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## **Institutional Analysis of Innovation Systems: an attempt at interdisciplinary approach**

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**Abstract:**

The paper deals with the issue of institutional analysis of national innovation systems or infrastructures for support of innovation. It takes into account the findings of comparative studies of national innovation systems and innovative firms, which are indicating that innovation performance is not positively related to a scale of innovation resources or the shape of their distribution only but in particular to their institutional framework and its propensity to change. Closer look at databases about institutional setting and its theoretical concepts are indicating that the institutional analysis is constrained by inadequate understanding and theorizing about nature of institutions. The discussion is based on application of Hollingsworth's model of institutional change in the innovative environment and its advancement with respect to experience of radical institutional change in the new EU member countries. In order to attain such step a wider social science approach is discussed: insight of social sciences and humanities in the constraining and facilitating role of institutions, more specific understanding of social sciences about functional differentiation of modern societies and institutional framework for its control and last but not least the understanding of historical context of institution building and re-building in the context of modernity. The advantages of such diversified approach have been used to specify differences in institution building between the old and new EU member countries. It is claimed that important difference is related to the way, how functional and practical resources, regulatory and self-regulatory patterns are mediated. In the final discussion some analytical approaches are suggested which would enable the study of the cultural context of institutional change in an innovative environment.

**Key words:** institution, institutional change, innovation, science, technology, reflexivity, trust, culture, modernity, modernisation, regulatory pattern, self-regulatory properties

**JEL Classification:** A12, D02, O31, O32, O38, P39

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## **1. Introduction**

The aim of this paper is to discuss the issues of the institutional changes which are related to science and technology, the implementation of modern knowledge in social practices and responses of social actors to knowledge based forms of economic growth and social change. This topic has been widely discussed in social studies of S&T and important conceptual implications have been drawn from the debate. The comparison of Mode II with Mode I of production of knowledge has helped understand the changes occurring in case of closer interactions between R&D organisations and their practical customers (Gibbons et al., 1994). Formulation of Mode II Society concept has outlined an institutional framework for knowledge-based society (Nowotny, Scott, Gibbons, 2001). Having been inspired by this line of discussion I have concentrated my research on the issue of innovation. The notion of innovation is based on the assumption that innovation has become the key factor of growth and competitive advantage. Neoschumpeterian economic studies of innovation have described and interpreted relations between diversified resources of knowledge and economic growth. The related comparative studies of national innovation systems have produced extensive data about the diversified interfaces among innovation actors. This line of economic studies of innovation has presented knowledge to similar topic as the above-mentioned social studies of S&T. Moreover evolutionary concepts in historical and sociological disciplines have, among others, oriented interests of researchers to systemic features of technology development (trajectories) as well as formative features of modern societies. Consequently, better insight into institutional interfaces between knowledge producing and re-producing institutions has been gained. All these cognitive initiatives have influenced me to be focused on the study of institutional issues of innovation processes. Of course, there has been also a practical reason for such research orientation: radical changes of regulatory regimes in the post-socialist countries have exposed current social practices to a changing environment and resulted in widely running processes of de-institutionalisation. Not only good chances for study of institutions but also a need for a better understanding the current situation has contributed to my above-mentioned research orientation. Taking into account the above-mentioned cognitive background I claim that the study of institutional aspects of innovations can contribute to better understanding of science – society interface.

My present paper is based on and will refer to the contributions, which I presented at our ESA congresses in Helsinki and Murcia. In former case I have reported about the outcome of comparative research of innovation resources and policy in the Czech Republic, which has been finished at the eve of recent accession of new countries to the EU. The available data have clearly indicated that restructuring of innovation resources has been to great extent conditioned by institutional factors. I have chosen Hollingsworth model of institutional framework for innovation development in order to interpret their pattern (Müller, 2001). In the latter case I have reported about the analysis of infrastructure for support of innovation in region of Prague (Müller, 2003). The analysis was more focused on activities of various innovation actors and could better describe context of their action and current practices. These findings have allowed me to develop the above-mentioned model and identify different factors of an institutional change. In the present paper I will deal more closely with cultural background of institutional change.

The discussion will be organised in the following steps: firstly, I will sum up findings about the infrastructure for support of innovation in the CR (and some new EU member countries) and its institutional features. In the next step I will discuss the concepts of institutions in the perspectives of social studies of modernity and cultural studies in order to propose (ideal) types of institutional change facilitating a growth of innovation performance. In conclusion I will discuss cultural context of institutional change.

## **2. Institutional infrastructure for support of innovation – a case of changing institutional framework of knowledge intensive societies.**

Let us start with a summery of research findings which have been gained from comparative study of infrastructure for support of innovation in the CR (and some other Middle European EU countries) which have been interpreted in my above-mentioned papers:

- National R&D resources are evenly distributed between public (academy of science, universities) and private (business enterprise) sectors; in the other CECs the public R&D sectors have a stronger position in terms of sources of funding.
- Large companies provide crucial sources of R&D funding and performance; even if there is a growth in the number of SMEs as well as in their economic role, their innovative capacities are limited to forms of non-research based, capital savings and product innovations.
- Prevailing sources of innovations funding (costs) are expended on equipment acquisition (45%) and the remaining part on knowledge acquisition (about 30% on R&D and 25% on other knowledge-related activities).
- Scope of outsourcing and co-operative agreements among firms are quite restricted; instead self-reliant strategies of actions – counting mostly on internal resources – are typical of firms' behaviour. Data on motives of innovation give clear evidence that innovative firms are pulled by market factors (trademark, the quality of products and services) and quite extensively by foreign markets. In general the firms' management does not ascribe importance to the implementation of key technology-based factors (investment, R&D resources).
- Innovating firms have so far been influenced by the competitive situation in the market, they mobilise and upgrade their internal resources (more human than physical capital) rather than external resources, including outsourcing and co-operation with other firms, which is what enables them to form functional networks.

Interpreting the above mentioned findings it can be claimed that two institutional factors are constraining the growth of infrastructure for the support of innovation (see also Müller, 2004):

- Inefficient borderlines between functionally specified systems, including academic and industrial science, the R&D system and industry, education and industry;
- Limited opportunities for the mobilisation of different (in particular market-based and programme hierarchy-based) forms of social co-ordination.

The above mentioned interpretation has been supported also by a more complex (interdisciplinary) study of transformations in the post-socialist countries in the perspective of modernization, and with help of modernity concepts (see e.g. Adamski, Machonin, Zapf, 2002).

The above-outlined phenomena can be understood as indicators of institutional environment and can serve as a ground for institutional analysis. The notions of innovation can be used for such purpose. The concept of national innovation system has already been used for the analysis in the macro-level (Müller, 2001). For the analysis of in the regional level one is applying the concept of *infrastructure for support of innovation*. This concept underlines, in similar way as the concept of national innovation system, systemic features to be considered in the analysis of institutional framework for support of innovation. The notion of infrastructure presumes that crucial institutions and interfaces among them are specified in view of the function of such an infrastructure – in our case to facilitate the growth of innovation performance in economy and society. Of course, the notion of infrastructure for support of innovation has to cover conditions for reproduction and accumulation of specific resources and capabilities as well as conditions for change and transformations. E.g. in the guidelines for the study of regional infrastructure for support of innovation the infrastructure is defined by two sub-systems: (i) resource centres of relevant resources and knowledge which can be offered to firms, like research centres, university laboratories, large firm laboratories, contract research organisations, venture capital companies and other financial institutions, training and consulting organisations, and (ii) interface organisations which can facilitate interactions between the supply of external (knowledge) competencies and the demand of firms, like technology transfer organisations, professional associations, chambers of commerce, science parks (European innovation monitoring system 1996:4). Such definitions offer a descriptive, rather than interpretative approach to this issue. It counts with specific resources and actors only. An interpretative approach has to be accomplished by a closer insight into the environment in which the actors are operating and the resources are mobilised. In short, the institutional issues have to be involved in the analysis.

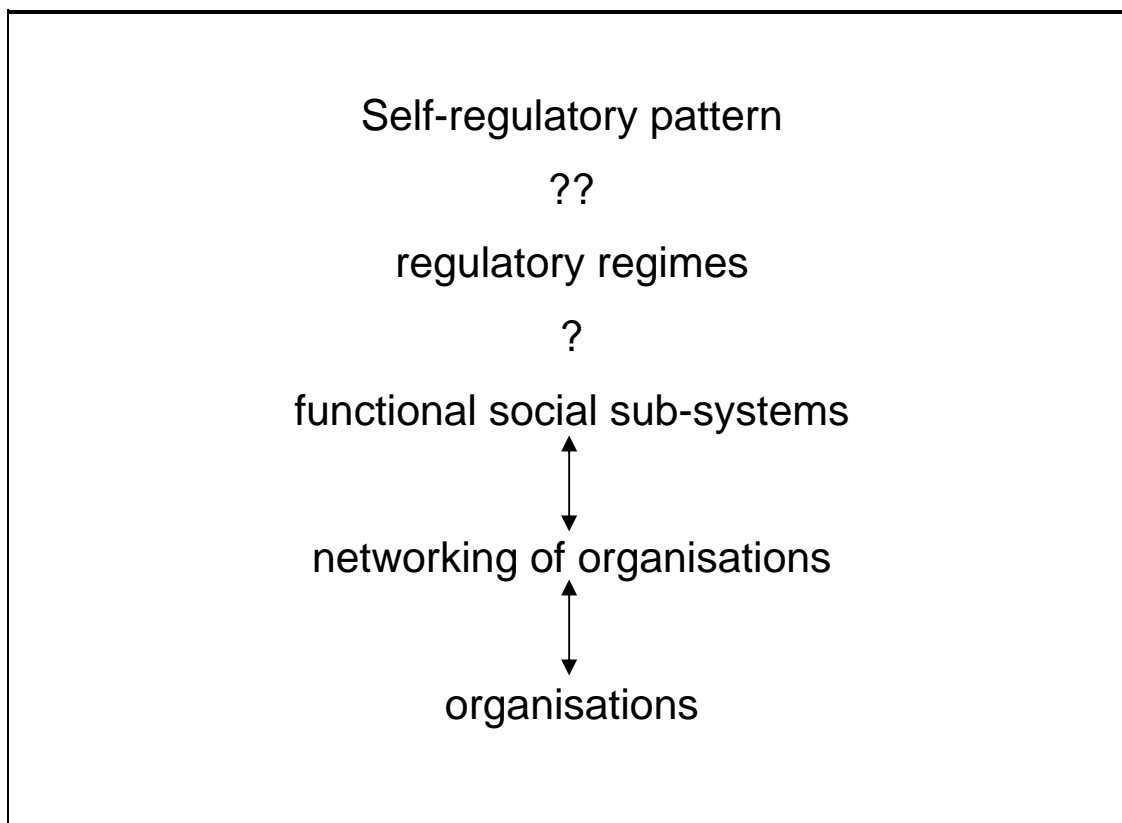
The first attempt of institutional analysis of innovation system / infrastructure has already been presented in my already mentioned ESA papers. Having used the Hollingsworth model the important factors, or levels, of institutional settings has been identified: – (i) the level of basic norms, rules, conventions and habits; (ii) the level of forms and capacities to co-ordinate, like markets, hierarchies, obligation networks, associations, the state, communities and clans; (iii) the level of the institutional sectors of society, like, for example, suppliers, funding sources, regulators etc.; (iv) the level of organisations and their structures; (v) the level of outputs and the performance of institutional components - their flexibility and variety (Hollingsworth 1998). The pattern of institutional framework for innovative situations, or innovation based social environments, can be described in a graphic form (see **Scheme I**). Hollingsworth is suggesting that an institutional analysis should proceed at each level and should identify the specific social contexts, rules, incentives and procedures for enforcing compliance, and measures for reducing the costs of compliance.<sup>1</sup> Following his recommendation I have found an uneven coverage of the single levels by research results. So far more data and better knowledge have been produced about lower levels of model - about changes in environment of organisations and their actors, about formation of alliances and co-operative links among them, specific social environments in social sub-systems (economy, technology, education, R&D, political public etc.). Less knowledge is

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<sup>1</sup> Hollingsworth justifies his approach with the assumption, that institutions are “embedded in a culture, in which their logic is symbolically grounded, organisationally structured, technically and materially constrained, politically defended and historically shaped by specific rules, habits, conventions and values“(Hollingsworth, 1998:14)

available about interfaces between cultural/ self-regulatory resources, regulatory regimes and their impact on changes in relationship among the social sub-systems. It has been also the outcome of my interpretative conclusions in both mentioned ESA papers. This time I would like to address the issue of “upper levels” – the issue about role of cultural resources in operation of regulatory regime and its possible change. I shall start my discussion from a general position since an understanding of this issue is not only conditioned by insufficient amount of knowledge but also by different methodological issues. Next chapter will deal with understanding of institutions by social sciences.

**Scheme I: Institutional framework of innovation based societies**



### **3. An institutional framework of modern life – its constraining and challenging role**

In practical terms the implications of innovations have been mostly reflected in market-based economic institutions. In theoretical terms such experience has been followed by Schumpeterian concepts. Their evolution indicates well a shift in understanding of the nature of innovation: at first, innovation was understood as a technology based artefact with its relation to science-technology paradigm (extension of Schumpeterian approach by Kondratief's concepts). Later, the notion of national innovation system has been developed to understand innovation as a network of economic, social and political factors (Nelson, 1992). Here, the *systemic* feature of innovation is used, and so the question can be asked, what is the groundwork to order innovation factors, or co-

operative efforts of innovation-related actors. Is it conditioned by the power of technology (as suggested e.g. by Ellul) or is it shaped by social and cultural resources? Due to innovation studies the issue of culture has been raised on the research agenda. Similar development has been followed by the social studies of science and technology. Extensive research on the social implications of science and technology has been accomplished a better understanding of the social context of their development, including an understanding that a (normative) concept of a (good) society is needed in order to cope with the current resources of science and technology. Here, also the issue of culture is emerging out of research advances in this field.

The economic science, which has been focused on the study of role of institutions, has mostly followed an assumption about constraining role of institutions. Similar approach has been applied in the other social sciences and humanities, in particular those ones which have closely analysed implications of current modernity. The role of institutions has been labelled by so called “repressive thesis”. The repressive thesis has its roots in a Freudian turn in social sciences and their closer study of “non-rational” sources of human action. For this reason it was supported and specified by some representatives of Frankfurter school (in particular by H. Marcuse). Currently, Foucault’s concept is much in the line of this thesis. The repressive thesis claims that modern institutions are means of disciplining human being, of suppression of his/her emotional resources, pushing them out of public institutional setting into the family and the intimacy of private life. Consequently, there have appeared different tracks of rationalisation in the public and private life - a consequence, which was previously noticed by M. Weber. Public discourse has mostly preferred instrumental rationality while externalising expressive resources into communicative discourse of private life. Currently, such a dis-balance seems to bring about unintended consequences for public discourse. Habermas has pointedly described it in terms of the feudalisation and emotionalisation of the public sphere (Habermas, 2000). This short comment on the debated issue of the constraining role of institutions has intended to present some arguments, which could contribute to an understanding of the cognitive role of the above-described paradigms on the concepts of culture. These arguments are specifying the forms or factors relevant to both paradigms as well as falsifying their independent and disjunctive cognitive roles. In terms of the functional approach to culture, one can observe that it has contributed to a better understanding of a pattern of human needs. Institutions function as they are covering basic human needs like protection against decay of man and community, against aggression, against material shortage and loss of meaning of human action and existence. These needs are specific in their function (and institutional setting) but are also interrelated (and are subject to inter-institutional impact). Of course, such a situation is much closer to an interpretative power of the value-based paradigm. Another challenge of the functional paradigm has been formulated by N. Luhman and his concept of autopoietic systems. In his view due to increasing individualisation and the growth of social distance between acting man and institution (manifested in environments of mistrust), the function of institutions rests in their capacity to reduce the complexity of social life, rather than it be embedded in the mind of an actor (Luhman, 1974). In this critical reconsideration of the functional paradigm, the issue of reflexivity has been raised. What kind of knowledge is mediating the relationship between acting man and institution? I shall come back to this question after commenting on the value based paradigm and the re-assessment of its role in current social studies.

The arguments put forward by repressive thesis have helped identify trends and articulate the negative effects of prevailing functionalisation of social life. They have facilitated a revival of a value based paradigm and closer study of institutions and their chances for a change. Institutions have, consequently, been understood to provide a more profound existential meaning for the survival of human beings. In the same perspective, Gehlen's concept of institutions has been re-discovered. According to his view, institutions are representing (i) an alternative to insufficient instinctive capacities of human beings, and (ii) a way or form, which facilitates human inter-action while embedding accumulated knowledge as a shared standard or framework of action (*Entlastung*). Of course, such an approach is able to reflect a wider scope of human (experimental or creative) action and also search for its practical roots. It can also reflect non-conformist practices, which are not shared by the (major part of) society. Its cognitive power has become evident and productive in the study of highly differentiated and differentiating social patterns of modern societies. It helps towards understanding how and why existing institutional frameworks are challenged and transcended by social processes (resources, actions and valuations) and what institutional changes may consequently emerge. Contrary to "repressive thesis" the value-based approach is stressing the *challenging and facilitating role of institutions whilst counting with the double-faced institutions, two sources of their power, and their diarchic nature*. In my view such approach, which is also reflecting on radical social changes of last decades, has been developed by A. Giddens.

In order to understand the institutional framework of modern societies Giddens takes into account three important lessons: (i) the outcome from the debates over the role of the *industrial system* in modern societies (in particular Bell's concept of post-industrialism); (ii) changes in their institutional and cultural framework - as suggested by the Frankfurt School's concept of "late capitalism" (in the 1960s), and (iii) the outcome of socialist developments in the CEE countries. Consequently, he specifies two important institutional dimensions of modern societies: industrial system and (*capitalist*) *economic system*. Further on, the debates concerning the issue of modernity/post-modernity help him highlight two additional institutional factors of modern societies: (i) the role of the *political, public and civil society networks* in an environment of turbulent cultural shifts, and (ii) the *diarchic nature* of modern institutions – the significance of the countervailing role of *formal* (systemic, organised) and *informal* (self-actualised, self-organised) *actions and assets*. Both issues are important factors for institutional stability and for institutional change. Following the heritage of functional analysis he outlines four dimensions of the modern institutional setting (the capitalist economic system, the political system with the surveillance function of the state, the industrial system and the systemic control of means of violence) – together these form the ***institutional cluster of modernity*** (Giddens, 1990). His understanding of the institution combines the functional and the anthropological approach: institutions are not justified by and organised in accordance with their function in social and human life alone, but also in terms of their reflexive capacities. "Human action does not incorporate chains of aggregate interaction and reasons, but a consistent ... monitoring of behaviour and its context" (Giddens, 1990: 36-37). They represent social "practices that are constantly examined and reformed in the light of

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<sup>2</sup> It should be mentioned, that Luhman is formulating the answer in functional paradigm assuming the relationship between actor and system is based on mistrust and reflexivity, therefore, can be understood as an outcome of (autopoietic) systems and their functional capability to reduce complexity of modern life.



incoming information about those very practices, thus constitutively altering their character.” (Giddens, 1990: 38).

That said, the question should be asked as to how the cultural environment is understood; for Giddens, relevant cultural resources rest in appropriating regulatory forms or procedures, which could govern the countervailing powers of formal organisations and self-organising movements. One should be aware that it is an attempt to combine an action-oriented approach with a structure-oriented one. Such a combined approach relies on the existence of a certain cognitive culture, which is (i) embedded in a general cultural pattern/structure, (ii) respected in the current practices of actors, and (iii) enables interaction between the two. Of course, such a cognitive perspective – projecting an interface between the level of human action and the level of its structured environment (social differentiation, power differential etc.) – is subject to critical objections. The above-mentioned Luhman’s interpretation is stressing the formative role of structural elements. On the other hand, the phenomenological approaches are much more focused on the level of action and generalising principles of a communicative environment. Similar distribution of views can be observed in the debate about the issue of reflexivity, with which I would like to conclude the discussion in this paragraph.

Having discussed the interfaces between culture and institutions its important “backbone” has been outlined: the necessity of legitimating the power and capability of producing symbolic knowledge for that purpose. Similar interpretation has emerged from the previous discussion about “and approach” – the necessity to study interfaces among institutions. The notion of reflexivity has been formulated in order to point to the most important cultural features of such an interface. At the same time these arguments are indicating that institutions cannot only be legitimated by their function but also by consequences of their activity for the environment and other institutions. Referring to previous discussions about leading paradigms in the study of the culture, such arguments can substantiate the formulation that the cognitive power of a value-based paradigm is a growing and complementary utilisation of both paradigms and can be of considerable interpretative value.

Extensive attention to the issue of *reflexivity* has been paid by studies of post-modern situations, or critical assessments of the current state of modern institutions. The attained consensus on the role of reflexivity among some sociologists has even led to the notion of reflexive modernisation, which has initiated collaborative effort and critical discussion about this topic (Beck, Giddens, Lash, 1994). From a civilisatory perspective, reflexivity can be considered a basic human capability which is closely intertwined with other capabilities, and forms a pre-condition for human survival in social environments (e.g. in terms of Gehlen’s approach). An important contribution to its understanding can be gained from the sociology of knowledge and its concepts. Currently this study explains that the difference between everyday (common sense) knowledge and abstract knowledge is the key outcome to the advancement of modern societies. The formation of balanced interfaces between both types of knowledge resources is the key factor of modern societies’ sustainable growth. The description of these differences is, therefore, of essential importance. Luhman has suggested a feasible concept to understand this issue. In his view *reflexivity* is representing an intentional relation of a human act to another act of the same sort (stressing the mimetic nature of human action as a consequence of a lack of information about the environment of an actor - added by K.M.). Generalization through reflexivity is based on the principle of

equity and can shape a state of consensus. Reflexivity forms a stock of practical knowledge, which is not easily changed via critical discussion and assessment.

**Reflection** is representing the intentional relation of a human act to an acting system; generalisation by the help of reflection rests on the principle of identity. It can become a factor of social change rather than social order - as is the case of reflexivity (Luhman, 1974:102). Luhman's conceptualisation has also been accepted by the above-mentioned authors of reflexive modernity. The point of dispute is related to the question – how can both forms of knowledge production be related to each other (such a question has become justified with the growing understanding that scientific knowledge – reflection - cannot substitute human reflexivity).<sup>2</sup>

Beck is more sceptical about the role of expert knowledge reflection), and its function in securing the reliability of human and social decisions. In his view decisions are taken without the decision makers knowing the consequences of their actions – in an environment of non-knowledge. In his view reflexive knowledge is produced and reproduced within social environment of sub-cultures and particularly in a form of non-intended and non-perceived self-dissolution which is self-threatening; as only the pressure of sub-cultures on the majority culture can become the main factor in the mediation between reflection and reflexivity.

Giddens sees, that the sources of reflexive knowledge interact between expert knowledge and symbolic tokens, which are intertwined with, and influencing everyday knowledge of laics. Its social background is formed by building mutual trust between experts and laics in important localities of their interactions – accession points (Giddens, 1990).

The third author – S. Lash – is defending the phenomenological interpretation of this issue. He counts with the framework of reflexive communities and mobilisation of esthetical forms of knowledge in order to mediate the relationship between forms of reflection and reflexivity. Well, the answers to the issue of mediation between both types of knowledge are quite different. So, one could be afraid that a reliable understanding of the role of reflexivity in institution building is not available.

Nonetheless, some important issues can be learned from this debate: (i) availability of both types of knowledge is important for the sustainability and change of modern institutions; while its abstract forms (reflection) open up the space for more diversified social situations and their justification (say in terms of positive power, market exchange or law). The forms of reflexivity take care of its application to humanistic aims (so that bureaucratic and instrumental forms can not prevail); (ii) interface of trust and mistrust is a crucial issue to be observed and governed, lest acting man is pushed into a psychologically pressing situation of dread and feeling of loss of identity; (iii) different forms of knowledge (verbal and non-verbal, face work and mediated, formal and informal) have to be mobilised in order to facilitate an environment of trust; (iv) a framework of balancing an interface between reflexivity and reflection can also be understood in a negative sense: one should try to avoid the negative implications of instrumentality of reflection-based knowledge (expertise) on the one hand, and on the

other, the negative impact of reflection-based knowledge in support of conformity and absence of self-reflection and identity.

Having examined understanding of institutions and their cultural resources in view of modernity studies let us make next step and follow the way how approaches and arguments of cultural studies can help us understand the nature of institutions. This step is made with expectation that a comparison of both conceptual views can help us specify key issues and notions which could be used in the institutional analysis of modern societies and their innovative efforts.

#### **4. Institutions and their cultural environment**

A brief overview of theorizing in the field of cultural studies offers a heterogeneous landscape of concepts. Quite diversified theories are available which interpret the nature of culture. Understanding the subject of culture seems to be a ground of conceptual differences. Should values or norms be a key factor of culture? Or should a difference between material and immaterial (symbolic) factors become the norm for understanding cultural phenomena? Even if I do not question the significance of the above-mentioned cognitive approaches I claim it is the clash between functional approach and practical approach to social ordering that is the key source of cultural contradictions in current societies. For this reason I side with such approaches, which try to understand culture via two basic theoretical approaches, or paradigms: (i) functional approach and (ii) value based approach. The former approach assumes that basic social needs are understood and internalised in forms of a normative framework of action; in such situation, effective forms of social control can be established, and distribution of power and social differences justified. The latter approach does not count with the mutually binding interface between social norms and values, as it is the case in the former approach. On the contrary, it assumes there are tensions between them and suggests that culture should be studied from the position of actor and his/her interpretative capacities, simply from the perspective of her/his practices (Geertz, 1973).

The differences between both theoretical approaches are important for understanding the notion of innovation culture. **Functional approach** counts with generalizing capabilities of norms and allowing for a functionally based regulation and normative based repression since they are embedded in human needs. In the functional perspective culture has systemic features – each of its elements tends to support its integrity, and any one element cannot be understood without viewing it in relation to the totality of the culture. On the other hand, differences between cultures are more visible and borderlines between them better re-constructed. The emergence and consolidation of the institutional frameworks of national states can be described well by a functional approach, here its explanatory power has proved to be effective. The application of a functional approach to the study of the relationship between innovation and culture helps focus our attention upon the study of infra-structural issues: improvement of interfaces among key actors of innovation processes, better logistics among innovation phases, reduction of uncertainty in decision making about innovation projects and a corresponding reduction of transaction costs. The functional approach prefers to see

innovation in terms of a “technological fix”<sup>3</sup> rather than as an uncertain and complex social process. Furthermore, it is also not open enough to innovative incentives from different cultures, which makes it difficult to transfer its innovative artefacts onto different cultural environments. The concept of alternative technologies has adequately reflected such deficiencies in the transfer of technologies from the so called First World to the Third World.

The ***value-based approach*** stresses the role of current practices and the interpretative capacities of actors and in their role to balance various types of contradictions and tensions in everyday life and in the organisation of social life. Such an approach is based on interfaces of signifying actors to their (local) environment, helps to accumulate their everyday experience and encounter challenges approaching them. The cognitive power of a value-based approach is focused on the sub-structures or sub-cultures rather than the generalising power of dominating structures, or cultures. It is sensitive to reflect on latent associative or co-ordinative activities, which are able to break established borderlines among cultures and build-up bridges among them. This approach has an anti-entropic flavour while suggesting that a system can be more than the sum of its parts. That is why it is compatible to the notion of innovation understanding it as an advanced social process. It takes into account the extensive and intensive social roots of current innovative process that are not only related to advances in technology alone, but to important trends of current modern societies - processes of individualisation and globalisation. A key advantage to a value-based approach rests on its methodological capacity to follow cases of how institutions are becoming open and reflexive to their environments. In doing so it is constructing new symbolic tokens for multi - and inter-cultural context and means for legitimising institutional changes. Its weakness, however, rests with underestimation of power differential. After all, power is a medium, which decides whether an innovative event or artefact will be transformed into a socially accepted and culturally justified phenomenon.

The above outlined paradigmatic dichotomy is quite known to social sciences, in particular those, which study institutional changes. As already mentioned above, national states have been quite successful in building reliable institutional frameworks of modern societies which balance the freedom to act with solidarity, mutual trust and security. Such a situation made it suitable for social sciences to follow a sort of state-centred approach (Wallerstein, 1996), since it could count with the advantage of a stabilised social environment (and institutional framework) and easily apply an assumption of *ceteris paribus*. The current globalizing pressures have set national states institutional framework in motion. Any conceptual effort, if it wants to be productive, must be sensitive to both sides of the institutional frameworks: structures and their impact on human activity as well as the pressure of individualising trends on shaping of these structures. In the same way a study of cultural issues should not follow an extensive dimension only (the number of factors influencing current cultures) but also an intensive one - what is the web of a specific culture which is able to signify all differentiating human efforts and co-ordinate them accordingly. That said, I shall make use of such a notion of culture, which takes into account both dimensions (Keller, 1997).

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<sup>3</sup> This term has been earlier used by A. Weinberg in an attempt to justify technology as a social factor: he argued that autonomous advances of technology can produce resources which can appease social conflicts (Weinberg, 1986).

In terms of *extensive dimension* the notion of culture can be understood as a set of propensities / capabilities to

- carry out *symbolic* communication;
- *institutionalise* human activities;
- build up legitimate structures of *organised* power.

Of course, the aim of these propensities / capabilities is to reduce the growing number of problems individual human beings have to solve in order to survive in such complex environment in a cultural way. In terms of the above suggested concept of culture, the *intensive dimension* can be identified as the interface among these basic propensities / capabilities: the more open and active the interfaces are among these basic factors, the more intensive are the culture's capacities.

The above-mentioned analysis of the cognitive approach to the study of culture can be interesting for the intentions of this discussion in several aspects. Firstly, the capacity to build up institutions is considered to be an important cultural resource. Secondly, such an assumption makes it possible to construct interfaces between cultures and institutions and thirdly, taking into account the suggested conceptual paradigms of cultures, the various types of different cultural bonds can be assumed - functional and situational, formal and informal, open and closed – and so their understanding can be improved. Last but not least, the principles of organisation and of justification are stressed. Fukuyama has arrived at similar conclusions in his recent interest to understand the role of institutions in building up competitive political regimes along with the state as their important regulatory instrument. In order to support his analysis he has compared the situation in the political realm with that of the (private) business enterprise sector. The fordist and post-fordist forms of organisations (as formulated in the theory of organisations) are offering good evidence of the factors which are important for institution building. Assessing all this knowledge he has come to the conclusion that institutions (in his words the demand for institution building) are influenced by four factors: (i) management of properties and design of an organisation's structure, (ii) political regime with its balance of representativeness and governability, (iii) legitimacy of regime, and (iv) cultural and structural resources (Fukuyama 2004). As we have identified above: institutions are related to culture and such a relationship is conditioned /mediated first and foremost by the resources and forms of organisation and legitimation. He argues that two types of such a relationship (in state-building) can be constructed: strong and weak national states. Such an assessment corresponds with his earlier analysis and conclusions regarding of social capital and high and low-trust societies (Fukuyama, 1995). The latter statement concerns the issue and role of interface between institutions and culture, which I have discussed above: it claims that it can be described by two different types.

To sum up the discussion in this paragraph it can be claimed that while following relationship between culture and institutions similar notions have been identified as in the preceding paragraph: notions of organised power, reflexivity, trust and complementarity of functional and practical approaches. That said, I could come back to the scheme of institutional framework of innovation-based societies and start discussion about the issue of relationship between self-regulatory and regulatory levels with the background of (functionally based) social sub-systems (upper part of **Scheme I**). Before I start to interpret it I present my preliminary assessment of this issue, which is based on

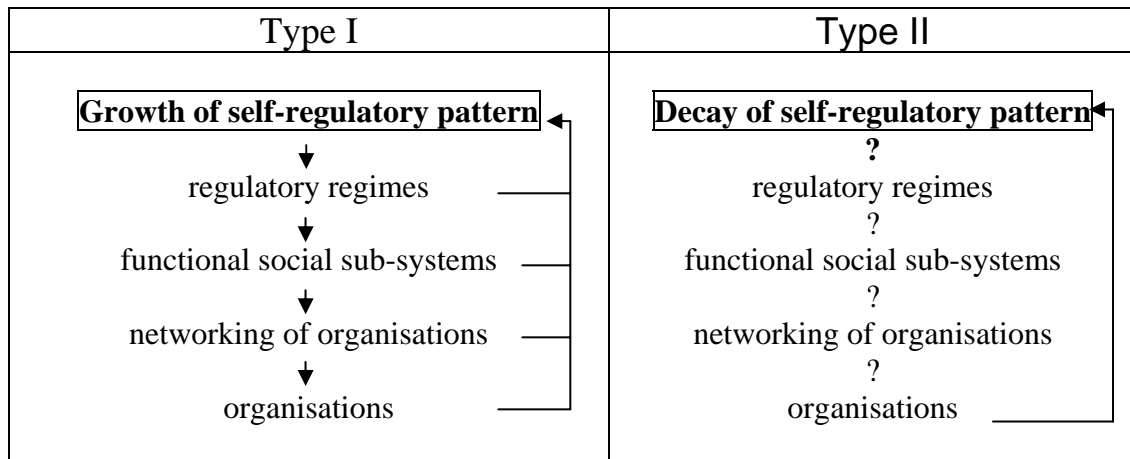
findings of the above-mentioned comparative studies. I will explain that such an assessment cannot be successful without a historical view is applied.

## 5. Historical context of institution re-building

In the preceding two paragraphs some paradoxical phenomena have been identified the balancing of which seems to be important for situations of modern and innovative societies. Alongside the functional perspective, reflection, formal organisation and trust one has to count with practical considerations, reflexivity, informal and value based interactions (and movements) and mistrust. In methodological terms such approach has been pointedly outlined by U. Beck. He is speaking about the need of “**and approach**”(Beck 1986); instead of looking at social situations in terms of “either / or” (e.g. either the role of functional view or value-based view) one should prefer “and approach” - balancing the role of both views. Beck’s methodological initiative as well as the above-mentioned discussion about the nature of modern institutions has been conceptualised well by A. Giddens. I would like to refer to his concepts since it allows me to continue in my discussion in a more specific way. His concept of the institutional settings of current societies in post-modern conditions is to apply both the functional as well as the interpretative approaches; the “and approach” is used to describe the dilemmatic nature of institutions and the social context of human action.

The application of “and approach” turns out to be an important cultural precondition for institution building and re-building in modern societies. Taking into account the **Scheme I** this cultural resource / capability is concerning the relationship of self-regulatory and regulatory level. If regulatory activities and provisions should be based on trust and also count with mistrust how the self-regulatory activities look like? Are they able to invest trust also in an environment of mistrust? Similar question can be asked about relationship of reflection and reflexivity. How the need for a combination of both sources of knowledge in regulatory efforts can be supported in level of self-regulation of actors?

In Luhman’s concept the regulatory efforts can be to great extent creative (autopoietic) without being related to the level of self-regulatory efforts. In this perspective one can suggest that position of post-socialist countries is not much dependent on the appropriated cultural resources: the destruction of centralistic regulatory regime offers chances for their creativity in applying up- to-date means of regulation. Of course, liberalisation of political life and privatisation of economic sphere has brought up lot of experimenting and diversified forms of (self-) organisation. The problem has not rested in a formation of diversity of organisations but in question, how to organise this diversity, how to evaluate diverse forms of activity, identify and select efficient ones and constrain those ones with reproductive capacities. Having in mind my comparative study of infrastructure for support of innovation I could identify two institutional consequences of such imbalance between growth of diversity of organisations and lack of co-ordination and regulatory forms.

**Scheme II: Institutional framework of modern societies: Situations of evolutionary (Type I) and radical (Type II) change**

The stabilised institutional framework and well-embedded practices make it possible for regulatory actors to get focused on an improvement of specific regulatory instruments (such practice has been labelled as a “fine-tuning”). If well designed the regulatory intervention is supported by reflexive responses of organisations; institutional reflexivity is giving evidence about stabilised institutional frameworks or may indicate the location of its weakness. The situation of stabilised institutional framework is advantageous for social study – it can be focused on particular issues of institutional settings and in the area of new knowledge suggest appropriate “fine tuning” of regulatory policy. Such a situation is indicated in the **Scheme II** on left side (interfaces of **Type I**). Interfaces of **Type II** (indicated in the same Scheme) are describing situations of institutional change. Institutional change is always accompanied by the decrease of influence of institutions and growth of mistrust of their role (due to processes of dis-embedding from old practices and re-embedding new ones). Two situations can be outlined here: (i) functional and administrative capacities of institutions can be effective enough to face such challenges and survive even in the situation of general mistrust and weak linkages between self-regulatory capacities of people and regulatory regimes (as the case of Luhman’s interpretation), and (ii) general mistrust of institutions is accompanied by inefficient administrative capacities; consequently, a self-regulatory pattern happens to be under pressure of extensive uncertainty, and starts to shift to more basic (traditional) valuation patterns, and regulatory capacities of (modern) institutions become interpenetrated by corruptive practices.

The **Scheme II** is comparing the institutional framework of new EU countries with the old one, which are also under pressure of institutional changes but dispose of established interfaces between the regulatory and self-regulatory capacities. The suggested typology is objecting to assumption of possible creativity in a situation of general destruction of institutions or in a situation of absence of adequate cultural preconditions. It also questions an assumption that regulatory capabilities can play an independent role in institutional transformations: they can ease a situation of institutional change but cannot substitute cultural and valuation pattern. The suggested typology is in fact supporting the historical approach – Institutional change of **Type I** can operate in a specific historical context.

A suitable historical interpretation of the discussed issues can be learnt from U. Beck, who has proposed an evolutionary approach to the study of modernization processes. He conceptualises emergence of modernity as a historical process in two stages - simple and reflexive modernisation (Beck, 1993). In his understanding, *simple modernisation* is representing a period of industrialism with trends of linear growth and expectations of a simple transition from industrial to modern societies, the predominance of instrumental rationality (and the externalisation of non-instrumental causes), social structuring in large groupings and functional differentiation as a mode of problem-solving (including the political differentiation in left/right orientations). *Reflexive modernisation* (Beck, 1993: 97-98) features a different pattern of resources and orientations (of action): uncertainty (instead of linearity); alternative modernity, or anti-modernity, as a medium towards modernity; side effects and unintended outcomes as the source of knowable action (instead of instrumental rationality); individualisation (instead of social groups, strata or classes); co-ordination, networking, fusions (instead of differentiation) and inclinations towards existentially based orientations, such as secure-insecure, internal-external, political-apolitical (instead of the left-right orientation). Similar differences have been outlined in the concept of post-industrialism and supported by many empirical studies. In the way of first approximation it can be claimed that core EU countries have already embarked on the track of reflexive modernity (post-industrial situation), while accession countries are still shaped by the context of simple modernisation and patterns of industrial resources.

## 6. Discussion

Starting the discussion I would like to reiterate basic steps (topics and arguments), which I have made in order to understand an institutional framework of science-public relationship and its current changes. Having in mind the concepts of science-public relationship, which have been developed by social studies of science and technology I have approached the issue in the perspective of economic studies of innovation. Their outcome is clearly indicating, that institutional factors should be understood as key explanatory variable of influence on a growth of innovation performance. Such claim is in particular relevant for the situation of new EU countries. The analytical and comparative reflection (towards EU situation) of selected new EU countries, in particular Czech Republic, has formed empirical background, and starting point of my discussion. Following step has been focused on the conceptual approach to institutional issues. With reference to empirical comparative findings two types of interfaces between regulatory and self-regulatory factors have been suggested as a possible interpretative approach. In the next step I have examined whether this interpretative assumption can be supported by knowledge of other social sciences. The following chain of concepts has been gained to support my discussion: institutions should be understood in their constraining as well as facilitating function; if so, their functional and valuation aspects should always be considered in the study of institutions; in order understand this issues one has to approach the basic and dilemmatic issues of social sciences – what is a relationship between social norms and valuation patterns, what is role of social structures and (value-based) action, of organised power and symbolic power? Essential arguments about the dilemmatic natures of these phenomena I have obtained from sociological debates about modernity and found out the issue of trust and reflexivity to be key factors mediating relationships between dilemmatic roles of modern institutions. Moreover, following concept of simple and reflexive modernity of U. Beck I have found it necessary to take into consideration the historical account while



assessing the role of trust and reflexivity in their mediating roles. At this stage an interpretative framework for an analysis of relationships between institutions and cultural resources, or in another vocabulary between self-regulatory and regulatory settings of action has been outlined. It can be claimed, that the above-identified mediating factors / actors are crucial precondition for building modern institutions and facilitating their change.

That said we could return back to the **Scheme II** and try to approach it with a more analytical insight. In this scheme the nodal points of interface between regulatory and self-regulatory levels of institutionalisation have been specified. Their identification has followed the conceptual interpretation of Giddens (structure-action approach) rather than that of Luhman or Beck. The advanced model is counting with individually based reflexivity which is mediated by an environment of trust; further on it demonstrates the diarchic nature of power resources (organised regulatory power and power of social movements); institutions are reflexive and construct for this purpose the access points in order to establish communicative links to their public environment (institutional reflexivity); and different varieties of organised power (and power differential) are taken into account. The Scheme III is indicating, how the basic model is advanced in order to include the above identified factors of reflexivity.

**Scheme III: Factors of institutional change**

<u><b>Basic model</b></u>	<u><b>Advanced model</b></u>
<ul style="list-style-type: none"> <li>▪ cultural (self-regulatory) pattern</li> <li>▪ regulatory regimes</li> <li>▪ institutions &amp; reflexivity</li> <li>▪ organisations &amp; reflexivity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Active trust, individual reflexive capabilities</li> <li>▪ Regulatory pattern, public activities of situated groups</li> <li>▪ Institutional reflexivity, access points of institutions</li> <li>▪ Properties of social organisation</li> </ul>

The advanced model of institution building, which is also appropriate for a situation of the change, counts with assets of social capital – propensity to invest trust and be able to take a risk in an individual decision-making. It should be, however, remarked, that such propensity is based not only on a rational ground (one has to have a chance to assess risk in calculative terms) but also on some practical reflexivity (Simmel speaks about weak inductive knowledge and also the notion “feeling of ontological security” is used in the same meaning). Next important methodological concern is focused on the analysis of interface between regulatory actors and situated groups and individuals. Last point is closer focused on the analysis of borderlines between institutions and the public environment, which is labelled by the term “access points” – points, in which trust relations between institutions and the public are produced and re-produced.

**Scheme IV: Types of culture by social capital and innovation performance**

<b><i>Reproductive culture</i></b>	<b><i>Innovative culture</i></b>
<ul style="list-style-type: none"> <li>▪ Low level of social capital formation</li> <li>▪ Power-oriented activities of situated actors</li> <li>▪ Low level of institutional reflexivity</li> <li>▪ Corruption of regulatory forms – clientelism</li> <li>▪ Self-sustaining strategies of action</li> <li>▪ Loss of „firm-footed“ position</li> </ul>	<ul style="list-style-type: none"> <li>▪ High level of social capital formation</li> <li>▪ Value-oriented activities of situated actors</li> <li>▪ Advanced institutional reflexivity</li> <li>▪ Co-ordination of regulatory forms</li> <li>▪ De-centralisation, outsourcing, networking</li> <li>▪ Innovation-based firm</li> </ul>

The aim of the **Scheme III** is to indicate the conceptual and methodological framework for the analysis of relationship between science and the public. It is focused on the institutional issues, yet suggests which factors should be taken into consideration so that valuation patterns are involved into analysis. It offers both the topics for a more detailed analysis and the interpretative framework for a generalisation of empirical findings. I will conclude the discussion with a latter case: having in mind the above-mentioned knowledge about innovation I will suggest possible types of culture according to their interface to innovation activities. The **Scheme IV** is framing the answer to this question while articulating two types of cultural environment by way, of how relevant factors and actors are ordered.

The above-outlined scheme makes use of the advanced model of institutional change (**Scheme II**). On the one hand it articulates resources, factors or actors for each level of the model and on the other hand it identifies the qualitative difference between them, which is summed up in the form of two different (ideal) types of cultures by their impact on the formation of institutional infrastructure for support of innovation. The **Reproductive Type** culture indicates a cluster of mutually conditioned factors, which do not form a suitable environment for growth and performance of innovation. The **Innovative Type** outlines social and cultural features of innovation friendly environments.

The suggested approach to understanding (ideal) types of institutional settings for support of innovation is also relevant for understanding science public relationship. It underlines the role of different cultural and social background, in which the functional aims of institutions are reflected, activities of situated actors mobilised and justified.

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