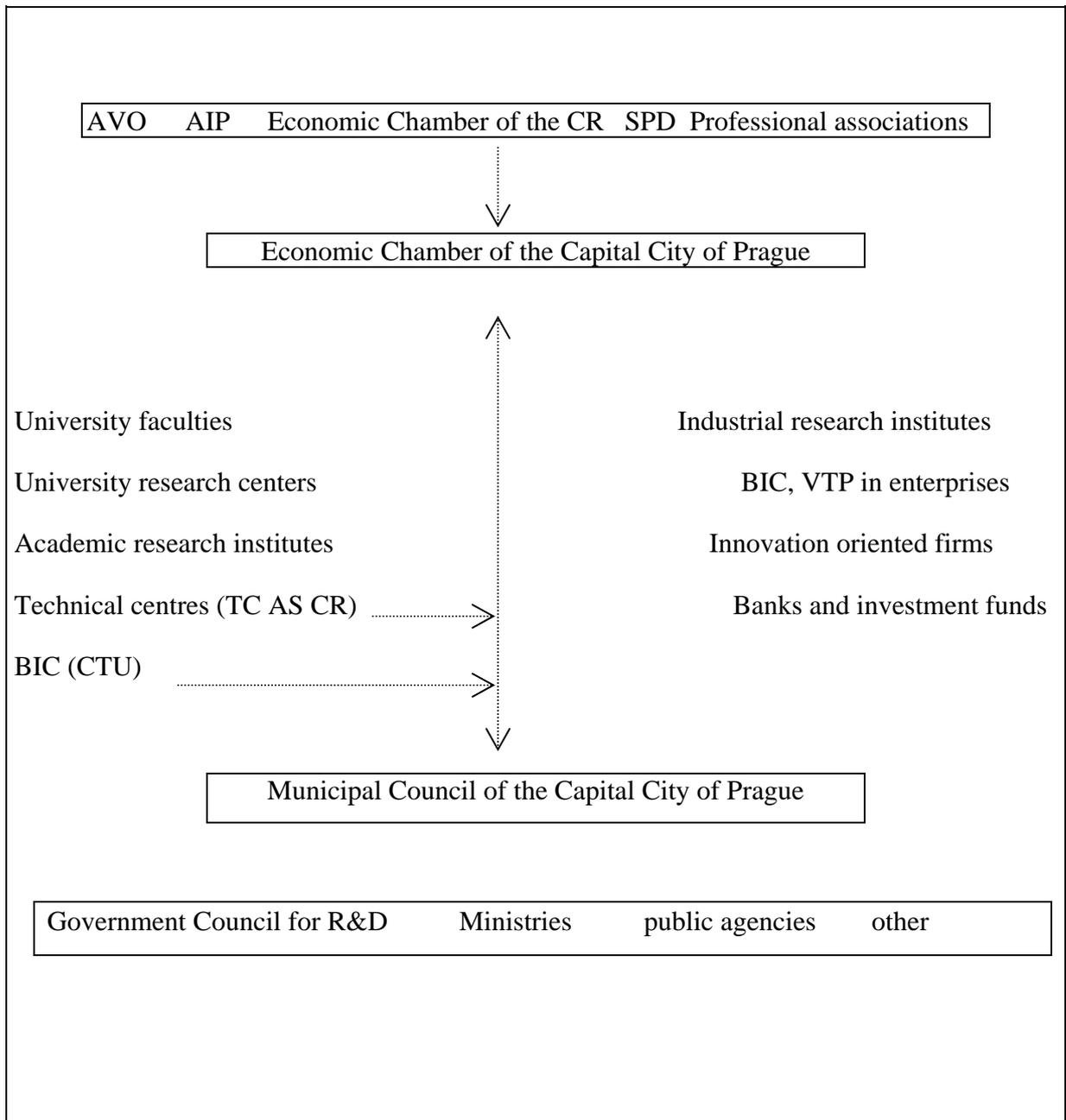
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**Annex 1**

**Infrastructure for Support of Innovation in the Prague Region**



**Legend:**

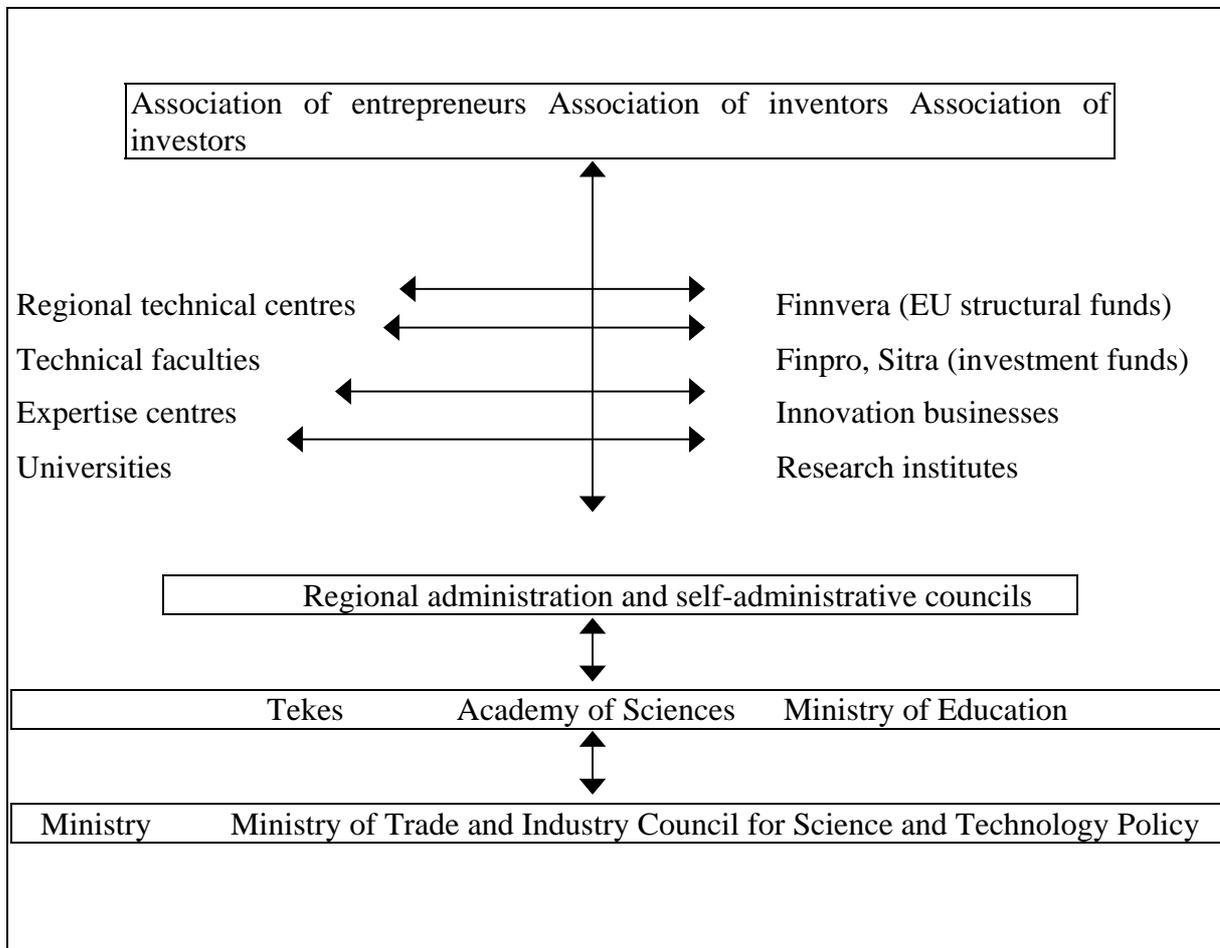
Weak one-sided relations:  $\dashrightarrow$

Weak reciprocal relations:  $\dashleftrightarrow$

Abbreviations: AVO (Association of Research Organisations); AIP (Association of Innovation Enterprising); SPD (Association of Industry and Transport); VTP (scientific and technological park); TC AS CR (Technological centre of Academy of Sciences of the CR); CTU (Czech Technical University)

**Annex 2**

**Infrastructure for Support of Innovation in the Helsinki Region**



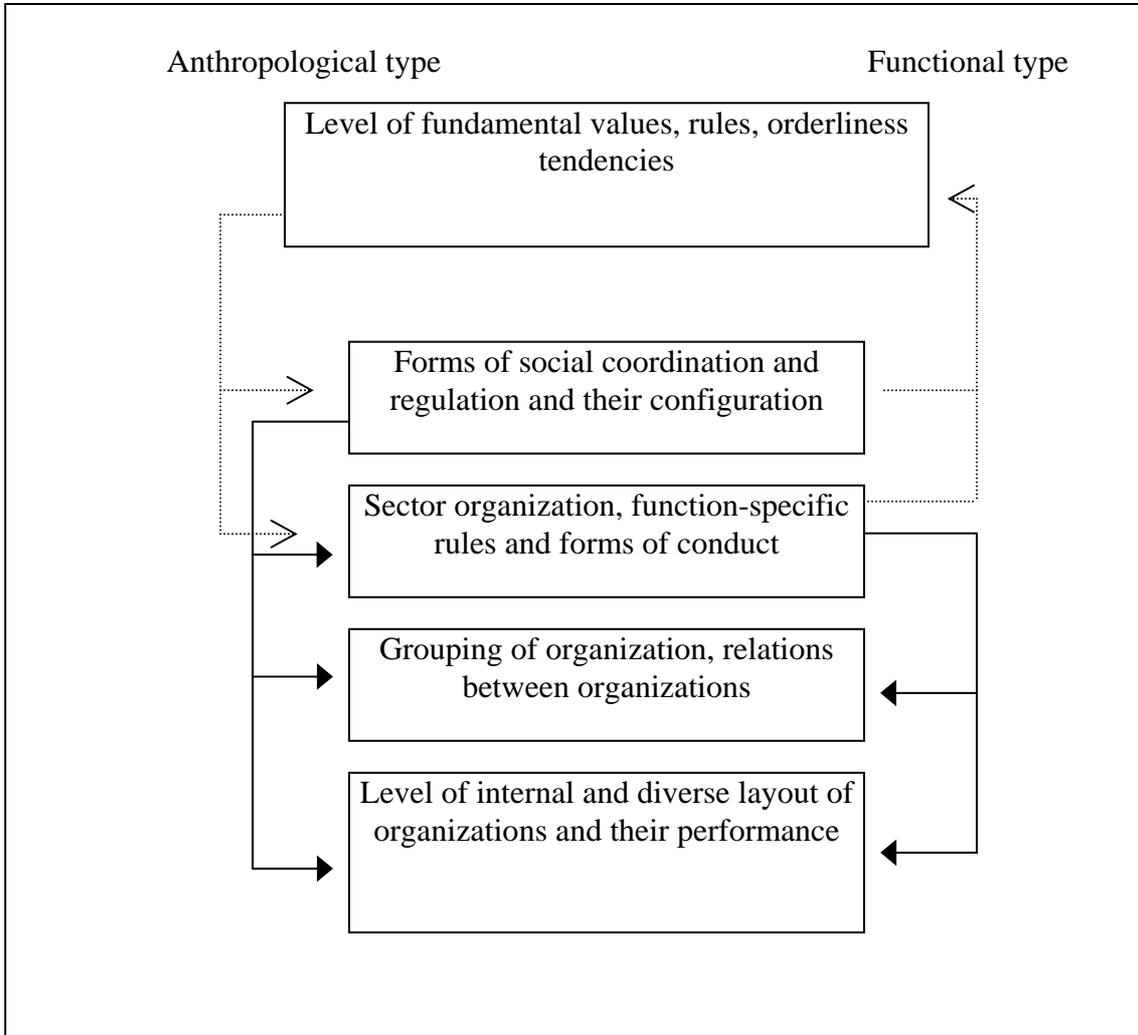
**Legend:**

Strong reciprocal relations:

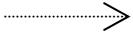


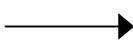
**Annex 3**

**Institutional Framework and Levels for Support of Innovation-Based Economy**



**Legend:**

Latent relations: 

Manifest relations: 

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